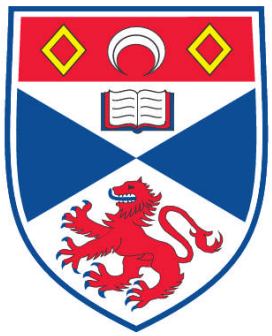
AN INVESTIGATION INTO THE USE OF SOCIAL NETWORK SITES TO SUPPORT PROJECT COMMUNICATIONS

Natalie Harvey

A Thesis Submitted for the Degree of PhD
at the
University of St. Andrews



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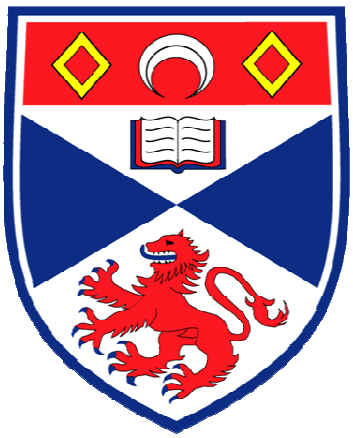

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Abstract

System deployment projects are extremely complex and with more and more organisations now choosing to configure and deploy off-the-shelf systems, the project teams are presented with new challenges. The aim of this study was to gain an understanding of the issues faced during such configuration and deployment projects and see if support could be provided.

A year long observational study of one of these projects was carried. While it was initially assumed that it would be technical issues related to the system's configuration that would be the primary problems, the study revealed communication issues to be at the heart of a large number of the issues.

Online social networks such as Facebook are extremely popular, allowing users to stay in touch with large numbers of distributed people. Private social network sites were applied to projects to see if they could replicate the benefits the sites provide and support project communications. A social network site was created for both a distributed research project and an administrative systems project and their use observed. Statistical data on the use of the sites and qualitative feedback from users is presented to assess the viability of the approach.

The experiments showed social network sites to have many benefits when used as a complementary mechanism to traditional channels for project communications. It is clear however, that social network sites cannot solve all the problems projects may encounter. If the use of a site is to be a success it is vital it gains a critical mass of users. The approach taken to the site's configuration and introduction will be hugely influential in its success. In order to choose the right approach a clear understanding of what the project's communication needs are and the possible uses of the site is needed. A process of configuration and development with a small group of potential users is recommended to ensure it is as user friendly as possible before going live to a large user base.

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Chapter 1 Introduction

System deployment projects are notoriously complex, especially when carried out on a large scale, effecting hundreds of people. The development of custom applications is both expensive and time consuming and empirical studies show that between half and two thirds of information systems projects fail [1] where failure means not meeting its objectives on time or on budget. In an attempt to avoid some of the problems, many organisations are now turning to off-the-shelf packages, which promise to integrate processes and reduce the costs involved in development, while providing ongoing vendor support. The work of the project team is no longer about programming and instead involves the configuration of an existing system that was developed to fit the 'best' practices of an industry.

While organisations are quick to cite the benefits of such an approach, Enterprise Resource Planning (ERP) systems are not a panacea for the problems encountered in large-scale projects. Instead they bring with them new issues that need to be considered and the impact of these is often underestimated. Organisations often expect a much simpler and lower risk project. Previous experience on projects however, is no longer transferable to these new configuration projects and they present new and often unexpected challenges to the project team which need to be understood. Approximately 90% of ERP implementations have been found to be delivered late or over budget [2].

The complexity of ERP systems means a large amount of skill is often needed to configure them and understanding what the package actually does is often difficult and time consuming. ERP systems are not made to a rigid requirements document produced by the organisation. Instead they are designed to include the 'best' practices for a particular industry. While vendors attempt to design them to be flexible enough to meet the requirements of most organisations in that industry, a combination of configuration and business process change is normally required to get a 'fit' between the organisation and the package. The impact of introducing an ERP system is organisation wide, involving a large number of varied stakeholders and this adds to the complexity of such projects. Users are wary of new systems and with ERP

systems requiring additional changes to business processes [3] they are often met with resistance [4-6].

This research investigates the problems encountered in projects attempting to deploy such systems and their root causes, with a focus on those issues related to communication which have been observed to be important. Social network systems were applied to provide project support and their use investigated, to see if they can alleviate some of these communication issues and provide benefits to both the project team and other stakeholders involved.

1.1 Motivations

Deploying a new Commercial Off The Shelf System(COTS) system is not as simple as just introducing the software and it being immediately productive. Instead it is a complex process, requiring ongoing interactions between the different groups of stakeholders and the project team to produce a system that will meet their requirements and in turn be accepted and used. If a system fails to deliver, it can have both a direct and indirect impact on the organisation both internally and externally, so every effort should be made to minimise the chance of failure[7, 8]. Even with this extra effort, it is common for projects to encounter large amounts of slippage and spiralling costs, causing them to be late and over budget. For these reasons, it is important that the process is understood in an effort to reduce the number of problems encountered and the impact that they have.

While many problems faced in large scale projects are related to project management issues[9-11], including staffing and meeting scheduling, these issues are not the focus of this study. Instead, the underlying factors that contribute to the problems encountered will be examined, focussing on the deployment issues around real systems. It was initially assumed that it would be technical issues related to the package and its configuration that would be at the root of many of the problems encountered and that these would be the areas where support would be needed.

To test these assumptions and gain a better understanding of the problem area, a longitudinal observational study of an organisation wide deployment project in a large

university with over 24 thousand students, was undertaken. The GEOMETER project planned to introduce a university-sector ERP system to provide complete student life cycle administration, while undergoing extensive business process change. It was hoped by observing a real project, the practical issues they face and the causes of any problems experienced would be revealed.

The GEOMETER project provided an opportunity to study the deployment of an ERP system across an entire organisation. The university would be the first to implement all of the system's modules and was planning to configure the system to be completely web based. The complexity of the university setting and the large number and variety of stakeholders involved in different areas presented interesting challenges for the project and made it particularly interesting to study. As previously mentioned, when implementing ERP systems, some business process change is normally required. The GEOMETER project was being managed as a change project, with an emphasis on standardising processes across the university and improving efficiency. The system was seen as enabling this change. Changes are often met with resistance and the impact of such large changes on the different stakeholder groups and how any conflicts are managed make the project a good example to study. While vendors normally discourage extensive configuration in favour of process change[12, 13], GEOMETER was taking a brave and rather ambitious approach, with significant effort in both areas.

It quickly became clear that, while the project faced technical difficulties due to the configuration of the package, communication between team members, and between the team and external stakeholders was also a major issue. Effective communication was seen by all involved as an essential factor in determining the success of the project. Problems discovered in the field study as a result of poor communication caused the focus of the research to change. It was clear that while the configuration process was challenging, the area that needed support was communication both within the project team and with the wider stakeholders involved.

Effective communication with the different stakeholder groups may have helped the project better understand the processes they needed to support and maintain the support of the users in difficult times. The lack of effective communication with the

stakeholders led to misunderstandings and confusion, with proposed processes not meeting the users' needs and having to be changed several times. This caused frustration amongst the stakeholders and project team and impacted on the schedule of the project. The end result was a set of business processes and a system configuration that very few users were happy with.

As ERP systems are normally introduced organisation wide, affecting a large number of different areas, the support of users[14], especially top management, is important[7, 15]. In order to gain this support effective communication is critical and, as the field study showed, this can be extremely difficult. While project teams are quick to recognise communication as important, the complexity of the communications problem is often underestimated.

User engagement with the project can help ensure that the requirements gathered support the actual work carried out and that any changes introduced by the project have user support. Gaining this engagement however was seen as difficult and, without this support, user resistance can prevent the benefits an organisation hoped to gain from being realised. Communication with the users can be essential, helping ensure that they are aware of the justification of any decisions made and the benefits the system will bring to them[16]. The organisation must however also ensure they don't raise user expectations too high, as they may end up disappointed and lose faith in the project. If a project encounters difficulties, communicating these effectively to the different groups of stakeholders is vital so they don't lose their support.

In large project teams of over 10 people, where people may be working on different areas of the project, possibly in different locations, communication is critical for the project to come together as a coherent whole[17-19]. When implementing off-the-shelf packages like ERP systems it is even more important that communication between the different parts of the project team is clear, due to the interconnected nature of the software. Decisions made in one part of the project can have a huge impact on other areas and it is important these are considered. Maintaining an awareness of what others are working on can help but doing this can be hard, especially in large, sometimes distributed teams.

Traditional approaches to communication such as meetings and blanket emails were used extensively in the project and their inefficiencies for two-way communication with such a large and varied group of people quickly became apparent. However, despite their best efforts, the team could not see an alternative approach.

Attempting to communicate with large numbers of people is notoriously difficult and traditional methods often fail to scale to the levels required. Arranging meetings for large numbers and ensuring those people get a chance to voice their opinions is almost impossible. Getting the balance right between too much information to everyone and not enough information to very few people is complex and finding a way to then communicate this information is also extremely difficult. Knowing who to tell about what can be a challenge, as people may have varying interests and this makes it difficult to ensure people get the information they require.

1.2 Social network sites

While groupware and awareness systems exist that attempt to help with these issues, they are often complex systems that require extra software to be installed, at an extra cost to the organisation, with no guarantees that they will be used and in turn be helpful[20].

Web 2.0 technologies provide a more viable and lower cost alternative to helping with the communication problem, providing simple interfaces that the user can access with nothing more than a web browser. Web 2.0 technologies are a group of 'social' technologies including blogs, wikis, and social network sites that give users more control over information. These technologies focus on user generated content and make the web a more interactive, collaborative and dynamic environment, allowing the users to determine the organisation of information. Blogs allow users to quickly post chronologically ordered entries to the Internet and get comments off other users, while wikis provide collaborative authoring, allowing groups of users to edit the pages they view. Social network sites emphasise the social nature of such technologies and are sometimes integrated with other Web 2.0 technologies to provide a richer interactive environment. They allow users to connect to each other and

communicate easily with groups of people who are sometimes geographically dispersed.

Social network sites are a relatively new technology providing users with a variety of quick and easy to use communication tools. Through the creation of a profile, users are able to find and connect to others and come together in groups around shared interests and share information. The high levels of use seen on public sites such as Facebook and MySpace, and users' ongoing commitment to check the sites suggests they have the crucial 'sticking factor', with users spending time both reading and contributing content. While the use of these public sites has been highly publicised, the nature of their use is only now being investigated. Their high levels of use in the public domain however made them an interesting technology to study and showed potential for application to other areas. Their popularity and the communication benefits they provide to such a large number of people are attractive to a project that is trying to engage its stakeholders and keep them involved.

While traditional communication channels struggle to cope with the large numbers of stakeholders involved in complex deployment projects, Web 2.0 technologies such as social network sites have no difficulty scaling to these levels. Large numbers of users can easily add content simultaneously with few problems. The ability for all users to contribute allows a project team to engage with and gain feedback from many more stakeholders than possible using traditional channels, while keeping this information clearly organised. Having the information online also means it is easily accessible to everyone involved and can be quickly updated, keeping other stakeholders informed.

Replicating the high levels of use found on public sites is however difficult and without a critical mass of users, such sites fail to be useful, due to their dependence on users adding content. If social network sites are to be applied within projects, understanding the factors required to gain and maintain users will be important for the communication benefits to be realised. The low risks and potential benefits if done right of trying this new approach still makes it very attractive to organisations embarking on large projects.

Organisations such as IBM and HP have started to experiment with internal social network sites to improve communication through the company with positive results[21, 22]. It is possible that the technical nature of these companies and the interest in technology of the people who work there impacted on the results. This research aimed to investigate the use of internal social network sites further to see if similar positive results could be achieved in large scale projects, where users may be less technically minded.

Private social network sites internal to the organisation or project provide added security and control that is often desired. Organisations can be wary of sharing possibly confidential information on public sites, even though access restrictions can be enforced and the use of such sites is sometimes banned. Knowing they can control exactly who has access to the information and have ultimate control of the entire site can be very appealing. It provides extra reassurances over the ownership of data and reduces the possibility of accidental leaks. These advantages make private social network sites most suitable to support organisational development projects.

In order to test the approach of using private social network sites to support project communications, the open source platform Elgg was used[23]. Elgg is a platform based around an SQL database that allows you to quickly and easily create and run your own social network on a private server. This provided the configurability and control required to create social network sites for specific projects and allowed their use to be monitored. The platform combines a variety of Web 2.0 technologies including blogs and a shared file store and allows users to create communities and hold discussions in their shared spaces. The nature of the platform, with plug-ins for different features, also allowed greater flexibility in what could be provided to help meet the users' needs.

The idea was tested in both a large distributed research project of 33 researchers and a newly started administrative systems project, and use observed over time. Each site was configured in an attempt to meet the different needs of the projects. Using statistical data from the sites and qualitative data gathered through a series of semi structured interviews, the viability of the approach was analysed to see what benefits it had delivered.

While the site was quick to gain a critical mass of users in the research project, it failed to gain acceptance in the admin project. A clear motivation to use the site is needed and, if users cannot see the potential benefits they are not likely to participate. Interest in the project is however also extremely important and it is possible that in the administrative systems project, too many stakeholders were given accounts when the project was in such early stages, that it would hardly affect them. The approach taken to organisation and use of the site may also have had an impact on the results and made stimulating activity difficult. As with any new initiative, support from senior figures is important and project organisation and management issues made this more difficult.

Despite its failure to gain users in the admin project we believe the communication benefits seen in the research project show that the approach can be helpful. It is however important that you know what you are going to use the site for and what you want from it if it is to be a success. While it can help increase communication among distributed members of a project, it cannot make the project a success. Using a social network site will not solve project management issues and it cannot be used to try and rescue a failing project. In these circumstances, the issues are normally deep rooted within the project and cannot simply be solved by improving communication among participants. While improving this may be seen as a good thing, people have often lost faith in the project at this point, making it unlikely for any new initiatives to be taken on board and adopted by users.

1.3 Overall project goals

The first goal of this research is to investigate, through the study of a real project, the real issues faced when an organisation attempts to deploy an ERP system. This involves developing an understanding of the possible causes of any problems faced and the impact these problems have on the project. These problems are then examined to identify the main issues and see if support can be provided for the project team in dealing with them.

While many problems are faced by project teams, communication was identified as being of critical importance to the success of a project. The second goal of this thesis

is therefore to investigate whether social network sites can be used in projects to support communication. We believe that the use of such sites can provide a scalable approach that can complement the traditional communication mechanisms more commonly used and help overcome some of the communication problems the project team faces. How social network sites can be used and any benefits they provide are examined. Any issues that need to be considered in order to be successful when attempting to introduce social network sites to projects are also discussed.

1.4 Novel contributions

The observational study of the system deployment project contributes to the understanding of the complex issues involved in such projects and the impact a variety of factors can have on project success. It demonstrates just how important effective communication in projects can be. It also provides further evidence of the issues that can arise when choosing an ERP system over one tailor-made to your organisation. The findings support those of previous studies of projects in university settings and further illustrate the complexity of such environments[3, 24-26].

The study also emphasises the value of such background research in attempting to understand a problem area and the real issues before trying to build a solution. Undergoing a field study allowed the research to be based on the real problems encountered rather than hypothesised ones often used in computer science research. Many computer science theses focus on the technical challenges of deploying new systems and these are, in fact, often far less significant than the organisational and social issues. The research shows how beneficial observational studies can be to research in computer science, ensuring they are tackling the real world challenges that people face rather than what they assume the problems to be.

The application of social network sites to projects to improve communication has been shown to be beneficial. The benefits of such an approach over traditional communication mechanisms have been shown and it has been demonstrated to serve a complementary role alongside such mechanisms. These benefits show how a new technology can be applied to a different domain and how mainstream ideas from public sites can be used with similar levels of success on a smaller scale. It has also

been demonstrated that social network sites can provide a scalable and cost effective solution to supporting communication in large scale projects.

The experiments carried out with the use of social network sites in projects and their relative successes and failures have provided an extended understanding of the conditions required for success. It shows the issues that arise when attempting to introduce such a technology and the considerations that need to be made by the organisation. The results also contribute to the knowledge of where and when it is appropriate to use such technologies and which approaches are most suitable for their development and deployment. It makes clear that a one-size-fits-all approach will not work and that, while new technologies can be beneficial, they are not suitable for everyone. It is important that everyone involved understands them if they are to be used effectively.

The experiments contribute to the knowledge of how to set up social network sites within organisations and the steps that need to be taken. The lessons learned from setting up and developing the two sites provide valuable insights into the process and where problems often lie. It reveals the importance of different features to users and how an evolutionary approach to development, with continuous user input can produce a site that is more widely accepted and better meets the needs of the project.

1.5 Thesis structure

The structure of the remaining chapters is outlined below, giving a brief introduction to their content. The following chapters take you from the background of the topic, through to the observational study, development of the experiment and the results obtained.

Chapter 2 provides background on methods used when studying processes and organisations, with a focus on ethnography, the approach taken in this research. An introduction to ERP systems and business process engineering is also provided outlining previous research in these areas. Computer supported communication is then looked at, including groupware and awareness applications and finally a brief introduction to Web 2.0 technologies, as used in this research.

Chapter 3 develops some of these ideas, looking in more detail at the issues encountered when undergoing an ERP implementation and why these make such projects interesting to study. The research method used for the study of the GEOMETER project is then described, followed by an introduction to the project background, its aims, and the progress that has been made to date.

In Chapter 4, the initial results of the study are presented, describing the first two go-lives of the project and focusing on the general problems that have been encountered and their possible causes. These problems include discovering what out-of-the-box really means, planning, communication, stakeholder engagement, managing expectations, recognising the need for change and system performance. Where possible, these problems are supported by anecdotal quotes from the stakeholders.

As communication was identified as one of the major issues, Chapter 5 describes the communication structure of the project and the problems they encountered. It then describes the efforts made by the project team to tackle these issues and why these approaches only go part way to solving the problems.

Chapter 6 introduces the idea of social network sites, outlining the features they provide and the benefits these bring to the users. The potential for using social network sites in projects and how they could be helpful is also described. While public sites could be used, justification is given for why use of a private site has been chosen. An introduction to the Elgg open source platform that has been used in these experiments is then provided.

In Chapter 7, the approach taken to the development and configuration of the social network site is described, including how feedback from initial tests was used to further improve its configuration. The research project and administrative systems project into which the social network sites were introduced are also presented.

Chapter 8 then describes the data collection process, before presenting the results of the two experiments, including both qualitative and quantitative data.

A critical evaluation of the experiment and the Elgg platform is presented in Chapter 9, looking at any benefits and limitations of the approach. The general applicability of the results to other projects is then discussed followed by the conclusions that have been drawn from the data and any future work that could be carried out to develop the research further.

Chapter 2 Literature review

This thesis focuses on the real problems that arise during the development and deployment of a large organisational system and proposes an approach to help address one of the most significant problems that we discovered, namely that of stakeholder communication. The aim was for the work to be driven by practice and so has involved three distinct phases:

1. An extended study of the system development process, where problems and issues around development and deployment were identified. Our focus was on development using an ERP system that was configured to the specific requirements and processes of the organisation deploying it.

2. The identification and configuration of support software to support the development process, with a focus on the most serious problem we encountered, namely stakeholder communication.

3. The assessment of the use of this software and its effectiveness in improving project communications.

These three phases require quite different background research and lead naturally to the structure of this chapter.

In section 1, I discuss methods for studying processes and organisations, focussing on ethnographic approaches

In section 2, the process of construction by configuration is discussed. I include background work on ERP systems, their introduction into organisations and business process reengineering.

In section 3, I look at computer supported communications. I cover the use of groupware to support team communications as I identified stakeholder

communications as the most significant problem in the GEOMETER project. I also look at Web 2.0 technologies, the approach that we have adopted, and discuss the experiences that other organisations have had with them.

2.1 Research methods

2.1.1 Ethnographic methods

One of the techniques that have become popular for studying organisations and eliciting social requirements is ethnography. Ethnography is a data collection method that immerses the researcher in the field to discover the actual work practices being carried out and gain an understanding of the environment from the viewpoint of the user. During the study the ethnographer creates an ethnographic record, which contains all the data they have collected. It is from this lengthy, descriptive document that useful insights into working life can be gained.

One of the most widely used methods of ethnography for the study of work is ethnomethodology. Ethnomethodology is driven by the stringent discipline of observation and description rather than the application of theory[27]. For ethnomethodologists it is important to enter a setting with no preconceptions or ideas on what might be interesting and instead to observe everything, attempting to see things from the viewpoint of the participants. In doing this they hope to gain a detailed understanding of the activities that occur and with this produce detailed descriptions.

Ethnomethodologists working in computer science do not believe that design is a 'problem' to be 'solved'[28]. They believe instead that you need to gain a detailed understanding of the situation and use this to determine where to focus your attention. Whilst designers can gain a great deal of insight from ethnomethodological studies, they will not tell them what to build but simply point out important features of the working environment that may require consideration.

During their studies the ethnomethodologist looks at technology as it is being used, rather than taking it as a separate component of the environment that can be

investigated individually. Doing this makes it possible to pay attention to the embodied interactions and practices 'within' which current technologies and artefacts are embodied[29]. The study reveals how people have adapted to the resources available to them and how they, in turn, have adapted the resources to meet their needs.

Whilst a great deal can be learnt from ethnomethodological studies and the rich descriptions they produce, the ethnomethodologist's insistence on observing everything and their refusal to make judgements regarding what they find and its relevance to design makes it difficult to integrate into the design process. To carry out a field study from an ethnomethodological perspective can require a large amount of time to be spent in the setting and this is often not available in systems design projects.

To overcome some of these issues many approaches have been developed in an effort to better integrate ethnography into the design process.

Perhaps the ethnographic method most commonly associated with design and the one most commented on is concurrent ethnography[30]. This is a sequenced process which allows the system design to be carried out in parallel to the ethnographic study. The information learnt by the ethnographer is fed back to the designers at regular debriefing meetings and this is then used to further guide the design process.

Prior to the first debriefing meeting the ethnographer spends a brief period on site to gain a general understanding of the environment which they are studying. In the subsequent meetings the ethnographer and designers discuss areas which they feel are relevant to the design and hence require more focussed attention. This allows the design team to improve their knowledge of the working environment whilst keeping the study focused on users' activities. They will also discuss the current prototype that has been developed and how this fits with the actual work practices of the setting. The prototype will then be developed further, with any issues raised being taken into consideration. While discussing the prototype with the ethnographer can be helpful, it may also be beneficial to show it to the users and get their opinions directly.

A combination of concurrent ethnography and rapid prototyping was used by Hughes et al in studying the London Air Traffic Control Centre[30]. In comparison to social research applications of ethnography Hughes et al. found that the payoffs for design came relatively quickly. Although more could be learnt about the working environment this would be better left until after the system was in use and learnt directly from the users when they are gaining experience with the system, a period several researchers have examined[31-34].

Hughes et al. found that the ethnographer was able to provide the design team with insights into the subtleties of the work taking place, drawing attention to areas of vital importance relating to the sociality of the work that had previously been missed by cognitive and task analytic studies[30] and which subsequently had a major impact on the system design. Whilst the approach is noted for questioning what has previously been seen as the fundamentals of 'good' systems design[35] it also has many problems. Although shorter in length than carrying out the study and design sequentially it still requires large amounts of time to be dedicated to it. The success of the method is dependent on a large amount of cooperation and communication between the ethnographer and the designers, which can be time consuming and often problematic. Hence this method is not suitable for all projects.

By accepting the impossibility of gathering a complete and detailed understanding of the setting being studied[30], the 'quick and dirty' approach has been developed, in which short focused studies are carried out to quickly gain a general picture of the work setting[36]. In large scale organizations where the location and focus of the work being carried out is not clear, such brief studies can allow a variety of areas to be studied and a picture of the work in a complex organisation to be developed. With the 'quick and dirty' approach it should be possible for some ethnography to be carried out in projects operating under tight constraints.

Although brief in nature, fieldworkers are able to rapidly gain an understanding of the work setting from the studies they undertake[37]. From these studies, they are able to provide the designers with informed knowledge of how the work is actually done and how organisational problems are dealt with. Previous studies that have been undertaken in similar settings may also be referred to by the fieldworker to help gain a

more detailed understanding of the implications for the system design[37].

Between the studies, debriefing meetings are held with the designers to discuss the findings and suggest areas for further study. Martin et al. suggests that 'quick and dirty' ethnographies can be used to target particular parts of processes, for example where different parts of an organisation are required to communicate, and whose understanding is crucial to the design[38]. The information found may then be used to aid the decision making of the designers in determining which activities it is important to support. The results of the studies can also point to areas of the working environment where the introduction of the new system may be particularly disruptive[38] and this knowledge can be used to hopefully create systems with increased levels of usability and that are more acceptable to the users.

By carrying out shorter, more focused studies the returns are more commensurate to the time and effort invested. Unlike traditional ethnography, where an extensive ethnographic record is produced that may be difficult for the designers to understand and extract the relevant information from, short studies gather factual knowledge of a calculable status [39]. This helps alleviate the communication problem which is at the heart of many interdisciplinary design problems.

Although useful in gathering information regarding the work setting, there are problems with the 'quick and dirty' method. As only a general understanding can be gained of the areas the studies focused on, applying this information to the formulation and adjusting of design objectives can be difficult. When used in isolation the results of the 'quick and dirty' studies can sometimes give a false representation of the sociality of the work being undertaken. Due to project constraints, ethnographies of the 'quick and dirty' kind are often the only form possible to carry out. The results of these may be best used to indicate where further research may be necessary.

Like other ethnographic methods that aim to reduce the amount of time a team needs to invest, rapid ethnography recognises that a lot of time and energy is often spent observing data that may not be particularly useful to the designers. With such a large quantity of data, identifying the useful points and finding patterns can become

difficult and time consuming. Millen suggested the use of time-deepening strategies to speed up the ethnographic process including using more focused observation, multiple researchers with a greater level of user interaction, better selection of informants and better data analysis tools[37]. The use of a variety of techniques can help in learning about exceptional user behaviour and speed up the often time consuming data analysis phase of the study. It may also be possible to focus on periods of time when activity is likely to be high, thus increasing the capacity for learning.

Evaluative ethnography only focuses on the areas of work that would be affected by the system that has been designed, thus reducing the time required. In this respect it can be considered a more 'focused' version of the 'quick and dirty' approach, acting as a 'sanity check' for the 'work-ability' of the proposed design solution[40]. It can help designers to discover vital errors in their understanding of the work carried out and hence their design. These new insights can be used to modify the design to produce something that would be more suitable for its purpose.

Whilst rarely used in this way, evaluative ethnography can also be used to make an assessment of the current system [41]. Evaluation of computer supported cooperative work (CSCW) systems can be particularly complex, partly due to the uncertainties over what exactly constitutes an evaluation, how it should be implemented and when and where it should take place. It has been suggested that evaluation of collaborative technology is best done through field evaluations because they can be used to assess socio-psychological and anthropological effects of technology[42]. By evaluating a system in use it should be possible to see how users work around the current system and possibly identify opportunities for improvements or for complete redesign. This could be beneficial to a business in helping develop a system that meets more of their users' requirements, with the users directly feeding ideas back into the development process.

Post-implementation evaluation of new systems that have been introduced to a setting is another area in which ethnography can be helpful. It can be used to provide additional evidence or more data to analyse when determining how successful the implementation has been[43]. System evaluation is often carried out by those who

designed and developed the system, meaning they are likely to miss basic flaws in the product[44]. By simply comparing the system to the design specification, social considerations such as how it will impact on current work practices are being ignored and this could impact the success of the system when in use. By using ethnography in combination with other evaluation techniques, such as user questionnaires, it should be possible to gain a complete view of the results of the systems introduction. It is important however to recognise that users take time to adjust and to learn how to use any new system.

Although these applications of ethnography allow it to be done in a shorter time frame, boundaries have to be drawn. By focussing on the system that has been designed or on specific features, the ethnographer may miss details that could be equally as important but have not yet been considered. Whilst ethnography of an evaluative nature is potentially useful it is yet to become a regular part of the design and development process. Its results alone are not sufficient for a complete evaluation of a system or potential design. Other qualitative evaluation techniques that are more widely accepted, such as interviews and focus groups may provide the designer with similar insights but at less cost to the project.

2.1.2 Interdisciplinary work

Although the time required is one of the major problems when attempting to combine ethnography and system design, there are also other issues that affect the success of interdisciplinary work. Successful interdisciplinary work requires a willingness for all team members to devote a considerable amount of time to getting to know each others' ways of working[29]. They must respect the skills of the different disciplines and be willing to make compromises in order to work together[45].

Gaining an understanding of the nature or focus of the other discipline would seem a sensible starting point. For software engineering, the main aim is the production of better more successful computer systems. With sociology, gaining this understanding is more difficult as it is a more fragmented discipline, with no single notion of what sociologists 'do'[46].

When working with people of other disciplines there are always likely to be communication and comprehension difficulties and differences in methodology however, these seem to be exacerbated when combining the disciplines of sociology and computer science. While for software engineers system design is about finding ways to simplify complexity through abstraction[29], ethnographers are reluctant to do this as it may hide details that could be important to the design of the system. System designers tend to work in a systematic manner following formal procedures. However, for sociologists this detracts from the utility of their methods, introducing the possibility of errors through their selectivity[47].

Designers need to realise that the ethnographers are there to guide them and help them, rather than criticise what they produce and ethnographers need to be sensitive to this when conveying their information. Tasks that may seem complex to sociologists may in reality be simple to implement and vice-versa and members from both disciplines need take this into account in discussions.

Through the use of formal and informal meetings it should be possible to break down some of these barriers and build productive working relationships. Regular meetings are essential to gaining a mutual understanding of the problem and ensuring a clear understanding of each others' jargon. This can also help to prevent each discipline from becoming too involved in its own issues, losing the focus of the project[45]. Through successful cooperation sociologists should be able to help computer scientists overcome the problems they encounter in comparing the ambiguity of real life procedures to the step wise instructions with which they are more familiar [48].

2.1.3 Structuring the ethnographic record

While the approaches to ethnography and its integration into the design process vary, all produce an ethnographic record, which has to be analysed to extract the points important to design. This can also be a lengthy process, with the record being large, unstructured and often only understandable to the researcher that produced it. In an effort to aid the researcher in this process, the Scavenger tool was developed to support the investigation, selection, structuring, sorting, composing and organising of fragments of data from original source materials[49].

The system outputs a structured database based on XML templates that can be tailored to whatever situation the user wishes. The user creates entities to represent the phenomenon they have observed and these are then populated with data from the ethnographer's sources. Relationships can be established between entities which will then appear in the systems output.

Scavenger includes a variety of media selectors allowing the use of textual, graphical and audio data sources and sections of these can easily be selected to rapidly create and populate entities. It also provides backwards traceability with each entity storing a list of the documents which have been used. Each entity forms an XML document which is stored on the file system and can be translated, through the use of XSL style sheets to a HTML page, making the output easier to browse and clearer to read. After testing the system with users several features were added to better support their work, making the system more flexible and allowing the collation of ideas over time.

Although Scavenger produces useful output which can then be used by a variety of analysis approaches, it suffers from problems when being scaled up. Projects which involve a large quantity of source materials would be difficult to scavenge due to the sheer size of the document set[49]. Projects of a large size can also slow down the operation of the program when used on certain platforms. The size of documents also affects the usefulness of the source traceability as this is only provided at the document level. This can make it difficult to find the exact point where information was scavenged from within a large document. To deal with these problems it would be necessary to provide better management and organisation features for the documents and possibly include source traceability at a finer level of detail. With large projects the number of entities created also grows rapidly and some form of help in organising and managing these would be useful, possibly with a more intuitive file naming convention.

There are also issues regarding whether the user has the knowledge to create the templates prior to use as they will not know what types of phenomenon they will encounter, however these can be adapted and added to at any time. In spite of these problems Scavenger is a useful tool that greatly reduces the time taken to organise

field data and produce easily navigable, human readable output from the ethnographic record.

Whilst the Scavenger tool is still under development there are a variety of qualitative analysis tools on the market that aim to help the user when organising and analysing large quantities of unstructured data. These tools work using the technique of coding, where the ethnographer applies code words to selected fragments of the documents. This process relies on discriminatory exercise of judgement in the face of the local events the schemas are intended to analyse [29]. Many of these tools such as Atlas/ti support a large variety of media types, allow for the creation of relationships between codes and provide source traceability to the specific fragment that was coded. Once coding is complete, queries can be executed on the results and these can be used to help aid the analysis of the documents. The coded results are said to make the social organisation of workaday activities in a particular setting visible to the ethnographer[40]. Ethnomethodologists however argue that coded results are simply akin to a person's report on his or her activities, and as such the activities and practices the coded results emerge from remain to be described.

When using these tools it can be difficult to create the complex structures that are possible in Scavenger, and the output is less suitable for use when presenting information to other members of the design team. It is also easy for the ethnographer to leave out relationships between codes which could potentially be important, as no checking is provided. The selection and application of codes is unconstrained and can allow disciplinary biases to be introduced in the categories chosen which may vary considerably depending on the theoretical background of the ethnographer[50]. Tools such as Atlas are most useful in aiding the individual ethnographer in organising their thoughts and findings and helping them progress further in their analysis.

If the results of ethnographic research are to be used by systems designers, structured output is important. Sommerville and Viller developed the Coherence approach, an ethnographically-informed approach to requirements engineering[41] that attempts to represent work spaces in a rich manner and show the coordination of the work being carried out. For the approach to be successful it had to be easily learnt and understood so the extension of UML, an existing structured notation designers were

familiar with, was chosen. Coherence uses a viewpoint-oriented requirements engineering technique to structure the categories of social phenomena that have arisen from previous studies, and apply them to new situations[51].

The UML meta-model is extended to allow for the modelling of the workspace, with the option of including detailed textual and graphical descriptions and links to the original source material. Opportunities exit to create classes, which can be arranged in a hierarchy of types that can then be instantiated with specific information regarding the system being developed[52]. UML sequence diagrams are used to show interactions between different members of the workplace and the objects within it, whilst class diagrams are used for modelling the more structural features.

The use of Coherence helps sensitise designers to the social concerns that could impact on the system being designed and allows them to gain a better understanding of the current system and how this 'fits' into the workplace. The flexibility of the approach allows it to be used with other techniques that do not consider the social aspects of working environments and allows these social requirements to be considered alongside those arising from other areas.

Whilst the approach helps to structure the ethnographic record and elicit social requirements there are no guarantees that the problems identified and thus designed for will be the correct problems that need to be solved. This however is a problem common to any social analysis technique but understanding the representations created by Coherence becomes vital in understanding the sociality of the setting. Although the development of a notation is useful, the development of a process for the conversion of the ethnographic record into such a representation is necessary. This in turn needs to guide designers in how to use the results if this problem is to be reduced and the results are to have an impact on the design.

Ethnography aims to show the actual work carried out in a setting from the viewpoint of the user. People may however have multiple orientations towards a system and these orientations could be used to organise the fieldwork results. Through identification of the user's relationship to the work process and each other within the setting, potential system requirements can be elicited[53]. The identification of

viewpoints can aid discussions regarding the sociality of the setting and, although each viewpoint has a different focus, they are often all interrelated [51]. There is also a high chance of inconsistencies existing and identifying these at the requirements engineering stage can be important to avoid conflicts later on.

A presentation framework of viewpoints was developed identifying key viewpoints consisting of; the ecology of work, the flow of work and the social and organisational perspectives on work[54]. The ecology of work viewpoint focuses on the setting of work, including its physical layout and how users work within a flexible division of labour[36]. The flow of work consists of collection of viewpoints looking at interactions and information flow and this can help identify hidden dependencies within processes. The final viewpoint consists of a collection of viewpoints concerned with the ways in which workflow is actually produced in the real world, real time action and interactions of parties to the work[40]. These include distributed coordination, awareness of work and plans and procedures.

2.1.4 The patterns framework

Further work by Sommerville and Martin looked at how data from ethnographic studies can be generalised to provide further guidance to designers[28]. As it is recognised that designers will often encounter similar situations, they attempted to reuse some of the knowledge from previous ethnographic studies to make the insights ethnographers believe important to system development more accessible. This was done through the identification of a series of patterns that can be used at any stage in a project. Ethnographic studies of work and technology were examined and descriptions of similar cooperative practices arising from comparable workplace configurations were extracted[55].

Each pattern has five dimensions; cooperative arrangement, representation of activity, ecological arrangement, coordination techniques and community of use, which are intended to help determine how applicable a particular pattern is to your setting. Vignettes provide examples of where the pattern applies and describe issues and problems that may have been highlighted in the studies and can be useful for designers encountering a novel situation with similar features[55]. They may also

help them to discover ways to tweak the current system to better meet the users' requirements.

While some of the patterns, such as accounting for an unseen artifact, focus on artifacts and how they relate to the work carried out, others, such as working with interruptions, are more focused on how the design of a 'job' relates to the actual work practices. The working with interruptions pattern looks at how people are able to interleave their work with the often regular interruptions that the setting presents them with. The examples of a hotel reception desk, a software helpdesk in a bank, and a government council planning department are used to illustrate the issues and highlight problems. This pattern can be used by designers to see what it is important to consider in settings related to service work. Each pattern builds up a collection of findings where similar observations have been made which in turn, with the help of the vignettes, point to areas that need considering for a particular setting or type of work.

A series of web pages was developed to make the patterns more accessible. Each contains the essence of the pattern, why it is useful, where it is used and the dependability implications. From here there are links to the vignettes and to more detailed descriptions from the ethnographic studies. Using these web pages the user can determine the applicability of a pattern to their setting. It is also possible to add new patterns and vignettes. However, users experienced difficulties in the identification of new patterns and determining the level of abstraction to use in the descriptions.

2.2 Construction by configuration

2.2.1 ERP

With the development of custom applications being expensive and plagued with uncertainties, and empirical studies showing that between half and two thirds or information systems projects fail, recent years have seen a turn to off-the-shelf packages[56]. By choosing a standard package, organisations hope they can reduce the costs and risks in the project whilst gaining the added benefit of vendor support

for the system. ERP packages integrate many formerly discrete applications around a common database allowing adopters to integrate their business processes throughout the organisation [1]. The packages are usually designed to fit a group of organisations and are built around what is deemed to be 'best' practices for that industry. These will normally have been developed with one of their customers. To ensure these practices have wide appeal the vendor often promotes them in ways that give them interpretative viability, making them applicable to a variety of contexts and applications and allowing them to be selectively interpreted to suit different needs. [57].

Due to the way ERP systems are designed, some configuration is usually required and this is combined with business process change to help make it meet the organisation's individual needs. This process of mutual adaptation between the IT system and the user environment is seen as a critical challenge of ERP implementations [58] and getting the balance right can be vital. The vendors will often discourage excessive tailoring of the system in favour of business process change; however changing the software may be seen as the easier option to the organisation as it would require less adaptation and is more likely to be well-received by users. Software vendors often fail to acknowledge how the contextual specificity within an organisation makes it difficult if not impossible to meet all users' needs with a standard organisational solution[57]. Some process change is always likely to be necessary and it is important that the organisation tries to understand their current processes and their association with their current IT systems, relating this to the new system before they attempt to make changes [2]. If an organisation tries to get a fit between themselves and the software purely by configuration, they are likely to incur problems that may result in huge cost overruns and, in extreme cases, project failure[59].

Approximately 90% of ERR implementations were found to be late or over budget [2] and failure of such a project can be devastating to an organisation[7, 8]. ERP systems are extremely complex and require a large amount of skill to configure. Changes made in one area can have a detrimental effect on another, without the implementers realising it. It is important that the project team includes analysts with both 'business' and technology knowledge and both consultants and internal staff to get the skills required[11, 19, 59, 60]. Due to their size and complexity, it is difficult to work out

exactly what the package can do and for this reason changes may be made that are completely unnecessary. Working closely with consultants from the software vendor can help avoid this problem. However this may be difficult due to high consultancy costs. One of the benefits organisations seek through choosing ERP systems is the ongoing support of the software vendor who regularly releases bug fixes and updates to the package. Configuration changes and tailoring of the software however can make installing these difficult, if not impossible.

When installing a new system on the scale of an ERP system, affecting every area of the organisation it is important to decide on an appropriate go-live strategy. While it is possible to implement the system in a 'big bang', with all functionality going live at the same time, this is a very risky and ambitious approach. If something goes wrong the impact of failure can be huge and recovery difficult. A safer approach is to roll the system out over multiple sites sequentially, maintaining the momentum of the project while slowly increasing the number of users. This allows bugs to be fixed, staff to be trained in groups and more time to be dedicated to ensuring everyone knows what is happening. If time is not an issue, another alternative is to only give users the basic functionality at the start and to gradually extend this as they become more familiar with the software. A stepwise approach to integrating the system with the working environment lowers the implementation risk but can greatly increase the complexity of the project [61]. While this approach may help with any issues of user resistance, timing of the updates is critical and projects with such long time scales are rare. This approach also encounters issues when determining how to roll out training. If the system is to be continually changed then a process of continual training is necessary. The time required to attend these and the introduction of updates to the system could be disruptive to people's everyday work. If a system is introduced as a whole, either in the 'big bang' approach or just at one site the disruption is focussed to one time period and, once the system is installed and users are trained, they can concentrate on their work.

ERP implementation affects most areas of an organisation and the changes it introduces often force other involuntary changes to the way people work. This introduces uncertainty and fear which may result in resistance to the new system[4, 6]. Sheth's framework shows that there are two fundamental sources of resistance to

innovations like ERP systems; perceived risk and habit[62]. Perceived risk is how much risk the user thinks there is to them adopting the new system, while habit is their current work practices. It is important to make sure people are aware of the benefits of the changes and reassure them that the new system is a positive thing[2, 9, 11, 16]. In doing this, however, it is important not to raise user expectations too much as this may lead to disappointment. If management want the new system to be adopted by the users then the adoption costs should be kept to a minimum[62] and it is important that the user friendliness of the system is considered.

Communication is critical in the implementation of an ERP system and getting support of key members of the user community to help with this can be beneficial. Visible top management support is also regularly cited as important to a project's success[8, 11, 15]. Doorwewaard and Van Bijsterveld argue that new processes should be presented clearly and simply so they can be translated from the perspective of the different stakeholders involved, who each hold their own assumptions and levels of understanding of current work practices [57]. Training can also play an important role in creating awareness about the system, offering the users a chance to adjust to the changes being put in place. If the training goes well it can help build positive feelings towards the system prior to its introduction. Unfortunately the time and cost of training is often underestimated and hence the benefits are not always realised[12, 15].

2.2.2 Business Process Reengineering

Projects are often undertaken to deliberately change existing processes with the aim of improving their efficiency or effectiveness. Such business process redesign (BPR) projects often hope to change the focus of the processes to the customer in a hope to increase organisational competitiveness. Implementing such changes requires the processes to become more coordinated across the organisation, with IT systems often being used to assist in this.

Process modelling may be used to determine which processes to change and what the inherent problems are. Using these models, the baseline of the current processes can be established and it is on this baseline that improvements can be made. The new

processes must then be defined, so that they can be successfully implemented and users trained in their use.

BPR projects generally take two forms, those which radically change a large number of processes to something almost completely new, and those which make small changes, maybe to one process, which they feel will be beneficial. Radical redesign projects often require a large amount of innovative thinking about how the business operates. Such radical changes require extensive communication across the organisation and consistency of work practices across departments normally has to be established. Implementation of large process changes can be facilitated by IT systems which can form a key part of the process, but this can also add an extra dimension of complexity and risk to the project[63].

By introducing new processes, an organisation requires those involved to change their ways of working. The introduction of a new IT system combined with these processes may also require cultural changes which they are not prepared for. Good change management can often be a determining factor in the success of a BPR project. Getting the stakeholders to buy-in to the project and change their values can be very difficult and is one of the main problems encountered in such projects. Gaining the needed cooperation and developing the shared values required for success can be difficult as recognised, when the NHS attempted to introduce a patient information system (PiMS). The organisation has to recognise that change can be seen as a threat to people's security and the process can be very stressful. By clearly defining the new roles created and gaining the different viewpoints of the stakeholders throughout the redesign process this fear can be reduced and make the change appear more appealing[64]. Senior management's active support of the project is also important in gaining the needed buy-in from the stakeholders. They need to be seen to be leading by example championing it to others in the organisation.

Kettinger et al. identify 6 stages which the business goes through when undergoing a BPR project [65]. These stages include: envision, where the business process to be improved is chosen; initiate, where the team is set up and a plan made; diagnose, where the current process is investigated; redesign, where the new process is developed; reconstruct, where the new process is introduced and finally evaluate,

where the new process is monitored. At each of these stages various tools and techniques can be employed, including process analysis and mapping techniques and a variety of creativity and data modelling techniques. They also identify project radicalness as previously discussed, process structuredness, customer focus and the potential for IT enablement as important characteristics to consider when planning a BPR project[65]. Where the emphasis is placed in the project depends on these characteristics. For example, if the process is well structured then it will be easy to understand so less time will need to be spent on modelling it. If the process focuses on customers then it may be important to look at how the process that is being redesigned links to other external customer related processes. However, for all BPR projects it is important to make sure the organisation is prepared for the change and committed to making the new processes part of their work routine.

The process analysis and design methodology (PADM) is a contingency framework that provides a variety of tools and techniques that can be used to adapt to the different characteristics of BPR projects[64]. The flexible nature of PADM allows it to fit with the contingent problem solving nature of people's everyday work which is often hidden in formal representations. Emphasis is placed on the use of IT to bring about improvements in processes. The four phases of a project identified in PADM are similar to the six identified by Kettinger et al. The current process is defined in detail, often with the help of the soft systems methodology (SSM) and the baseline process is then modelled. From here weaknesses and problems are identified to see where improvements can be made. A new process is then designed taking both a technical and social perspective, something which, like in socio technical design projects, is promoted in BPR. This consideration of the whole picture and the actual work done would appear to be one of the strengths in using PADM and the tools and techniques it provides can help project teams undertaking BPR.

Another similarity between socio-technical system design and BPR is that they involve a large variety of stakeholders with varying levels of expertise in different areas. For this reason modelling techniques which help communication through visualisations can very useful. BPR projects can also benefit from multi disciplinary teams and utilising the skills IT professionals have developed through systems design can be beneficial.

2.2.3 Project Work

A project characteristically involves a complex piece of work being undertaken by numerous participants, requiring, in the assembly of the final product, the intricate integration of the results of their work[66]. Relatively autonomous organisational members collaborate to perform complex tasks that require specialised knowledge and expertise[67]. While these definitions focus on development work they are equally applicable to deployment projects.

Social theorists perceive the way in which time is organised and managed in human projects as dependent on the knowledgeable actions of human beings within their particular social context (e.g. Giddens 1984)[67]. IS development work however manages time by treating the work as decomposable into discrete activities that can be organised into an orderly process and whose duration and interactions may be reliably estimated[67]. These activities form the tasks and milestones of the project plan that states when each must be completed and often by whom.

Keeping to schedule in extremely important in development projects and this is a fact engineers are very aware of. Determining in advance of doing it just how long a task should, and will take is however often a problematical issue, and there is commonly a discrepancy between the time allocated by schedules for the completion of jobs and the time that the actual task will turn out to take[66]. 'Aggressive scheduling' combined with inevitable misjudgements about the actual time required, means that engineers are always looking at uncomfortable deadlines, and are invariably under pressure to solve problems in ways that can be dealt with in the available time[68]. In order to complete tasks on time it is common for short cuts to be taken and the 'quality' compromised to produce an acceptable rather than perfect solution[66]. Sharrock and Button found in the projects they observed, that monitoring how quickly the work was getting done against the demands of the schedule was a routine activity that was undertaken in any meeting on project business[68]. While a variety of constraints operate on a project, time is seen as the most important to address.

Problem lists are often used by engineers in a project to help judge how they are progressing. In the early stages of a project it is expected that the number of problems

will expand and relatively few will be solved. Eventually however the rate of clearance should start to reduce the number of outstanding problems and the rate of accumulation of new problems should drop[66]. Engineers are able to judge how long this process should take and whether they should be clearing problems quicker. This accumulation and clearing of problems and the use of problems as a method for monitoring progress is something that was seen in the GEOMETER project.

Due to the separation of activities in the project plan and the interrelated nature of project work it is necessary for team members to coordinate their activities. Many different activities are competing for team members' limited time resource and have to be fitted into, and interwoven with the stream of their other activities[67]. This scheduling is subject to many constraints including the availability of other team members and the completion of their tasks. It is common for several tasks being carried out by different team members to require completing before the work can progress.

As previously mentioned, it is difficult to estimate how long tasks will take. In order to meet deadlines tasks become more compacted within the plan and it has to be adapted accordingly. As the work overruns tasks run into the time previously allocated to testing, leaving testers struggling to complete the necessary tests in the time available[69]. Inadequate testing has been attributed as one of the reasons behind many high profile system failures including the PAS system at the UK Passport Agency and the opening of Terminal 5 at London Heathrow Airport. Whittaker argues that as software becomes increasingly more complex, so does testing that software[70]. This is a point that seems to be forgotten when allocating time for testing, with some tests being postponed in order to meet deadlines, a problem seen in the GEOMETER project.

In complex projects where plans are constantly changing, being able to adapt your work accordingly is important. Developers heavily rely on informal, ad hoc communication to fill in details, handle exceptions, correct mistakes and bad predictions, and manage the ripple effects of all these changes[71]. It is this informal and ad hoc communication that allows them cope with the instability of project work. As projects become larger and more distributed this becomes more difficult as it is

hard to know who is available and initiate communication across distances. Tools developed to help with these problems are described in section 2.3.

Previous research on project work indicates that engineers are aware of the many problems they are likely to face in a project and are constantly working to try and produce something that meets the needs of the users in spite of these ever changing constraints. While this awareness of the difficulties can be helpful, the high number of projects continuing to fail to deliver what they promised, on time and on budget suggests that more help and support is needed.

2.2.4 System configuration, introduction and use

While the work previously discussed has focused on considerations that need to be made during design, attention also needs to be paid to the possible issues during deployment of the new system. At this stage, previously acquired knowledge and experience can be invaluable as developers often find that, if they knew at the outset what they knew at the end of the project, they may have done things differently[72].

People routinely tell 'war stories' to one another as a 'natural' way to share their knowledge and communicate their experiences. Facilitating this knowledge sharing can be beneficial to companies, allowing the detail of situations often lost in documentation to also be shared. Knowledge of procedures and practices which have worked well in the past, and may still be relevant, can help improve work in the future[73]. The complexity of technology and the increasing demands for efficiency and higher performance make it essential for people to learn from each other as much as possible [74], allowing common solutions to problems to be developed which can be transferred to others.

Mackie et al. developed a resource to store information regarding possible 'risks' in deployment using a series of organised web pages containing war stories in their natural narrative form [72]. Each story includes a description, accompanied by what was learnt from it. The stories are organised by the stage of deployment at which they occurred, the stage it is thought necessary to be aware of them, and the type of story, giving the user various options for finding the stories relevant to them. The stages of

deployment include; procurement, award and signing of contract, data collection, database build and configuration, integration, testing, transition management, domestication and evolution and maintenance. Types include access, bespoke or off the peg, communication, configuration, incomplete data sets, integration, local versus global, outside commitments, participation, relationships, schedules, security, suppliers, and support and training. Identifying which type or stage is applicable may not be easy when you approach the site, unless you have a particular focus in your project. Many may read the exhaustive list of stories provided at the procurement phase or browse through each category until they find something relevant.

The initial site was populated with stories identified from ethnographic material regarding the deployment of healthcare systems, where something caused a problem in the deployment process. Although this is not ideal as the narratives for the stories had to be developed from other types of ethnographic material, a submission facility has been provided allowing managers to contribute their own stories to the site. Stories can also be elicited by an ethnographer in interviews or they may witness their use during observations and these can then be added to the site.

Although the initial site focused on medical settings, the idea could be taken further and applied to other complex settings, where designing and deploying systems can be problematic. The usefulness of past experience is not restricted to the healthcare domain. The use of the resource was initially aimed at designers but, due to its simplicity, it could potentially be used by other stakeholders, helping to share knowledge and aid decision making.

Deployed systems are often viewed as finished products, however new technologies are almost never perfect upon initial introduction[31] and much innovation has been witnessed at the point of implementation, as well as during the design phase of the system life cycle. Once a new system has been deployed it becomes ‘domesticated’, embedded in the systems of culture and information practices of the organisation[32]. Although it is common for designers to try and constrain the ways in which users can interact with a system, they will often find novel ways of working around this. Users can always choose not to utilise the technology or modify the ways they interact with it and without this interaction the technology remains inanimate and hence

ineffectual[75]. Through using the system, for example, users gain familiarity with it and with this develop more efficient ways of using it. When a new patient administration system was introduced in New South Wales, users initially found it to be cumbersome and inflexible. However, over time they adapted and came to like it[74]. It is important to gain a better understanding of how the use of computer artefacts develops in practice and how models are created and adapted in unusual situations[76]. Developers could learn from this and gain ideas for future improvements they could make to the system. Taking advantage of this process of 'innofusion', where the user's needs and requirements are discovered and incorporated in to the system while they struggle to get it to work in useful ways[33], can lead to systems being developed that are more suitable for their purpose. This however often relies on the users telling developers about the workarounds they have created and this feedback can often be missing[77].

Stewart and Williams suggest taking a social learning perspective, viewing the system deployed as unfinished in relation to the complex and evolving user requirements, to gain a greater understanding of the innovation process and ease the domestication process in the hope of creating more acceptable systems [32].

In an attempt to modify the process of system development to accommodate system adaptation through use, Hartswood et al. suggest a process of co-realisation. This involves the IT professional entering the organisation after the system is deployed and attending to the specifics of the workplace and the unnoticed ways in which work goes on[34]. The idea is based on the fact that it is only through use that a user fully attends to the system and recognises deficiencies in what it provides with respect to completing the work. Once these are identified, improvements can be made and further editions of the system released. As the evolution progresses the users become more competent with the system and are able to help generate new ideas for future developments. This process of co-realisation however relies on it being possible to deploy early, possibly incomplete, versions of a system which can be built on. This is not always possible as in some settings a complete system is necessary for work to be carried out. Co-realisation pushes the control of design and development into the workplace, a feature that may not be suitable for large scale projects with large

teams[34]; however it can be adapted to the needs of the project without losing its benefits.

Whilst it is recognised that innovation can occur after a system has been deployed, it is also noted that this is a contradictory and uncertain process where there is often a struggle between solving technical problems and the articulation of the varying needs of the users[78]. Orlikowski recognised that the effort people put into adapting a new system is often focussed during the immediate aftermath of its introduction[79]. This effort dies off dramatically when other work pressures start to take affect and habitual patterns of use develop. This is not to say that innovation cannot occur after this initial 'window of opportunity' but rather these windows are brief and should be taken advantage of when they occur. Further adaptation may occur if there is a change to the work setting that interrupts the daily routine of the users. As the technology becomes part of organisational routines, users rapidly form interpretations of the technology which can become particularly influential in their acceptance of it and these early interpretations may be difficult to change[79].

Work has been carried out to investigate the process of domestication in healthcare systems, where each region is integrated with a larger, national computer system. In the past COTS systems have been used and these need to be configured to fit the specific needs of the domain, where the requirements are continually changing and developing. A mismatch between the new system and the social system it is supposed to support can potentially result in the failure of the project[74]. The use of COTS systems is becoming more common as an alternative to developing a system in house, whilst still providing the flexibility to configure it to their needs. The configuration needs to support the actual work practices of the setting and the system needs to be integrated into these practices. To some extent it is impossible to know in advance what the impacts will be on work practices as these evolve in response to the system[38]. Designers however, must try to take into account these possible results when making decisions regarding the system's configuration, as there is a high risk of failure if they fail to do so. In a safety critical domain like healthcare this can be particularly dangerous. After a system has been deployed users often make them aware of errors in their judgment and of the severity of the impacts these have. Discussing design decisions with the users before deployment can be a useful exercise

in gaining a more detailed understanding of their work practices and may help reduce these errors in judgment.

In large-scale systems, such as those in the healthcare domain, carrying out a full ethnographic study to gain an insight into the social aspects of the setting is impossible. Some form of ethnography however, can and should be carried out. Martin recommends targeting studies to those questions that appear crucial to the system design [38] and the results of these studies would give the design team a more detailed insight into the complexities of the work that the system needs to support. A small scale, targeted ethnography could also be carried out during procurement to gain an understanding of current work practices which would help ensure that the chosen system can be suitably configured to support these.

Users are often only consulted late in the design process, when it is too late to make major changes to the system, but they are the only ones who really know what it needs to do. If they are not consulted and are only then told why something can't be done this can lead to problems in their acceptance of the system. Getting users to actively participate in the development process can help ensure their requirements are met and avoid the problem of user resistance. Many researchers have pointed to the strong link between user participation in system development and system success, with system use and user satisfaction being commonly used as a measure of success. While participation can vary in scope during the different phases of the development process, it is particularly appropriate during the early stages relating to problem definition and requirements identification, and also during the testing and installation of the system[80]. Although users may not necessarily want to or have the time to get involved, if they perceive the system as important to their jobs they may be more willing to take part. Baronas and Louis propose that the process of implementing a new system represents a threat to users' sense of control over their work[81]. By getting them involved any fear and uncertainty they may have had about the new system is reduced and they feel they are regaining some control and this may result in them developing more positive feelings towards the system.

Whilst it is recognised that design is a process full of compromises, in the system studied, Martin found that these would often appear to users as being at their expense

[38]. Presenting information to users throughout the design process can help prepare them for the new system and aid the integration of the system into their working lives. They are more likely to accept compromises and make changes if they understand the reasons why they are being made. Hartwick and Barki recommend having users participate in the system development as participation and conflict are likely to play a constructive role in the development process [82]. Like with any interdisciplinary work the different backgrounds and knowledge levels of the users and developers can make interactions difficult. It can sometimes be difficult for them to envisage a design and understand its implications before a prototype is produced that they can interact with[38]. Lin and Shao however propose that user participation should be promoted as a process of interaction between the two parties through which they can learn about each other's expectations and requirements and, hence resolve their conflicts[83]. How successful this process is can determine the effectiveness of the participation, so effective communication is critical. A huge cost is incurred when users reject systems that organisations install[84]. Although directive strategies imposed by management can help when dealing with system resistance these are often viewed negatively by the users.

The ETHICS (Effective Technical and Human Implementation of Computer based Systems) methodology was developed to assist and encourage user involvement throughout the development process to help create systems that are both technologically efficient and provide job satisfaction for the users. It aims to help a design group diagnose and formulate the problem, set objectives, develop alternatives, and take other appropriate actions right through to implementing and evaluating the new system [85]. The process of considering a large number of alternatives can however be time consuming as different groups may prefer different, sometimes conflicting solutions. Hirschheim, Tait and Vessey found that time constraints lead to a substantial decrease in the participation of users in the development process[80]. The ETHICS approach also fails to consider organisational constraints and the sometimes overriding objectives of management.

Although Martin found that integrating a system into working practices was a complex process, the study focused on how this process could be improved prior to roll-out and did not demonstrate how both the system and the users changed to create

a good fit [38]. Anderson et al. studied the deployment of PiMS, also in the healthcare domain and aimed at integrating and standardising patient administration [86]. Each department had its own ways of working that they had developed to suit their needs and these needed to be generalised and aligned so they could be considered in the system design[87]. Local meanings can also be attributed to data and these may not even be consistent within a group of similar users. Mutual trust between users from various departments of the same organisation is often missing and introducing a new system can bring conflicts to the surface, which then need to be dealt with [85].

Developing a standardised classification scheme removes local meanings and variations and everyone must then adapt to use it. Achieving shared meanings in a heterogeneous organisational setting requires the integration of often incompatible meaning structures and in this case, the introduction of the software heightened inconsistencies in the existing routines of different departments[88]. The new menu system that was introduced confused users and, due to the significance of several aspects of work practice being misjudged by the design team, did not provide a good fit with everyday work practice. This 'misfit' often led to decisions being made that reduced the quality of the data being stored which is especially important in healthcare systems. The users were initially blamed for making poor decisions until the design team discovered the difficulties that they were encountering.

Users may also have different interpretations of the technology and its purpose. They may form varying expectations towards it and these may shape their future use of the system. Discussing these differences in their technological frames early in the design process can be important in removing misunderstandings between the different groups of users and stakeholders and help manage the change process [79].

The PiMS project also pointed to communication difficulties between users and the design team and the need for a clear understanding of their requirements. Although a user group was in place, people didn't know how to get involved in it and this caused them to be under-represented. Effective feedback is essential if the project team are to make informed decisions regarding the future of the project. Of those who did bring feedback on the system it was often a case of listening to 'who shouts the

loudest' when deciding whose views were relevant [86]. The study also supports Martin's view that involving users in the design process and making them aware of the benefits of the new system is important as they are the experts in their work and the ones any changes will affect [38]. Determining what these benefits are and which will be most important to the users can however be difficult as Southon et al. found in their study of the New South Wales Health System [74].

The study of PiMS helped to show that systems evolve over time and through use issues will arise that can aid in developing it further to become more usable, a view supported by Anderson et al. [86]. It is important to recognise that if a system configuration needs to be changed this is not a failure. Stewart et al. [32] and Tyre et al. [31] are in agreement that, as with PiMS, systems will change and this period of 'domestication' is important in the production of more useful and dependable systems[73].

When the New South Wales Health Authority decided to introduce a new system for finance, pathology and clinical services they recognised that commitment to the project at all levels would be necessary for it to succeed. When the order communication part of the system was introduced however it failed to meet the users' expectations. Only those who used the system regularly were able use it to meet their needs. Others experienced a great deal of frustration due to problems with the user friendliness of the interface. The project pointed to problems in sectors such as healthcare, where it is often difficult to see where decision making authority is actually held. Both the software vendor and the department coordinating the project lacked the ability to control the doctors and get them to engage with the project and the new processes it would introduce. This is a similar problem to that faced in the GEOMETER project when attempting to engage with academics. The dispersed nature of the decision making power caused decisions to be made that might not have been best for that situation and made solving problems more difficult. When the decision was taken to withdraw part of the New South Wales system, many users were relieved. Managers can often be susceptible to an 'escalating commitment to a failing course of action', where they pursue it unquestionably even it information they are receiving suggests it should be abandoned [74]. While a lot can be learnt from this case study, one the most important lessons is that while all the stakeholders must

commit to the project, it is sometimes necessary to 'admit defeat', rather than waste more resources on a failing project.

In their study of the use of ERP systems, Pollock et al. recognise the importance of concepts such as 'domestication' and 'innofusion' for allowing past experience to influence future developments [89]. They propose studying the 'biography' of ERP packages, looking at how they have developed and how the history of the package influences how it is used and adapted in new settings[90].

Pollock et al. carried out an ethnographic study of the implementation of such a system at 'Big Civic', a large UK university introducing an ERP system [91]. As universities struggle to revamp their identity within an era focussed on 'commercialising higher education' [92] there has been a trend towards the use of ERP systems to allow them to remain competitive in an increasingly complex global higher education marketplace ([93];[94])[57]. Big Civic was one of the first universities to attempt such an implementation and hoped that it would allow them to carry out recommended restructuring of their management processes, whilst replacing the existing systems. They chose to procure 'Enterprise', a system initially built for manufacturing and material requirements planning as the supplier, although not experienced in the higher education area, had shown a commitment to developing the package to meet the needs of the university sector.

The new functionality was to form the 'Campus' module and was developed in consultation with several pilot sites, universities across the world who wished to use the software. The supplier attempted to develop a set of general processes suitable for all the universities. However, it became clear that this would be extremely difficult due to the diverse range of requirements. As with the studies carried out in the healthcare domain, it became clear that there was a wide diversity of processes for carrying out the same task within each institution and sometimes these appeared to be so complicated that they were shrouded in mystery [89]. As with PiMS it became a case of 'who shouts the loudest gets heard' when developing the requirements for 'Campus'. The largest university with the most influence was able to get more of its specific requirements included in the system, causing tensions between 'Big Civic' and the supplier.

When attempting to implement 'Enterprise' at 'Big Civic' decisions had to be made on how much customisation work would be carried out to make it meet their needs. As Light pointed out, from the vendor's point of view, many of the local incompatibilities between the system and the organisation can be reconciled through customisation [13]. Although organisational change was planned at 'Big Civic' it was still recognised that a process of 'mutual adaptation' would be necessary for a successful implementation. However, there were always fears that if too much customisation was carried out their system would be incompatible with future upgrades.

Process diagrams were used in an attempt to aid communication of the new processes to the users. These were used to help discover problems in the proposed processes so they could be removed before they were implemented. Although this suggests a large amount of consultation with the users, due to the variety of local practices, difficulties were encountered in attempting standardisation. Decisions often had to be deferred to a higher level authority and as these increased in number they were eventually taken by the design team, often choosing the default settings. In their study of an ERP implementation at 'Ivy' university in the US, Wagner and Newell found that decisions made by the Vice-Principal who wanted to gain more central control, resulted in the design of the system assuming a level of knowledge and sophistication that didn't match the way the university operated [57].

As with any automation of processes and process change, the new processes are not going to meet everyone's needs. In a context where you have diverse user groups with different requirements, finding a solution that meets them all is impossible. By definition universities are involved in research, teaching and service activities that thrive with heterogeneity [57]. At 'Big Civic', many of the most inflexible processes were often ignored or 'worked around' allowing procedures to carry on as before [24]. By working around the new procedures that they were not happy with, the users were able to continue their work and the university remained unaware that the new procedures were not being implemented. Feedback to the developers on these processes could potentially have allowed the system to continue to evolve and adapt further to meet the users' needs.

‘Big Civic’ experienced many problems similar to those in the implementation of PiMS and these are issues often associated with the implementation of COTS systems. Whilst they chose the system for its benefits over developing an in-house solution, they over estimated the influence they would have over the supplier and were unable to anticipate the extra work required to match the system to their organisation.

When ‘Ivy’ attempted to introduce an ERP system in 1999, they, like ‘Big Civic’ worked closely with the software vendor to develop the system whilst themselves undergoing business process change. When the system was introduced however it was not well received, due to differences in the way the financial module operated. It was seen as a way for management to enforce their values without clearly understanding the nature of the work that needed to be done. After a group of users came together and showed a powerful example of how the system failed to meet their needs a temporary customised application was bolted on to the system. While this meant the system now met the users needs, they continued to use their own Excel systems as well [57], a fear now being felt in the GEOMETER project. ‘Ivy’ have now recognised the need to customise the system to meet their local needs, even though they were the site at which the ‘best practices’ installed in the system were developed.

The case studies discussed point to a variety of areas that need to be addressed in system deployment and show how a system and its users need to adapt to become successful. Complex projects have been recognised as having similar characteristics, affecting large numbers of people who may suffer serious consequences if the computer cannot deliver accurately and on time the service they expect. The case studies are however, rather specific examples and further research is required to see if these issues are more generally applicable to other systems.

All the case studies show that when a complex project is undertaken that involves configuring an off-the-shelf system and any business process change a large and varied number of stakeholders should be actively involved. These each have different needs and are often disparate groups who would not normally work together. However, for the projects to be a success they all need to communicate effectively.

There is a need for on-going communication and collaboration amongst the stakeholders to ensure that the system delivered meets the requirements of the organisation. This is, however, very difficult and the next section will look at tools that have attempted to address this problem and make communication easier.

2.3 Computer supported communications

2.3.1 Groupware

Today, globally distributed teams in multinational organisations operate across time zones, have differential access to communications infrastructure and services, and work in very different organisational and cultural contexts[95]. The distributed nature of these teams makes it extremely difficult to schedule face to face meetings and this, in turn, makes it difficult for members to work in a coordinated manner. Group members must communicate directly and extensively in these situations if they are to coordinate their activities successfully [96].

In an attempt to support this process, groupware applications have been developed providing a variety of facilities to enhance group work. Groupware is the name given to computer systems that support groups of people engaged in a common task or goal and that provide an interface to a shared environment [97]. These systems attempt to provide users with up to date information on the activities of the other group members and the ability to communicate with the group in a synchronous or asynchronous manner. The technologies are utilised to overcome space and time constraints of group meetings, to increase the range and depth of information access, and to improve group task performance effectiveness [98]. Many provide facilities for scheduling of meetings, collaborative editing and the ability to engage in spontaneous interactions with group members. Through the use of a groupware system, coordination may improve as group members are able to see how what they are doing fits in with the overall goals of the team [96].

As in designing any computer system, developing groupware applications that are accepted by users is difficult. The challenge is creating a system that works well with people of different backgrounds, in different places, and often at different times [99].

With multiple users sharing the same interface there are added complexities including how and when you notify users of changes to resources and the implementation of concurrency control. Designers must have an understanding of the degree of homogeneity of users, of the possible roles people play in cooperative work, and who the key decision makers are and what influences them [100]. Issues such as ease of use and responsiveness are even more important in groupware systems as their success is dependent on getting almost all group members to use them. Designers must also be aware of exceptions to the normal flow of communications and activities to ensure the technology is not obstructive in these situations.

Even when these considerations are made, due to the nature of such systems they still suffer from the problem of gaining user support. A system will generally only be seen as worth using if a large enough number of other users already exist. People are attracted to systems where there is a considerable amount of activity and this activity may excite or motivate them to use it themselves [101]. For this reason, it is especially important to encourage key people within the organisation to become active system users and promote its use to others[77]. This can be seen in the adoption of many of the systems that will be discussed, where 'word of mouth' was often the primary influencing factor in increasing the size of the user population.

Understanding the benefits of the system can be one of the key factors affecting its use. Orlikowski argues that without proper training and demonstrations people struggle to understand and therefore realise the benefits of groupware [20]. If their technological frames do not adjust to the collaborative benefits of the system, they will evaluate it in relation to personal tools that they are familiar with and often fail to use those features that could benefit group work most. While groupware is expected to provide benefits to all group members, this is often uneven. Some members may be required to do additional work to enter or process information that the application requires or produces[102]. Designers must recognise this issue and attempt to reduce its impact. However, making the workload and benefits gained completely even is almost impossible. Demonstrations of the benefits of the tools may help by showing people what they gain from the extra work.

In their study of the use of TeamSCOPE; a groupware system developed to provide a central location for awareness information in combination with more traditional groupware features such as message boards and shared file repositories, Steinfield et al. found that group size, the level of group maturity, the accessibility of the tool and the need for sharing were influential factors in the level usage [95]. Structural properties of the organisation including policies and reward systems can also affect use, with many organisations having a culture based on competition. Where such a culture exists, it is likely that changes will be needed that cannot be brought in by the system alone and these changes may be met with resistance [20]. The lack of hierarchies and the often informal nature of communication in many systems can be another source of resistance, with some managers feeling that the system is reducing their authority and hence their level of control.

As previously mentioned, one function provided in groupware systems is notifications of others activities. Maintaining awareness of the day to day project related activities of group members within the system is essential for distributed groups. They have little opportunity to physically observe what one another are actually doing and this awareness is seen as essential to coordination of group work [95]. When decisions and outcomes depend on integrating different team members' efforts, knowing the status of the others' tasks is particularly important [96].

2.3.2 Awareness

As recognised in Viller and Sommerville's viewpoints, awareness of work is an important and complex issue to consider. Early ethnographic studies in CSCW indicated that cooperating actors align and integrate their activities with their colleagues in a seemingly 'seamless' manner [103]. These practices and the ways in which they are carried out are often referred to as awareness or 'passive awareness'. Although we are capable of maintaining an awareness of many things, our environment contains huge amounts of information that competes for our attention and we selectively attend to only a small portion of it depending on a wide range of factors [104]. Awareness has been defined by Dourish and Bellotti as 'the understanding of the activity of others, which provides a context of your own activity'. This is a popular definition in the field of CSCW due to its direct relation to

cooperation and coordination. Whilst many definitions of awareness exist, exactly how we select what to stay aware of and when, is not well understood. As active participants in our environments, we are able to select information from the background and bring it forward when it is necessary for our current activity, whilst maintaining a peripheral awareness of the rest [52].

A physical workspace may be designed in a way that allows us to quickly gather awareness information using methods as simple as a glance, a technique found to be particularly important in the study of Air Traffic Control [30]. The ability to see and hear events in the physical world is important, but as organisations have grown and become more distributed, this ability has become limited to those working in our local setting. Moran and Anderson point out the importance of signalling the availability of information and people in a way that uses the human capability to peripherally process non-attended aspects of the environment [105]. Virtual workspaces are making this more difficult, as their abilities are very limited and often slow and clumsy in comparison with the affordances of the physical workspace [106]. Many efforts have been made to create interfaces that help overcome some of these problems and, after describing some of the design considerations that need to be made, some of this work will be discussed.

Privacy needs to be considered when designing a system that provides awareness of others. People will only be willing to accept a reduction in their privacy to a certain level and this must not be at the cost of a disturbance to their work. In the physical workspace, actors take great care and skill in choosing an interactional modality for monitoring the work of others and in displaying aspects of their own work, that is obtrusive or unobtrusive to a degree and in a manner that is appropriate to the situation at hand [103]. Moving this to a virtual workspace is extremely difficult as the process is often reliant on the individual's knowledge of their environment. Access controls are also important when a large amount of information is being shared and it is important that everyone is clear what is private and what is being seen by others.

Many systems aim to keep people aware of events and information through the generation of email or web pages. However, for these to succeed, they require readers

to actively check them for new content. This can then distract them from their work rather than allowing them to become peripherally aware of the information. As they are required to check the web page or email this can affect the timeliness of the information as the sender has no control over when it is actually read by the recipient. When members receive the information out of context, they may fail to appreciate its meaning or significance, and may not take appropriate actions in response [95].
How this awareness information is generated is also a problem that must be considered. Maintaining awareness information generated by users can be time consuming and there may be a trade off between the time required to do this and the benefit the user gains from the system [105]. When the user is responsible for maintaining the awareness information, the system needs to provide information to others so they can determine how up to date it is. Features such as last modified dates are now commonly added to systems related to awareness to try to overcome this.

To reduce the time taken for the user to generate their own awareness information the process can be at least partially automated, with the computer providing information regarding their activities to others. This again however raises the issue of privacy, and there are limitations to the kind of awareness information a computer can automatically generate. Any system designed to support awareness must allow flexibility in what information is provided as users' interests and requirements will change over time.

Once information has been gathered, it needs to be presented to other users. This can be done in a passive way as with email, where the user has to actively seek the information, or in an active way where they are notified of changes. The interface must be careful to choose an appropriate method dependent on the type of awareness it is trying to support [107]. The length of time the information is stored for must also be considered and whether this is related to it actually being seen by the user. If users can see the benefit of keeping aware of different things then they are willing to sacrifice some of their screen space. This however must be minimal, without preventing other applications from being used as normal, and the information must be presented in a clear and easily observed manner.

Event-based notification services are increasingly being used to provide awareness support for collaborative environments [108]. By creating interfaces to these services it is possible to give a perceptible form to the notifications associated with computer based events. An example of one of these services is Elvin, for which three different interfaces have been developed to improve awareness. These include CoffeeBiff, a simple interface for registering who is on their coffee break; Tickerchat, an interface using the familiar idea of a chat program; and Tickertape.

Tickertape is the most frequently used of the three interfaces and provides a single scrolling line display of the notifications provided by Elvin. Users are able to sign up to groups they are interested in and any notifications and messages regarding these will appear in their Tickertape window. Over time the messages fade to give an indication of how recent the information is. Due to the small size of the window it can be displayed constantly in the user's workspace. The use of animation such as tickers allows lots of information to be displayed in a small space. However, due to their dynamic nature, there is some debate about how distracting they are [109]. When surveyed, regular users of Tickertape did not find the animation distracting and those who had stopped using the interface did not cite this as one of their reasons for doing so.

Whilst the initial idea for Tickertape was to distribute announcements, possibly of a timely nature, its use evolved to include informal interactions between colleagues and checking of their availability. It was also used to give a perceptible form to a user regarding events occurring on their own computer, such as email notifications through the use of private groups. These new adaptations were common and, although using Tickertape required effort initially in setting up subscriptions, the time saving benefits gained in the future seemed to outweigh this initial cost.

A similar idea was developed by Zhao and Stasko to support community awareness with the 'What's happening' program [110]. This again uses a small interface to cycle through information that may be of interest, including local weather and events. Users are also provided with the opportunity to discuss the articles presented in a related chat room or visit websites where they can obtain more detail and are able to

post their own content for others in the community to read. Like Tickertape, the program seemed to be well accepted within the community.

The groupware system 'The Notification Collage' also aims to support community awareness by allowing members to post media elements onto a real-time collaborative surface that all members can see, almost like a virtual notice board [104]. Like a notice board, members add items they feel might be of interest to others in the community and over time these may become covered by newer postings. Included in the various media items was the facility to use Sticky Notes which work almost like real sticky notes, allowing users to post notes to each other, often attempting to alert other members to items of interest. These were also often used for informal interactions which could be seen by all participants. If a user wishes to keep a posting that they feel is particularly relevant to them, they can move it to the side of the Collage, preventing it from being covered by more recent additions. Although this is a beneficial feature, people still found it difficult to find the information that was relevant to them and filter items accordingly.

There is a tremendous wealth of data available on the Internet and corporate intranet that people would like to maintain in peripheral awareness and access with minimal effort. Several applications have been designed to attempt to support this [109]. The Sideshow application allows the user to select items (tickets) they are interested in and display them in a side bar that is permanently displayed on their screens. Each ticket is displayed in the sidebar with a small amount of information which is expanded in a tool tip when the user hovers over it. Allowing users to expand on the existing tickets combined with an iterative development with a large amount of user involvement helped to encourage users to try the system.

The difficulty of keeping up to date with changes in the information available on the Internet has also been recognised by McCrickard [111]. To try and deal with this Irwin (Information Resource Watching In a Nutshell) was developed which notifies users of changes to Internet information through graphical, auditory and textual cues. Irwin attempts to determine the user's interests by examining their email files and web bookmarks. However, the user can still configure both the information monitored and the way in which it is displayed [111]. To give an indication of the

timeliness of the information the colour of the icons changes and the bitmaps are changed to show the status of the resource. With a textual representation, a list of headers is used from which any can be selected to display a summary of the message. The complete information can be retrieved following a link through to the original resource. This summarising and condensing of information is a common technique used to help reduce information overload.

Information overload has been traditionally defined as 'information presented at a rate too fast for a person to process' [112] and is a problem that has emerged with the expansion in the use of computer mediated communications. Systems designed to help mediate computer communication increase the social density of their users enabling them to stay in contact with a larger number of people. In a similar sense, awareness applications enable more information to be watched also increasing the potential for information overload. With any of these tools the problem is most prominent with beginners who try to monitor too much information. Users learn to cope with information overload after they gain sufficient experience with a system [112]. Providing information asynchronously and aggregating it, rather than providing it incrementally, may help reduce the feeling of overload for these users without reducing the usefulness of the information [96].

As users become more experienced in using a system, they develop screening skills that allow them to select the information of most relevance to them. Programs can include tools to help in this process such as filters which can be configured possibly using real world roles and groupings, as participants are not interested in all the information generated by each event [113]. As interests change over time and everyone has different interests, it is not possible to create one automatic process that can completely carry out this filtering. Instead it must be left to the user to select what is of interest, a strategy employed in most of the applications previously described. Although many techniques can be employed to help reduce information overload, it is often more effective to change people's behaviours rather trying to overcome the problem with software.

Many studies ([114];[115]) have found that a large proportion of the interactions in the workplace are informal in nature and not pre-arranged. Although this is the case,

people still prefer to use formal communication channels to disseminate information so they can be sure it reaches all those it is intended for. Despite this there is still a demand for a system that allows informal interactions to be used more effectively. Piazza was developed to allow people to be aware of others who are doing similar tasks and thereby enable spontaneous interactions, whilst still supporting formal communications [116].

Like many of the awareness interfaces discussed, Piazza is integrated into the desktop to allow peripheral awareness of others whilst carrying out your normal activities. The system is split into five sections, each of which is designed to support awareness and interactions at different levels. Its features include providing 'at a glance' knowledge of the workspace, the ability to select users or groups of users to stay aware of, the ability to have an audio-video conversation with another user and the ability to have discussions or meetings and share documents in one place. As with the 'Notification Collage' the metaphor of a sticky note has been used to allow users to post messages on other people's screens. This feature is popular with users and this might be due to the closeness of the implementation of the metaphor to the physical, real-world sticky notes that people are familiar with.

Good communication tools allow a flexible working environment and focus on human centred and project oriented approaches [105]. The flexible and informal nature of some computerised communication methods can leave users feeling unsure which to use in which situation. The social norms regarding the appropriateness of their use have not yet been firmly established or may not have been learnt by new members to a setting. This needs to be considered when designing communication and awareness tools. @Work was designed to allow users to inform each other of where they were, what they were doing and how they could be contacted, through the use of thumbnail video images of people using the system, supplemented by information provided by the users regarding their current status [105]. Unlike other awareness applications @Work was not designed to be permanently visible on the user's workspace. Instead, it provided a selection of interfaces, including a text and web interface for the users to choose between that could be viewed when they wanted to. The most frequently used was the web interface as it was natural for the users to go to their browsers for

information and common for users to keep a browser window open at all times. This reduced the effort required to gain access to the awareness information.

A similar idea was implemented at Rank Xerox EuroPARC and Xerox PARC with the Portholes system. This system displayed images and information via the Internet, to make you aware of what colleagues in distributed or local locations were doing. Like @Work, the Portholes interface suffered from the problem of size. When a large number of images were selected to watch a large amount of screen space was consumed, making it necessary to minimise the interface and then choose to check it when awareness information was required. As with Piazza the developers of Portholes found that informal communications increased, especially over distributed locations.

One of the most widely deployed groupware systems is Lotus Notes. While many groupware systems were not adopted by organisations, several chose to implement Notes on a large scale. The system is based on document databases; an advanced form of bulletin boards and electronic mail, allowing users to organise and search for discussions based on topics and responses. It provides a time stamped record of who said what and, depending on privileges, allows a group discussion to be kept in one document. Due to the use of databases and mail messages the storage requirements of such a system can however escalate quickly with use. Many studies of Notes and its implementation have been undertaken. Kiely summarises the findings, stating that as with most groupware systems, it is able to enhance collaboration in organisations which have an inherently collaborative culture [117]. It is however also noted that these organisations are rare.

Vandenbosch and Ginzberg studied the introduction of Notes in a large American insurance company who hoped it would help them with business process re-engineering by allowing users to participate in discussions about the changes being proposed [117]. Although they found that users were generally satisfied with the software, no significant increase in collaboration was seen and those who rated the software highest were previously very collaborative workers. In this case study the training provided was minimal and focussed on the functional aspects of the system rather than the benefits for collaboration. This could have been a factor in how the

system was used. This seems to support Olikowski's view that training in the benefits and the new way of working is essential if the collaborative benefits are to be achieved.

The success of many of the above interfaces can be attributed to the need that people have for awareness information and the need to communicate and collaborate effectively, especially when working in distributed groups. The simple interfaces allow users to distribute information and communicate with ease without disturbing their workaday activities. If ideas regarding awareness are to be implemented in computing systems and deployed on a large scale it is important that the majority of the bugs are removed and that the users are consulted during the development process. This communication with users is important as people are not easily sold on anything that promises change in cognitive processes and organisational social structure [112]. However, the response of users to many of the interfaces described would suggest that this can be overcome if they can see the benefits. Awareness is a complex issue and the challenge for systems design of any nature is to be able to represent the wide and varied types of information about workplaces with awareness as only one facet of this[52].

Although benefits are seen in the implementation of some of the above systems, groupware has failed to gain the popularity expected given the benefits it claimed to provide. Many of the larger groupware systems require a huge financial investment and are complex to implement, requiring large amounts of resource. As seen with Notes, the hardware requirements can also be large and maintaining such systems can be time consuming. In the companies that have chosen to implement groupware systems, the benefits promised have not been seen in the short term. When this is combined with the large installation cost it can put off smaller organisations. When the investment needed is high, the cost of failure can be too much for organisations to take the risk. The case studies suggest that if the true benefits are to be realised a large amount of investment is required in training and changing the way people think about software. The culture of many organisations can also have a negative impact on the success of any groupware implementation attempted and changing this can be difficult. These barriers to groupware success and the high cost of failure associated

with them could be why they have failed become widely adopted, despite a recognition of the problems they intended to solve.

2.3.3 Web 2.0

Web 2.0 technologies provide a more viable alternative to the expensive groupware systems. The term Web 2.0 is associated with new approaches to managing the organisation of information, treating information and knowledge as things constructed in social interaction and in the interaction between users and information systems[118]. These 'social' applications give users more control, allowing them to contribute and organise their own information. The use of such technologies has grown in recent years due to their ease of use and the availability of many open source and low cost software and hosting options[119]. Web 2.0 technologies including blogs, wikis and social network sites are becoming more popular seeing their application in a wide variety of contexts. The popularity of sites such as Facebook and MySpace has helped bring the possibilities of such technologies into the public eye with users spending large amounts of time both contributing and reading others content[120].

Businesses are now recognising that their employees are using these technologies and, although CIO's annual consumer technology survey found that 10% of the survey's 311 respondents listed social networks as the top consumer technology threat facing their organisations[121], many are still trying harness their power rather than attempting to ban their use. By bringing the social tool inside the enterprise DiMicco et al. believe that you are providing new information sources and new possibilities for understanding the workforce[122]. Many companies such as SelectMinds now exist to help businesses create their own social network sites in an attempt to achieve this and open source platforms exist to assist those wanting to develop them in-house. Farrell et al. also believe that the benefits associated with the use of Web 2.0 technologies within the enterprise can help make the business more socially resilient and able to cope with internal and external changes and challenges[123].

Blogs

A blog is a website that contains dated entries in reverse chronological order about a particular topic or by a particular user [119]. Blogs were initially used as a form of public online diary. However, they are now used in a wide variety of industries from journalism to medicine for a variety of purposes. The tools for posting entries onto blogs have made publishing information on the Internet extremely easy, quick and accessible. They can be used for both internal and external communications with the ability to widely publish immediate postings, providing an agile method of communication that can spread quickly through a distributed network or community[123].

BlogCentral: BlogCentral is a blogging system that is being used by IBM for internal communication and, as such, is inside the IBM firewall. As of September 2008 it had 58400 registered users and 14000 blogs with over 124000 entries, of which about 1800 are active blogs with 10 entries of more[123]. When studying the way in which the blogs were being used, they found that their dominant use was for the sharing of information and expertise often through the asking of questions[124]. This is similar to the use of online forums, such as Yahoo Answers, which are designed to facilitate this kind of sharing. Although the posing of questions and discussion of ideas related to work was the predominant use, personal opinions and stories were sometimes included to try and build interest and attract readers. They also found that, as users would research a subject on the web, they would often make blog postings of this research which others could refer to, saving them time in the future. IBM found that the use of blogs allowed the tacit knowledge normally communicated informally and locally could be shared across the large distributed network of the company. As found at IBM, blogs can draw together small virtual groupings of people interested in co-constructing knowledge around a common topic within a community of practice [119] and assisting such collaboration across a large distributed company can be extremely beneficial.

Wikis

The wiki is a tool to enable collaborative authoring, allowing users to edit the pages they browse[118]. The best known is probably Wikipedia, the online encyclopaedia which is ranked as the 11th most visited website in the world and has over 6 million

articles in all languages[125]. Wikis are also being used in a business context with Majchrzak, Wagner and Yates finding that enterprise wikis are being used to facilitate work processes, collaborative work and knowledge reuse[123]. This is similar to the benefits found from using blogs. However, the ability for a distributed team to work collaboratively on a document with ease is one of the main advantages of wikis. Although many believe that the quality of information stored on a wiki is questionable, it has been argued that the very openness of them makes it possible to rapidly correct or restore a 'quality' wiki page[119]. IBM has introduced a wiki system in the form of WikiCentral which is used for communicating and collaborating amongst teams.

Social network sites

One of the best known and most popular Web 2.0 technologies is social network sites. Boyd defines social network sites as web based services that allow individuals to construct a public or semi public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system[126]. Although social networks have always existed, the new online sites provide a way of making these visible and sharing them with others. While it is possible on many of these sites to create groups and communities around shared interests it is the users that form the organisation of the networks.

Many studies have been undertaken looking at the connections people make on these sites and why. Ellison, Steinfield and Lampe suggest that Facebook is used to maintain existing offline relationships or solidify offline connections as opposed to meeting new people [127]. Boyd and Ellison suggest that this is not a phenomenon unique to Facebook and, whilst exceptions exist most social network sites primarily support pre-existing social relations[126]. The study of Beehive, a social network internal to IBM was one of these exceptions. DiMicco et al.'s findings showed that employees were using the site to discover and connect with people they did not know, reaching out across organisational boundaries[122]. This suggests that there could be differences in how internal social networks are used compared to the open online sites.

The first site to provide all the facilities mentioned in Boyd's definition was SixDegrees.com in 1997 however this appeared to be ahead of its time and closed in 2000 with little success. Since then a large number of sites have appeared with different goals and these have had varying levels of success.

Friendster: Friendster was launched in 2002 as a dating site for meeting friends of friends on the premise that they would make better romantic partners. It became one of the first social network sites to gain widespread popularity. However they were unable to cope with the large number of users. After many difficulties, early users began leaving and turning to other sites that were now available. This was both due to technical difficulties and a rupture of trust between the users and the site [126].

MySpace: The difficulties encountered by Friendster allowed other sites to become popular. Many of the users leaving Friendster were searching for an alternative and some saw this in MySpace. The unexpected popularity with bands allowed MySpace to expand rapidly and, in July 2005, News Corporation purchased the site for $580 million attracting widespread public attention[126]. By allowing users to personalise their profile pages through the embedding of HTML and listening to what users wanted, MySpace was able to differentiate itself from other online sites and maintain a good relationship with its users, avoiding the problems encountered by Friendster.

Facebook: Although many of the sites are designed to appeal to a wide audience some target a smaller niche. Facebook was initially designed to support distinct college networks and began in 2004 as a Harvard-only site [128]. The site then slowly expanded to wider groups, starting with other colleges and universities and continuing to include corporate networks and schools. Conditions were still enforced to ensure the users had a suitable email address for the network they were joining. Facebook has now been completely opened so anyone can join, with networks being used to group users. As with most social network sites, a user's profile is a way a representing themselves on the site. Like MySpace, Facebook allows users to personalise their profile pages. With Facebook this is done through the addition of applications built by external developers.

The use of consumer social network sites and the desire to replicate the social-networking and collaboration of these applications in an organisational context has seen an increase in the popularity of enterprise social networks[129]. The popularity of LinkedIn.com, a social network site designed for corporate use with over 20 million users shows that there is a demand for such a site in a business context. Jonathan Yarmis, an analyst with AMR Research says that businesses 'should be trying to understand why users find the platform attractive and how to leverage it from both an internal communications and a customer-facing perspective'[121]. Companies however seem more comfortable with the use of Web 2.0 technologies for internal communications, with the 2008 McKinsey Global Survey finding their use in this context at higher levels than for external purposes.

Beehive: Beehive was launched by IBM in May 2007 as an internal social network site. Like most social network sites each user has a profile and connects to 'friends' within the network. They are also able to upload photos and lists to show their personal and business interests and leave comments on others content. The team found that status messages and profiles were used primarily for work-related purposes while shared content like the photos and lists were used primarily for personal reasons[123]. The goal of the site was to enable users to express themselves in rich, personal ways so that other users could get an expressive picture of who an individual was on a personal and professional level[122]. After a year of use, the site had 30000 registered users from a wide variety of business areas and 67% of these were active.

As previously stated, unlike the use of the public social networks, users of Beehive spent more time connecting with those users they did not know and were open to meeting with these people in person after getting to know them on the site. Similar findings were observed at HP with 55% of connections in WaterCooler, an internal portal that aggregates social media platforms across the company to make it easier for people to stay aware of new activity, being to people outside the user's business group[22]. The communication on Beehive conveys to users that people are enjoying their content and establishes a social connection between groups of users that can lead to real-world connections between people[21]. Beehive allowed users to overcome the hierarchical barriers traditionally in place in organisations which can often cause

communication problems, and users at various positions in the company found using the site beneficial.

As the site grew in popularity and the body of content increased however, it became harder for users to find items that are most interesting and valuable to them[130]. In order to increase the diversity of content being viewed on the site a user driven promotion system was introduced. By allowing selected users to promote content they found interesting, it drew attention to items that would not normally have gained high viewing levels. This then led to an increase in the number of comments being added to these items and in many cases led to new social connections being made. By increasing the variety of content being viewed and helping users find items that are interesting Farzan et al. were able to prevent the community from becoming too focussed on a select few individuals and their content and this is an important lesson to learn when creating a large online social network[130].

Forums

Online forums provide a way for users to share information and discuss ideas. Yahoo Answers in one of the largest with approximately 23 million resolved questions. Using Yahoo Answers a user posts a question within a category and other users can then post replies. When studying the systems use Adamic et al. found that it was being used in unexpected ways, with users often asking for opinions and wanting discussion [131]. They found that factual answers on technical subjects attracted a few lengthy replies while the discussion topics attracted a larger number of shorter responses[131]. This sharing of information works because experts in one area are often novices in others and something that one person may consider to be obvious can be life saving to others[124].

RSS

The use of Web 2.0 technologies such as blogs and social network sites is often combined with RSS. Through the use of an RSS aggregator users are able to keep up to date with new activity. The user subscribes to a feed which is updated with a notification every time the page changes[132]. By checking the RSS feed the user then knows when to check the site reducing the number of times they then visit the site unnecessarily. This is especially important for people working in a business

environment such as 'knowledge workers', who sometimes suffer from what Leslie Perlow calls a 'Time Famine' [120] due to the high number of demands on their time.

Tags

In recent years people have become exposed to a growing volume of online information that can hardly be processed, let alone absorbed by any one person[133]. One strategy employed by Web 2.0 technologies to organise content and help users select what is relevant is the use of tags. Tags are keywords assigned to content by the users who upload it. Such a classification system; termed a folksonomy by Thomas Vander Wal, is reliant on the similarities between the ways in which people describe disparate pieces of information[118]. By allowing the users to tag their own content it allows for a more flexible organisation of information with the ability for more complex and often intuitive associations. Feldman and Sharman, speculated that the business content shared by employees and the frequent desire for teams and communities to share resources drove users toward similar tags[123]. The observed use of tags within Elgg supports this theory with a smaller number of tags being used a lot and a large number being used only occasionally.

2.3.3.1 Requirements for success

Web 2.0 applications are not necessarily be suitable for all environments but certain factors can help promote their success. With most new technologies it is important to establish a critical mass of users. In Web 2.0 applications which are dependent on user generated content, this is even more important. The hardest part of designing systems for collaboration and knowledge sharing is getting them used[120]. O'Reilly suggests setting defaults for aggregating user data as a side effect of their use of the application, taking some of the burden of data creation from the users [132]. When introducing the application it is important, as with any new system, to demonstrate to users the potential benefits providing examples of how it could be used[134]. Wilensky et al. agree with this stating that it is important for those who introduce the technology to communicate with users and educate them on what it is about [129]. A lack of active participation by a large number of users is often cited as the main barrier to the success of Web 2.0 applications.

When interviewing users of WaterCooler, Brzozowski et al. [22] found that many felt that to help engage a large number of users the tools should be more actively promoted through official channels and that managers should been seen to 'lead by example'. Having visible senior management support is important in the deployment of any new computer application something the GEOMETER project attempted to promote. The 2008 McKinsey Global Survey Results found that companies that encouraged the technologies use through tactics such as getting senior managers to act as role models for adoption and integrating the tool with existing workflows had a higher level of usage. Herrmann emphasises the importance of integrating the Web 2.0 applications with the socio-technical system of the organisation if they are to become part of everyday practice [134]. This is easier where a culture of collaboration and sharing already exists. The software must also be designed so users can quickly learn how to use it and retain the skills they acquire[135]. By recognising the variety of tasks they may need to support, developers can produce more usable tools that also meet the social requirements of the user. If a system is easy to use, then people are more likely to continue with it.

2.3.3.2 Barriers to use

Today workers have more freedom to choose whether to adopt a new system introduced to their organisation. As previously stated, users are important as they provide the content which adds the value to the system. Only a small percentage of users will actually go to the trouble of explicitly doing this[132]. Employees may see little incentive to invest their time providing content for the consumption of others[22]. If they do not receive feedback that what they have contributed is useful they are less likely to contribute further. Convincing users to adopt the system is vital for the systems success.

Experiments have been undertaken on the Beehive system with various incentive schemes to encourage users to contribute to the site as user activity encourages others to participate. A point based system, where more points were allocated to content that generates more activity, was introduced to the site as a way of rewarding users for contributing. As their points level increased their status would change, increasing their reputation and giving them greater visibility on the site. They found that this

initially caused a substantial increase in the number of contributions however over time the effect of the points decreased. The incentive mechanism failed to continually incent users to contribute and the suggestion of a dynamic point system in which point levels decrease over time seems more appropriate if high contribution levels are to be sustained[136]. It is also clear that understanding users' motivations for contributing to the site is important if an incentive mechanism is to be successful. While the ability to increase your status on the site was desirable, comparisons were generally made within the user's social group, not the whole site which it had been assumed when designed.

To the younger generation, Web 2.0 technologies are part of everyday life. However some of the older generation often have difficulties grasping their collaborative features[129]. This can then cause problems as they have a less developed technological frame and may use familiar technologies to help them interpret how it should be used[79]. This may result in them using it in unexpected and possibly less effective ways, as they are less familiar with the new features that would provide the most benefit.

SelectMinds found that businesses are often scared of the changes the use of social networks bring with them [137]. As previously mentioned they encourage a flatter organisational structure and allow employees to communicate more freely, without the hierarchical barriers traditionally in place. Another worry is that employees will use the technologies for personal expression and socialising instead of working[123]. Graeme Thompson, CIO of BAE Systems argues that banning their use is not the answer. The popularity of the consumer technologies suggests he is accurate when he says that 'the devices and social computing sites are here and your employees will bring them into the enterprise. If you ban it, then you are really just sticking your head in the sand and losing an opportunity to manage it.'

2.3.3.3 Access

One of the biggest concerns of organisations with respect to the use of Web 2.0 applications is that confidential information will be leaked outside the company. SelectMinds state clients are not comfortable with the openness of environments such

as MySpace and Facebook even though they include some access controls[137]. A wide range of controls are desired to restrict access and administer the system. Although access restrictions are implemented in internal systems such as Beehive, only 7% of photos and 3% of lists used these restrictions[122]. When asking the users why this was the case they stated that they were less concerned about privacy within the company and were therefore willing to share a larger amount of personal information. The statistics show a large difference between the use of internal and external systems with between 20 and 40% of Facebook users using the privacy controls to limit the visibility of their profiles[122]. SelectMinds support this, stating that, with time, clients become more relaxed about the use of controls however this is in part due to the extra resource required to enforce them.

2.3.3.4 Concluding remarks

Developing and deploying computer systems is a complex and often problematic process and the consequences of failure can be devastating to organisations. Introducing new systems will normally involve a change in the way people work and this will often be met with resistance. Social studies such as ethnography can help design computer systems that better fit with the work practices of the organisation and hence may be more acceptable to the users. In any situation where you have people from different disciplines with different perspectives, communication problems will exist. Many software solutions now exist that attempt to improve group communication and approaches have been developed to help overcome interdisciplinary barriers. Groupware systems have had varied degrees of success and companies such as IBM and HP are now turning to Web 2.0 technologies to see if they can help. While the barriers to the success of these technologies are similar to those associated with groupware systems, the costs are considerably less. With minimal training required and low start-up costs, organisations can afford to try out a variety of these technologies to find those which are most suited to them. The reduced risks of introducing Web 2.0 technologies combined with the same potential benefits of groupware make them very attractive and these systems could go some way to providing a solution to the communications problem. The personal use of such technologies is now widespread. However, current studies seem to suggest that usage patterns are quite different when moved to a corporate context. While Mack et

al. found that using social tools such as these in project work allowed more natural and flexible communication [138] and the adoption levels at IBM and HP are promising, the question that still remains is can these technologies help communication with a variety of stakeholders in complex system projects and if so how?

Chapter 3 Research study

ERP systems are off-the-shelf systems that allow organisations to integrate formerly separate business processes. The GEOMETER project at Edinburgh University planned to introduce such a system to integrate the entire student life cycle. The use of ERP systems is becoming increasingly common due to the perceived benefits over building a new enterprise system in house and this is one of the reasons it was chosen. Implementing ERP systems usually involves a level of business process change, with their deployment affecting a large and varying number of stakeholders. Edinburgh was no exception and, as the complexity of such a process and the issues that arise are not fully understood it is an interesting project to study. Before help and support can be provided for ERP deployment projects, it is first necessary to gain a proper understanding of the real problems that are encountered. Undertaking a year long ethnographic study of the GEOMETER project provided valuable insights in this area. The remainder of the chapter will contain the following sections.

1) This section will outline some of the issues that have been recognised in ERP system implementations and show why this makes them interesting to study.

2) In section 2 the research method used to gather data on the case study will be briefly outlined and justified.

3) Section 3 will describe the case study; the GEOMETER project, giving some general background information on the setting followed by what its aims were and its progress to date.

3.1 ERP systems

ERP systems are packages that can be purchased off the shelf and provide the facilities for an organisation to integrate their business processes around one central system. These systems were originally applied in manufacturing industries to reduce production costs and administration overheads but industry-specific systems have since been developed for sectors such as healthcare and education. Recent years have seen more and more companies choosing to purchase these off-the-shelf products such rather than develop software in house, in a hope to substantially reduce the costs, risks and delays associated with custom software development[1]. According to reports by Gartner Dataquest on the software market, ERP software revenue has continued to grow suggesting that demand for such packages has remained high.

Whilst viewed by many as the safer option when installing a new system, implementing ERP systems is not without its problems. The 2001 Robbins-Gioia survey found that 51% of the businesses surveyed viewed their ERP implementation as unsuccessful. The 2001 Conference Board Survey also found that of those companies attempting ERP installation, 40% of the projects failed to achieve their business case within one year of going live[139]. There have also been many well publicised project failures including the failed implementation and integration of SAP, Manugistics and Siebel at Hershey foods in 1999 costing them $112 million[140]. Goodyear also found that after implementing SAP in 1999, errors in its set-up had introduced errors of up to $100 million in their financial data up to 2003. These examples are not uncommon however they do not seem to be deterring other organisations from choosing ERP systems. The promise of ongoing support from the software provider with the possibility of future enhancements to the product and continued bug fixes still appears to appeal.

ERP systems are organisation-wide systems affecting a wide range of departments and hence involving a large variety of stakeholders. As the systems are developed to be applicable to an industry rather than a specific organisation they require configuration to meet an organisation's needs. Getting a 'fit' between the organisation and the system requires changes to be made to both the business processes and to the software configuration. Determining the best strategy is difficult,

with a trade-off between extensive configuration, which is discouraged by the software vendors and may make future updates incompatible, and extensive process change, which is likely to be met with high levels of user resistance. This will, in turn, impact on the success of the system. It is important not to 'go to war' with the package in an attempt to make it meet the needs of the organisation as this could lead to huge cost overruns and, in some cases, project failure[59].

Unlike in-house development, where the organisation finds out what the work practices are and builds a system to support them, configuring an ERP system involves working with in-built processes that were developed as 'best practices' for that sector. Whichever strategy an organisation chooses, some changes to the way people work are likely to be required. Any change to the routine work practices may be met with user resistance, often due to uncertainty about the new system. To successfully communicate changes to the wide variety of different stakeholders involved, Doorwewaard and Van Bijsterveld argue that they need to be presented from the perspective of each group, as a set of simple, universal and non-controversial ideas, as each group will have their own underlying assumptions that will affect their understanding of the changes being put in place [57]. It is important for management to use their knowledge of the potential users of the system to set up strategies for each group to overcome the resistance and convince them to adopt it[62]. Summer also states that communication of what is happening in the project is critical if it is to gain user support and be a success [59]. This process of communication poses interesting challenges to project managers who need to gain and maintain user support and exactly how this can be done effectively needs further research.

ERP systems are more complex than traditional packages and require more knowledge, effort and skill to adapt them to the characteristics of a particular organisation[1]. To determine exactly what these needs are, the organisation needs to speak to the users to understand the current work processes and relate these to the new system. In order to keep users enrolled in the system, determining which processes they need to support should be a process of negotiation with the different user groups [57, 141 cited in /Wagner, 2004 #160]] and this can be difficult.

The challenges faced when implementing an ERP system are heightened by the complexity and often distributed nature of the organisations undertaking the projects. In such complex and distributed organisations, it can be difficult to meet with people to discuss the project and getting people together from across a range of departments can be even more problematic. Even when meetings are held, it can be difficult to define the current work processes as people may find it difficult to describe them in sufficient detail and ensure they have been correctly understood. Differences in people's perspectives on the work carried out and their varying levels of knowledge also make it difficult to successfully manage interactions with users and gain support.

As previously discussed, ERP projects have a high rate of failure and this may be fatal to an organisation. Due to the high costs associated with these failures several researchers have attempted to discover the causes of problems in ERP systems deployment. Sawn et al. [58] argues that the root of such a high failure rate is the difference in interests between customer organisations who desire unique business solutions and ERP vendors who prefer a generic solution they can apply to a broad market. Ewusi-Mensah also points to a number of factors as being associated with, in the extreme case, project abandonment including [59]:

- lack of agreement on a set of project goals and objectives
- lack of a measurement system for assessing and controlling project risk
- lack of adequate technical expertise and application knowledge
- lack of an adequate technology infrastructure to support project requirements
- lack of senior management involvement
- escalating time and cost overruns

With such a range of factors affecting the success of a project recommendations have been made as to important issues to consider. Summer suggests using a mix of consultants and internal staff in the project team and ensuring that you manage the common issue of 'scope expansion' which occurs when enhancement requests are received [59]. Most of the firms in the survey also emphasised the importance of training, something that is often vastly underestimated. Huge storage needs, networking requirements and training overheads are frequently mentioned as ERP

problems[56]. Aladwani also cites getting the support of well known users and top management and minimising the adoption costs to the users as important factors in the success of ERP implementations [62].

While many researchers have pointed to factors that are important for success, few tools or strategies have been developed to help overcome the problems. The importance of ERP success and the complexity of the process of configuration makes their implementation interesting to study. They present the project team with a variety of new challenges that are both technical and social and all need to be tackled by the team. Much of the research into the success factors of ERP implementations is survey-based and a more detailed study of an implementation is needed to gain an understanding of the complex interactions and problems that occur. From this, it should be possible to see if there is an area to which support can be provided. Many of the studies of ERP implementations [38, 57, 74, 86, 89] point to user engagement and understanding their requirements as being important factors and the extent to which this affects a project is interesting. User support is often cited as one of the main critical success factors for ERP implementation and how this can be gained and maintained needs to be considered.

3.2 Research method

While ERP implementation in higher education institutions is often described as difficult, expensive and risky[142, 143], a continued belief in the benefits they can provide has seen their use continue to grow[144]. A two year ethnographic study was carried out at Edinburgh University, who were introducing a new student administration system. The university has approximately twenty four thousand students and two thousand seven hundred staff. The geographical size of the university and the size and time scale of the project made it suitable for study as it allowed data to be gathered from a wide variety of sources across the university and for the project as a whole to be studied. The university is a complex organisation with users distributed across the city and the scale of change and implementation being planned should demonstrate the variety of processes involved and the challenges that are faced.

An ethnographic study was chosen in an attempt to explicate the situated character of work as it is understood and accomplished by those who carry it out[86]. It allowed the small things people routinely do which may not be mentioned in interviews to be observed. The study was a joint study carried out with another fieldworker allowing a larger amount of data to be collected. While it is recognised that a wide variety of ethnographic methods exist, no one method was used in this study. Instead it was decided to use the general principal and ideas of ethnography in order to carry out the study and still gain valuable insights. An observational study was deemed most appropriate so as to cause minimal disturbance to the project and allow work to carry on as normal.

Meetings were held with the Project Director, Deputy Director and Change and Communications Manager at regular intervals to discuss the progress of the project and the study. As permission for the initial study was given as a trial, reports were produced at various intervals and were presented to the Project Board for approval of the continuation of the study.

During the fieldwork a variety of meetings were observed. These included the monthly Project Board meetings in which issues related to the future of the project were discussed and decisions made. Observations of meetings with user representatives and presentations to the user community were also observed and a postgraduate supervisor training session attended. After the initial period of observations an understanding of the project developed and a more focussed approach was taken, selecting meetings to observe that would help progress with the research objectives. While access was granted to the majority of meetings, those with heads of the university and of a financial nature were not attended. Although valuable information may have been gathered from these meetings a wide variety of data from different sources was still collected.

The primary method of data collection was the taking of detailed notes during the observations on any discussions and activities that were undertaken for later analysis. Additional supporting documents were collected including papers from the Project Board meetings, project plans and business requirements documents (BRDs). Online material such as FAQs, online training and user guides were also analysed. To help

develop a feeling of trust, it was decided that recording of meetings would not be carried out. This decision was taken partially due to the requirement for the confidentiality of some of the data. Field notes provided a visual, more tangible representation of what was being recorded which could be shown to team members at their request. They also provided a way to clearly show things being removed from the records if necessary.

A series of semi-structured interviews and group discussions were also carried out to supplement the observations. These involved speaking to people from various academic and administrative departments within the university who had been and would be affected to different levels by the project, enabling a more complete picture to be developed. Wood advocates the benefits of semi-structured interviews in enabling the user to talk freely showing what is important to them whilst being kept on topic and guided by the interviewer[145]. In certain departments it was decided that small group discussions would be most appropriate for those who worked together to make them to feel more relaxed and comfortable in discussing any issues they have had. Handwritten notes were also taken during these discussions. For the one on one interviews it was decided to leave note taking to after to allow full attention to be given to the interviewee, helping them feel comfortable and allowing a rapport to be built. In order to minimise the information lost in doing this the notes were made immediately after the meeting took place.

The group discussions and interviews helped verify the findings of the observations and the understanding that had been developed. Getting information from a variety of sources also helped corroborate the findings. Combining the observational data collected with that of another fieldworker provided another source of verification and is one of the methods LeCompete suggests to help maintain the internal reliability of data collected in an ethnographic study[50].

3.3 GEOMETER

The GEOMETER project was established in 2004 to bring about business process change through the introduction of a new complete lifecycle student administration system at Edinburgh University. The system was to be deployed across the whole

university and take students all the way from their initial application through to graduation.

While it is tempting to see universities as different from other organisations [24] they face many problems that are common to modern organisations, including the problems of coordinating resources, controlling costs, of stimulating and facilitating enterprise among staff, etc. [146], therefore the issues they face in implementing a new system should be applicable to organisations in a variety of different sectors. Studying the project should therefore provide valuable insights into the issues faced in large-scale deployment projects.

The university had recently undergone some restructuring and now operated a college based structure with three colleges: Humanities and Social Sciences, Science and Engineering and Medicine and Veterinary Science, each of which were sub divided into schools. While two of the colleges operated a centralised administration system in the College of Science and Engineering it was still distributed throughout the constituent schools. As the change to a college-based structure was relatively recent, the work practices within the schools were quite disparate.

One of the main drivers behind the project was the need to improve the efficiency of the university. Many tasks, such as making an offer to a postgraduate applicant took a long time and they worried that the applicant may decide to go elsewhere rather than risk not having a place. This can result in the university losing many of its applicants, something they want to avoid, especially with respect to overseas postgraduates. The GEOMETER project aimed to eliminate many of these inefficiencies, increasing the speed of operations.

Another of the aims of the project was to increase student satisfaction. Whilst the university is regularly rated highly in league tables its student satisfaction rating is often a lot lower than that of its competitors. The new system is seen as a way to address this issue by providing students with a higher-quality internet-based experience. Many of the current systems that are in use are also out-of-date and there is a lack of documentation and expertise that is necessary for maintenance and upgrading.

When talking about the project at its launch the Principal and Vice Chancellor, emphasised the project's main aims:

'This project will enable us to deliver a world-class service to our students and prospective students, facilitating and supporting every stage of their academic life at the University with leading edge technology. Behind the scenes it will enhance our business, by increasing the speed of our decision-making and operations.'

As the project involved creating such a large system, a phased approach was taken, with different modules being deployed over a time scale of several years. The first phase of the project involved a local systems audit and analysis of the existing business processes to discover how work was currently done. This was carried out in consultation with both students and senior figures within the university. During this initial study the team discovered that many of the business processes were not defined and that practices across the different colleges varied considerably. They also found a large amount of duplication of data in the local systems that people were using. The use of a large number of local systems is not uncommon in large organisations, with many relying on computer systems that have been developed 'in house', have grown over time in an ad-hoc manner and are maintained and developed by dedicated staff as required [89].

In phase two of the project, the university undertook a detailed procurement process after deciding to purchase an 'off the shelf' package. By buying a package they hoped to gain the benefits associated with such packages including a high-quality, tried and tested solution with the flexibility to configure it to meet their needs[24]. A detailed analysis of the various products on the market was undertaken including visits to other universities that had implemented them. Many university staff were involved in this assessment process to try and ensure they chose a package that would meet their needs. A detailed requirements specification can help in selecting an ERP system that can meet the organisation's requirements[5].

As a result of the procurement process the university decided to purchase the SITS: Vision package from Tribal, a well-known package that is in use in over 65% of institutions in the UK higher education sector[147]. However, although many of the

package modules are in use at other universities, GEOMETER would be the first to fully implement the software as a web-based system. While the goal of systems like this is to integrate all business processes, Russo et al. found that only 20% of the organisations they surveyed had all the modules installed [148]. In choosing to fully implement the package they also chose to highly configure it to meet their needs, making it entirely web-based instead of using dedicated client software as it was initially designed. Many software vendors are now being forced to move towards a web based architecture to deliver the e-business capabilities the market now requires [56] and this is something Tribal admit they have been slow to do. While a high degree of tailoring with ERP packages is often discouraged [1] a strong working relationship with Tribal gave Edinburgh the confidence to go ahead. Like in the development of the Campus Management module at Big Civic [91], Edinburgh felt that as one of Tribal's largest customers they could influence the future direction of the package.

It is generally accepted that successful ERP implementation must be managed as a program of wide-ranging organisational change initiatives rather than as a software installation effort [58]. With the aims of the project in mind this is something Edinburgh were keen to emphasise regularly. To them, the software was simply enabling the changes that needed to take place. They felt that the vision of the project could not be achieved with the software alone and that while the software could be configured to accommodate most of the current processes, this would be missing an opportunity to improve the university and the way it operates.

The project had a team of over 40 full time staff and also included the involvement of various other members of the university in different roles. Members of the project team were recruited both internally and externally to gain the necessary skills. By creating quite senior roles in the form of functional experts and specialists they hoped to attract lots of applications. The initial round of recruitment aimed to fill the positions internally within the university but this was not successful so a second round for external applicants was carried out.

3.3.1 Project structure

The project team was initially split into three streams, with stream one dealing with applications, admissions and enquiries; stream two dealing with areas related to courses and stream three the more technical areas including interfaces, management information and data migration. As the project progressed this structure became more flexible with two streams being merged and people moving more freely between them. As the project was being viewed as a change project, a separate Change and Communications Team was established to help manage the process. A small Testing Team was also created to test all the documentation and software. The structure of the project team is shown in Figure 1. This shows the hierarchy within the team and the various roles and subgroups that existed. The numbers in brackets show an approximate number of people assigned to each role when the project team was at its largest, however these numbers changed throughout the project. Where no number is given, the role was held by one person.

In addition to the groups shown in the diagram, the project was managed by the Project Board, a group of approximately 14 people from various senior positions in the university who were responsible for making decisions regarding the direction of the project.

To ensure engagement with the user community the role of Implementation Coordinator (IC) was created and assigned to members of the user community who would act as champions for the project. The Virtual Stakeholder Group was also established as an extended mechanism for communication with the wider community.

To try and manage the risks involved in the project, regular external reviews at key project milestones are undertaken by Valuta Ltd. At each review an assessment was made of the status of the project and recommendations made that should help the project move forward effectively. A large number of people from the user community and project team were involved in the review process and the results were taken very seriously by the Project Board.

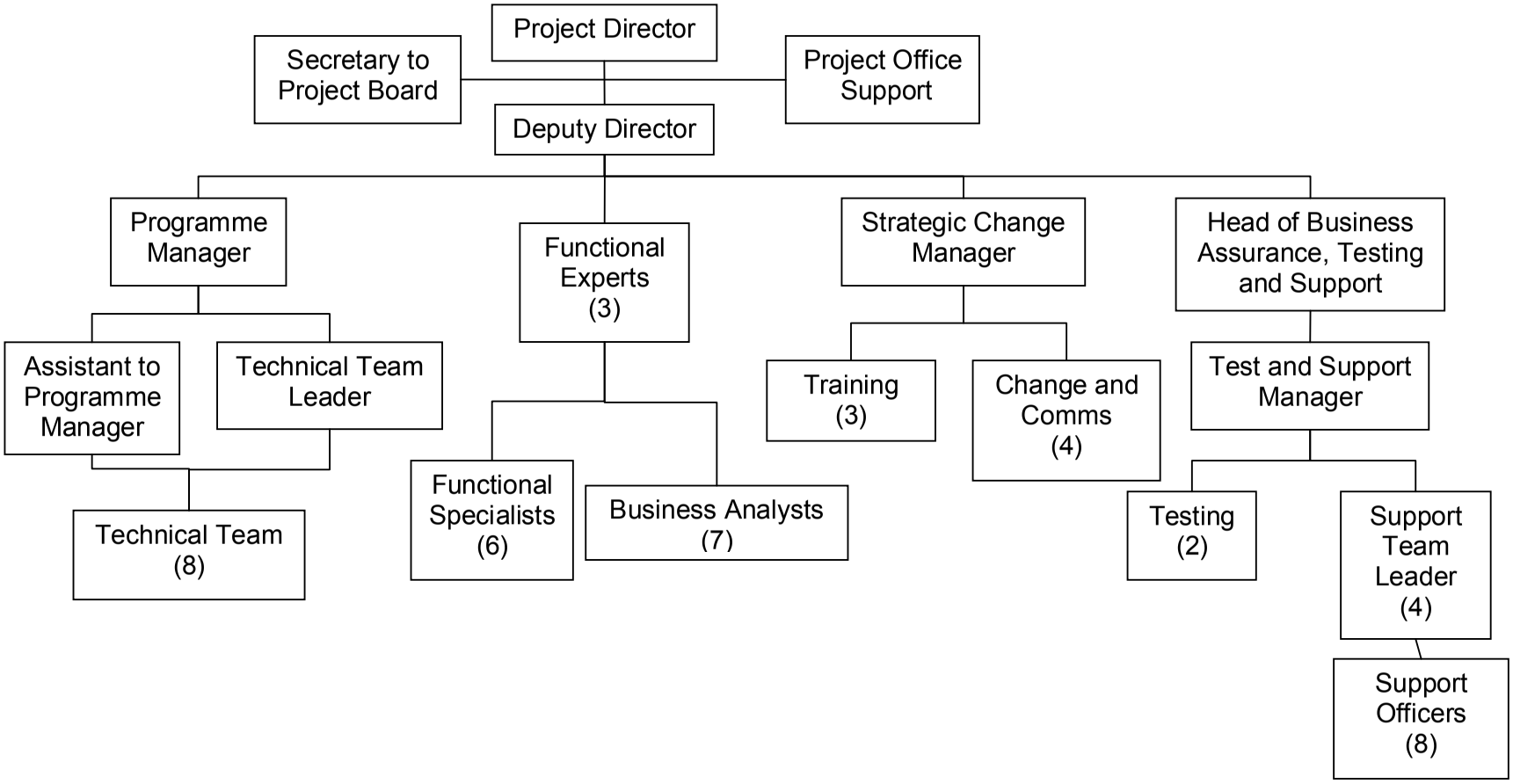

Figure 1 GEOMETER project structure

The project planned a phased approach to implementation, with a series of go-live dates scheduled for appropriate points in the academic calendar. The postgraduate admissions system was due to go-live in December 2007. This time scale made it the most appropriate module of the system to focus the study on, allowing both the introduction and 'bedding in' process to be studied. After studying the project in general to build an understanding of how things were done, a focus on the postgraduate system allowed more detailed data to be collected. By studying the entire process it was hoped that issues and problems that arise could be identified and discussed with the users and team members. It also allowed observations to be made of any attempts to solve the problems and how successful these were.

The postgraduate system was planned to be the second part of the system to go-live. Due to changes in the UCAS admissions system the project had a tight deadline externally imposed on them for their undergraduate admissions system. If they chose not to go-live with the undergraduate system, extra work would have to be done to further develop the existing system to cope with the changes. After going live to meet this deadline many problems were encountered with the system and time had to be spent fixing bugs to ensure that the system was fully operational, that applications weren't lost and that offers were still made. These problems and the lessons learned from them will be discussed in Chapter 4. The problems encountered with the UCAS system had an impact on the rest of the project and caused deadlines to be delayed considerably. Due to these changes in the schedule it was decided that studying the project as a whole and the problems it encountered would be more useful and allow more data to be gathered in the time frame of the study while still looking at the postgraduate system as the next major go-live.

3.3.2 The Postgraduate (PG) system

The postgraduate admissions system was to be one of the most important parts of the overall system. The university currently relied on paper applications and wanted to move to an online application system which they believed students would expect from them. By introducing an online system, they also felt they could increase the turnaround times for decisions being made and become more effective and competitive in the postgraduate recruitment market and this is emphasised in the

business requirements document. The new system would allow applicants to track the progress of their application and remain in contact with the university. In the initial requirements specification the system planned to deal with the recording of all pre-application enquiries allowing this to link in to the application process. Only after a thorough look at what this would entail and after time constraints became tight was this deemed out of the scope of the current project.

To speed up the decision-making process, the university planned to introduce tight turnaround time targets for each part of the process. The times chosen for the targets seemed to have been selected in comparison with those used by other universities in an effort to make them more competitive. The targets would only be achievable with the new system and the new business processes that were to be introduced with it. The team were aware that the targets would be unpopular and when initially presented to the prospective system users their first reaction was that they were not possible. Although against the targets that were presented, users were not completely against having targets of some form. One user summed up the feelings saying:

'The problem of an ambitious target is it may become meaningless if they feel they can't achieve it and feel it's not realistic. You need to challenge people but not be too challenging.'

Although the targets remained competitive they were revised in light of peoples' reactions. Efforts were also made to make it clear that they were not expected to achieve the targets in the first months of the system going live and that the students themselves would not be made aware of them, as these initial misunderstandings were at the root of many peoples' concerns.

The decision to predominantly accept scanned documents rather than originals was also extremely unpopular when initially announced, with many fearing it would make fraud detection more difficult, even though 40% of Russell Group universities were already doing this. There was also a feeling that the project was trying to change university policy. Up until the go-live of the PG system, the PG admin forum were discussing this issue and had managed to get it raised for discussion at the university Senate. The team were able to defend the decision with evidence showing it is not the

University's responsibility to detect fraud. However, the influence these users had and their ability to discuss the issue without the team being aware of it was worrying for the Project Director.

Although a lengthy requirements gathering process was undertaken the initial processes presented by the team did not show a clear understanding of what was required. It was felt by many users that they had completely misunderstood why certain practices where in place and how necessary they were. Minimising misunderstandings is important in ERP projects as they can introduce extra risks to success[149]. In light of these discussions the processes were then revised to include additional paths allowing them to accommodate the differences between selecting and recruiting departments. These processes still required a large amount of change in the way people worked, with new roles and responsibilities being assigned to them.

3.3.3 Current project status

A series of go-live dates were initially planned for appropriate times throughout the academic year, starting with the UCAS/GTTR go-live in October 2007. While this part of the system went live as planned, problems encountered caused the rest of the project to be rescheduled to try to avoid similar issues with future go-lives. These problems and their possible causes are described in Chapter 4. The next major part of the system scheduled to go-live was the postgraduate system. This was due to go-live in December 2007, an ambitious target. However, this date was postponed several times and the postgraduate system eventually went live in October 2008, almost a year later than planned. Table 1 shows the dates each part of the system was initially scheduled to go-live, and the new dates the go-lives were postponed to. This shows the large amount of slippage encountered in the project and the initial reduction in the project scope. It further demonstrates how the academic year effected when the go-live dates could be rescheduled to, with a small amount of slippage often causing them to be delayed for a whole year. Prior to the postgraduate go-live, the only new part of the system to be implemented and go-live was the UCAS confirmation and clearing functions in August 2008, as these were required to complete the application process.

Table 1 GEOMETER go-live dates

Project part	Original date	Current completion date
UCAS/GTTR admissions	October 2007	October 2007 (live)
UCAS confirmation and clearing	Unknown	August 2008 (live)
PG admissions and fees	December 2007	October 2008 (live)
Enquiries	December 2007	Out of Scope
Funds and scholarships	December 2007	Out of Scope
PCAM/CCAM	December 2007	November 2009
Student admin	Autumn 2008	August 2010
Assessment	Autumn 2008	June 2010
Online course enrolment	July 2008	August 2010
Visiting students admissions	Jan 2008	April 2009
Graduation management	June 2009	November 2010
Authentication and integration	March 2008	October 2008 (live)

The unhappiness with the UCAS system remained a problem and when the postgraduate system went live, users were equally disappointed. In order to deal with the large number of issues, a Change and Prioritisation Group was established in February 2009. This group included many members of the user community and hoped to make the system more usable.

The project had encountered serious performance problems with the system. In order to address this issue and ensure it did not affect future go-lives, the project requested extra funding to improve the infrastructure. While some extra funding was granted, the large number of issues that had been encountered throughout the project caused the Principal to take control and disband the Project Board in March 2009, demanding tighter constraints on resources. In place of the Project Board, a Strategy and Quality Assurance Group was established which, reports directly to the Principal and a User Group was formed to ensure their concerns are addressed.

In order to minimise further costs to the university, the scope of the project was vastly reduced and the rescheduled go-live dates shown in Table 1 abandoned. It was instead decided to focus on making the undergraduate and postgraduate systems more fit for purpose and make sure the other university systems could get information from them successfully. Some other small areas of student administration remained in

scope as it was no longer possible to maintain the current system. This vast reduction in scope has resulted in large number of redundancies, affecting the motivation of those remaining. In November 2009 the Project Director left the project, with no new appointment being made and her role being taken on by several other key project figures. It is clear that with the reduced scope of the project it will only achieve a tiny part of what was planned. The university can only hope that the users will be happier with the parts of the system that have been delivered once improvements have been made, and try to engage with the new processes that have been put in place. The key dates in the project are shown on the timeline in Figure 2.

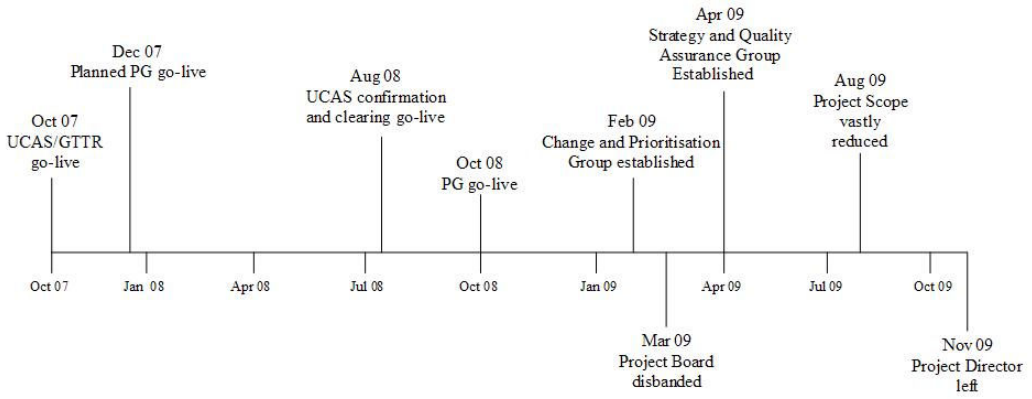

Figure 2 GEOMETER Project timeline

Chapter 4 GEOMETER Problems

After a large amount of data had been collected, information from the various sources had to be brought together for analysis. The data that comprises the ethnographic record is usually lengthy and can often seem messy and confusing at first glance so a classification scheme is often used to help interpret the data [40]. The Atlas.ti software was used to highlight key sections of field data, assigning them associated keywords. This helped organise the information and made it easy to group themes together. The supporting documents collected during the study were used in combination with this information to help determine which were the key themes.

As with many large scale software projects, the GEOMETER project has encountered problems resulting in deadlines being missed and costs increasing. This is, in part, due to commonly faced issues such as underestimating the time to implement the system, the complexity of the installation [148] and the scale of the BPR and customisation tasks involved [56]. As more deadlines were postponed, the deliverables in the project plan become more compacted in the available time. The project has now been extended for a further 12 months to allow them to address this, further postponing many deadlines. This extra time however will also allow them to enhance the parts of the system that are currently live. Extensive re-planning is now being undertaken. The rising costs and the requirement for large amounts of extra funding to complete the project has meant the university is now demanding more stringent management of resources. Spending now has to be more heavily justified and, until they are satisfied with the financial management of the project, no further recruitment of staff will be made.

Many of the issues encountered were related to management of the design process such as staffing and meeting scheduling, however the focus of this study is not to describe each individual factor but to look for the broader themes that contributed to the projects problems.

Whilst this is the case, one management issue has had a considerable impact on the project and how it is perceived by the wider community. The project has suffered

from an ever expanding team with a high staff turnover. When a member of staff leaves they unfortunately take with them their knowledge of the project and the relationships they have built with groups of users. A new member of staff coming to the project then has to learn everything that has happened so far before they can start work. In a project on this scale, that is a considerable amount of experience of the past presentations to users, go-lives etc. which can be helpful in sensitising them to how future decisions and implementations will be received. The high loss of staff also reflects badly on the project in the eyes of the users, with them questioning why they are leaving and makes it hard for them to know who is responsible for what. As one university staff member said:

'You have to wonder why so many people keep leaving. It makes you think something must be really wrong.'

As the different modules of the project have progressed and reached different stages of development many other issues have been encountered that have had an impact on the project. These have often been recognised by the project team themselves and lessons-learned exercises have been undertaken after each go-live to see how they can improve. The problems encountered during the project will be described below, followed by a discussion of how these issues had an impact on the go-live of the undergraduate and postgraduate parts of the system.

4.1 What out the box really means

Although an off-the-shelf package designed for use in higher education institutions was chosen for implementation at Edinburgh, a lot of configuration was still required for it to meet their specific needs. During the procurement phase, research was done within the university to find out what the current business processes were and to discover any complex requirements, for example the scaling of exam results, that the system should handle. A large number of potential system users were involved in this requirements gathering process. The potential suppliers were asked to demonstrate how their system would meet these requirements. Tribal, the chosen supplier was the only company to adequately demonstrate a match with the requirements. Several members of the user community were however sceptical about the reasons for this

choice and felt that it was chosen because the university already had some undergraduate software from them. Those who were involved in the procurement process were asked which piece of software they felt was the best. Some believe that their views were ignored and that Tribal was always going to be chosen.

By choosing a software system that was already in use in other universities Edinburgh thought they were making a safe choice. While Tribal had only recently taken over SITS Ltd, they were very experienced in the education sector with other software packages of their own. As the company's largest customer, Edinburgh also felt that extra effort would be made to make sure the system was a success to attract more high profile customers. Although other universities use the software, Edinburgh would be the first to implement it on such a large scale and at the same time they wanted a web-based system. This required extra configuration as the majority of the system is traditionally operated using dedicated client software. Whilst being a large customer gave the university some influence over Tribal and the future development of the software, they were also very much a 'guinea pig' as one user described it.

As the project began it became clear that the size and structure of the university did not match that preferred by the system. The University of Edinburgh has its administration distributed across its 3 colleges. However, SITS is better suited to institutions where the administration is centralised. Problems where the system did not really meet the University's needs became more common and these incompatibilities had to be reconciled through further customisation, a view often taken by the vendors of COTS systems [13]. There are, however, areas such as assessment, where it is now clear that the system will not be able to do what the university requires. In these areas, a lot of extra work was required to generate processes that bring together university practices and that are implementable in the system. This required a large number of meetings and an extra committee was set up to come to the important decisions regarding the assessment process. Due to the large number of changes that need to be made to university practices around assessment there was a fear held by some that, due to time pressures, decisions would be made that they would later discover weren't the right ones.

Edinburgh also started to try and influence Tribal to make changes to the software by trying to convince them that other universities would also benefit from the features. When issues regarding the software's inability to meet the universities needs were discussed, comparisons were often made with other institutions using the software to try and see why they were not experiencing the same problems. It became clear however that many of the institutions using SITS were only using certain modules, often in isolation, and on a much smaller scale than planned at Edinburgh. They had also made fewer changes to these modules, only using those that were appropriate for their specific needs. Differences in the Scottish and English education systems in areas such as funding also added unexpected complexity.

While one of the benefits of ERP systems is that the supplier is constantly updating them in light of new requirements [91] the release of updates during system development often caused an extra level of complexity. The new versions of the software always had to be considered to ensure compatibility and time had to be allocated to installing and testing the upgrades. The timing of the install had to be chosen very carefully. If any problems were encountered they could impact the rest of the project. Certain areas of development work were also carried out by Tribal as required and delays in the delivery of these and issues with what was delivered also had an impact on the work that could be done.

The effort required to configure the system to meet even the basic requirements was vastly underestimated and it is now recognised by everyone involved that they were naïve in their expectations. This experience is being learnt from and a better idea of the effort required to web-enable the software is developing. There is, however, a rather unhelpful culture of blame in the university and this often comes to light when these issues are discussed. It became more common to question if the correct decision was made and if the system they chose was the right one. As the amount of slippage increased and more difficulties were encountered many people, both within the project and in the user community, started to believe that the university was over-sold the software and that they bought into what was simply a 'good sales pitch'. When they are discussing the matter more seriously, however, there still seems to be a belief that they would have encountered the same problems and possibly more with any of the other systems on the market.

4.2 Planning

Whilst it was recognised from the start that extensive planning was necessary, this was generally at a high level, with a series of 'go-live' dates being scheduled for appropriate times in the academic year. No complete and detailed plan of the project as a whole seemed to be generated until requested by the Project Board, after the problems encountered during the first go-live. This plan has now become a much used document and is recognised as extremely useful by team members. It allows them to see what other tasks are being worked on in different areas and where dependencies lie. Having a detailed project plan has been recognised my many researchers as essential to project success[2, 150].

Due to the nature of the system and the university academic cycle, hitting deadlines was essential. If a deadline was missed it could mean postponing that part of the system for a whole year as it would not possible to go-live at a time when that part of the system would be experiencing a high level of use. Scheduling in time for user acceptance testing and training also then becomes difficult as university vacations are often the only times when staff are not busy with their work and some are reluctant to come in during the vacation. Although the project had a training room in their office space, requiring staff to travel here from another campus is not always desirable and getting alternative space to hold testing and training sessions in a more suitable location can also be difficult during term time.

After the problems encountered with the first go-live, the results of the first Valuta review recommended a clear separation of configuration, testing and training. It then became more common to have detailed plans with time allocated to each phase, including built-in contingencies. However in some areas producing these still seemed to be given low priority. It has been recognised, as the project has progressed, that the ability to estimate the time required for different tasks comes with experience [151, 152]but as each area of the project is different the applicability of this experience may be limited. The time being allocated to areas such as testing still seemed to be limited, requiring the staff to work extra long hours to meet their deadlines. Getting Tribal involved in the planning stages may have helped with the accuracy of estimates due to their knowledge of the system and the configuration effort required.

While a risk register was used to manage the risks in the project and regularly presented to the Project Board, this document is lengthy and unintuitive. It was hard to spot those risks that posed a serious threat to project delivery dates. The February 2008 Valuta report recommended changing this strategy and emphasised the importance of having a clear plan for the project, which could be shared across the university, allowing everyone to plan the resources required to put the new processes in place and go-live with the new system. It was also suggested that this plan be used to help change the format of their risk reporting to exception reporting, highlighting deviations from the plan, mission critical risks and any actions required by the Board. The new risk reporting format used colour coded diagrams and tables to make things a lot clearer.

Plans need to be kept up to date and changed as a project progresses so they can continue to be a useful resource and help in spotting potential problem areas.

4.3 Communication

Communication is an area that was recognised as being vitally important from the start. A Communication strategy was drawn up and a Change and Communications Team established. Several groups were set up, including Implementation Coordinators and the Virtual Stakeholder Group, for communicating news about the project to the wider university community. As the project progressed however it became clear that these strategies weren't working and that communication was an area full of problems. A common misconception was that it was GEOMETER driving the changes that came with the project rather than the institution and this was a message that required high level support to change.

Whilst lots of information was being communicated to the stakeholders at the start, as soon as problems were encountered it seemed to go quiet. This was recognised in the wider university community and many started to wonder if the project was still going ahead. As one said:

'Sometimes it goes quiet for weeks and we don't know what is happening or if we are missing something'

The website initially provided a useful resource for information but, like other channels of communication, this quickly became out-of-date when problems occurred. It is now only really used when people are specifically directed to it. There also seemed to be a common feeling amongst stakeholders that, although they received lots of information prior to these quiet periods, the information was not very user-friendly. Process maps were used in presentations to show how the new processes would work however many found these too abstract and they were open to interpretation. Often users would agree to things but they didn't really understand what they meant.

Communication within the team was also an issue initially, due to the way it was structured. Although splitting the team into streams seemed suitable for getting the work done, there needed to be communication between these streams due to the inter-connected nature of the work. This communication was lacking, with many not having any idea what the others in the project were doing. As the Project Director said:

'They all know about their own bits. We have separate streams but there doesn't seem to be much communication between them'

The layout of the office, with some groups being upstairs and some downstairs also caused problems with respect to communication, with downstairs often feeling isolated from the rest of the team.

4.4 Stakeholder engagement

As mentioned previously, groups were created in an attempt to keep the wider community informed about the project and engage them in the change and development process. Although presentations were made to the stakeholders on new areas, these were generally after something was finalised such as new processes. Other than this, the majority of the engagement was done through the Implementation Coordinators. Their role was to communicate information about the project to their departments and promote the project, whilst preparing users for the changes it would bring. They were also supposed to provide the development team with feedback from

their departments and inform them of issues with the system that they were having. This role however didn't work as well as intended, with many implementation coordinators finding it difficult to find the time to engage fully with the project. They also seemed to struggle when championing the project due to their limited influence. The role of Implementation Coordinator was intended to be allocated to people with a high level of influence in their department. However, this was in some cases delegated to people at a lower level who felt that they lacked the authority to tell people what to do.

Engagement of academics was an area of great concern for the project team. It was recognised that this would be difficult, but crucial to the success of the project[14]. Initial work on the project focused on modules in areas related to student administration, something most academics had limited interest in. Many were happy to *'put their heads in the sand and wait for it to blow over'*. Once talks turned to assessment this changed and many academics wanted to actively engage. What engagement actually meant however, was open to interpretation and some felt they could just provide a wish list of what they wanted and that it would be provided for them. Where the responsibility for engaging academics lies is also a point that was often questioned. Some felt the schools should be responsible rather than GEOMETER itself. In reality a combined effort was necessary to prepare them for change. Although many are reluctant to get involved at the moment, when there is something for them to see and do this might change, as one academic described it:

'They will probably complain but then just get on with it and use it anyway as there is no alternative'.

The go-live of the postgraduate system was to be their first encounter with the software however use of this will be infrequent, even during peak times as it is limited to when they have applications to assess.

During the initial procurement phase engagement with the university community was encouraged and many helped the project in understanding the potential requirements of the system. They also helped the project understand the current work practices of the different university departments. When the processes and system were presented

to the users, however, there was a perception that the changes to their work processes were driven by the project team and that they had not been consulted. These changes were actually a result of the information gathered during the procurement phase but this wasn't made clear to the users. The Valuta review after the undergraduate go-live suggested that this could have been avoided by following the initial requirements gathering phase with a business process reengineering phase in which the processes would have been defined, with the users developing a specification for the software that they agreed with. A similar feeling developed amongst the users when the postgraduate system went live. When presented with the system in a training session, several academics questioned if there were academics present on the Board and if those who take PhD students were even consulted.

Another group of stakeholders with whom engagement appeared to be lacking is the students. Although cited as the primary beneficiary of the system, little attempt was made to get them engaged in the early stages of the project. New applicants to the university would interact with the system throughout their time as a student. The system would store all their details and would be used for almost everything, including enrolling in modules, checking exam results and payment of fees. The university hoped through introducing the system that they would increase their levels of student satisfaction. Any engagement with students however was done by proxy, a small group and the concerns of students were prioritised dependent on how they would affect the university application rates and funding. The needs of overseas students for example were given high priority as they pay high fees to the university; however 'home' undergraduate students were given a lower priority as the university was oversubscribed by them. Little feedback was also gathered on applicants' opinions of the undergraduate system after go-live. However, this has only been in operation a short time and plans are in place to do this more extensively in the future. The main assessment of the system's success focused on comparison of application numbers rather than determining if the system had succeeded in its aim of being student friendly. After the postgraduate system went live and work was due to begin on student administration it was decided that students needed to get more involved in the project, helping to push the student-centric view. The Project Director commented that it would be interesting to see how the dynamics of the project and stakeholders would change with students involved.

Engagement of stakeholders is an area recognised as being extremely important to the project but also as being very difficult. In this project, the stakeholders are from many different groups and a member of the Board described it well, comparing their composition to having

'Lots of sheep which are easy to herd, some cats which are so so and, in a few colleges, some squirrels which are extremely difficult as they move in 3 dimensions.'

4.5 Managing expectations

One issue directly linked to communication and engagement and very important in this project is the management of expectations. The project was launched very publicly and gave the impression that it would do wonderful things. Due to the over-ambitious nature of the project and the naivety of the team with respect to what would be involved, they raised the expectations of the stakeholders. Users were asked not only what they had and needed, but what they would like if there were no restrictions. Although they were not promised that they would get any of their requests, it encouraged them to raise their expectations. In the early stages when requirements were being derived it was also common for team members to say yes to a large number of the requests that were made. This led to over-complicated requirements being generated, which then had to be simplified, and this resulted in users being dissatisfied with what was produced. As the project team recognised that they were being over-ambitious more effort was put in to managing the message they put out and ensuring people had realistic expectations of the system. Some current users of the system feel that they may have been less disappointed with what they got if they had not had their expectations raised so high.

Another problem when trying to manage peoples' expectations is that many messages are not even coming from the GEOMETER project. It had become common for people to say 'don't worry, GEOMETER will do it' when they had any problems with any of the current systems, even if they had no knowledge about what the project was actually going to deliver. This again raised people's expectations of the system and the team had to do a lot of work to ensure that when each part of the system was delivered, users were not unpleasantly surprised.

When the undergraduate system went live many of the users in the college offices were disappointed because the system did not come close to meeting their expectations in terms of functionality. It also contained a large number of bugs. Some felt that GEOMETER had encouraged them to raise their expectations, but what had been delivered didn't even do what their old system did and it was less user-friendly. They did however, understand the pressures and problems inherent when introducing a new system and were sympathetic towards this, but they felt that this time, the system failed to deliver what was required. This negative feeling then had an impact on the prospective users of the postgraduate system who heard about the problems and lowered their expectations accordingly. When that part of the system went live it still failed to meet these lowered expectations in terms of how user friendly the interface was and the speed in which tasks could be completed. Many people who had never seen anything prior to the training session were often shocked with what they were presented with, as they still expected something more functional and easier to use.

The expectations of the development team also needed to change. Initially they were working as perfectionists and wanted to provide everything for everyone. As the Project Director described it:

'They were behaving like world class service to students could only be delivered through world class software; they were trying to create a Rolls Royce'.

This problem of 'creeping elegance' and excessive professionalism has been seen in engineers in many development projects[68]. After the experience of the first go-live however this seemed to change and a more realistic approach appeared to be being taken. It is now more common when consulting with users, for the team to say no to requests that would over-complicate the system. The Change and Communications Team tried to ensure the user community understood what they were getting and what was feasible so they were not disappointed when it arrived, and new strategies for managing expectations for future areas were developed.

4.6 A need for change

Although the project was introducing a new computer system it was also being managed as a change project. A key feature of this was that processes would be standardised and people would have to change the way they work. As with most projects that involve change, some were resistant to this and quite defensive of the dependable ways of working they had developed. Hawking et al. however emphasise that ERP projects are dependent on change to achieve success[153]. As in Pollock's study of 'Big Civic' [24], the project made visible a wide variety of local practices. It showed how disparate the different processes were across the university and finding out exactly how things were done was often difficult as some processes were 'shrouded in mystery'[89]. The team found some of the practices that were in place to be shocking and often unfair to the students. The process also made clear where university regulations were not being met. One of the benefits Academic Affairs felt they would gain from the project is that by standardising processes it would help them enforce regulations that were often being broken.

The readiness for change, like the new processes, varied between schools and colleges and thus different strategies were required to prepare for them[154]. Wastell et al. suggest that clearly defining the new roles created and gaining different viewpoints of the stakeholders throughout the redesign process can reduce the fear of change and make it appear more appealing [64]. This is one of the strategies being used by GEOMETER with varying levels of success.

The negative views of GEOMETER after the problems of the first go-live have led the project to be blamed for everything that has gone wrong with admissions. In reality, many factors had an impact on the admissions process. However, the easy option is place the blame on GEOMETER. The team began to worry that people would be more resistant to the system as it started to be seen as a joke amongst some stakeholders. Some are also concerned that decisions are made about how they should work by the Project Board when they don't really have the relevant expertise. One manager explained the attitude of users to change saying:

'It isn't always that people aren't willing to change but that they need to change to something better, without lots of bugs and understand the reasons for the change.'

Another issue related to communication and preparation for change is that people struggled to envisage how they would work differently when they couldn't see the software in front of them. This then resulted in them being surprised when they were eventually presented with it and able to step through the processes. As more of the system has been built, attempts have been made to show users these modules to give them a better idea of what to expect. Response to these demonstrations has been positive. Visual representations of some form which can help the user see how the processes will work in practice have long been recognised as useful[34] and in approaches such as Participatory Design a variety of techniques have been developed and used. Some of these such as mock-ups could have been used to help communicate the new processes to users, demonstrating what is different and why, before any of the software was ready. Having a clearer separation between the configuration, testing and training stages also made it possible for users to actually see how the whole module would work, rather than isolated parts which they got with the undergraduate admissions system.

Once the Change Team was established the project had the resources necessary to ensure the change process was managed effectively. One of the concerns was that if they did not continue to support the users then they would revert back to their old methods of working. Although there is no evidence to show this is happening, work-arounds were put in place to ensure work could continue while there were bugs in the system and some continue to be used now the bugs have been fixed. Some work arounds were also created by users to allow current work practices to continue whilst using the new system, but it is unclear whether these will be necessary and continue to be used in the future. Those resistant to the changes introduced so far are in a minority with many just being apathetic towards the project. After the go-live of the postgraduate system there was however more heated discussion and negative feedback from the colleges at the Project Board meeting and it remains to be seen how this will be managed and affect people's feelings towards future go-lives. The extension of the project and the plans to get users involved in revisiting existing parts of the system may help to overcome these negative feelings but some may feel it is a case of too little too late.

4.7 Performance

Prior to the first go-live several discussions were held regarding the load capabilities of the university infrastructure. Understanding the issues related to load is complex and estimating and testing can be difficult. Prior to go-live the GEOMETER team were aware that there may be performance issues and this was the only potential 'showstopper' for go-live. Major performance issues were encountered when the system went live for UCAS admissions, with small problems accumulating and making tasks laborious. It was unclear if these issues were due to small bugs in the system or a larger infrastructure problem. After issuing several hot fixes in an attempt to solve the performance issues extra consultants were brought in from Tribal to help. They were 'candidly surprised' at the performance problems and dedicated developers to trying to find the root cause. Although significant improvements were made by changing areas such as the querying of the database, making screens more slim line and looking at exactly how the processes had been implemented, the performance problems remain a worry. There was fear that the performance will be even worse when more functionality goes live and in depth load testing will be carried out at each stage. One consultant said that is was *'unfortunate that they were using the worst part of the project first for the web'*, suggesting that other areas would have less issues but this did little to reassure them. When future developments are being made to the system, care is taken to consider the possible performance implications as it is clear that a web interface will never be as fast as using the system in client server mode. There is now a recognition that it may be necessary to deploy the client version of the software in certain areas, however this could only be in isolated small functional groups of users.

Work has now been done to ensure the project infrastructure is able to cope with the predicted peak load of September 2009 and extra funding has been requested for this. The system is currently running with an average of one small failure a week and has experienced two periods of lengthy unexpected downtime. It's availability between October 2008 and January 2009 was falling short of the 99.9% target, at only 98.6%. Extra load testing was undertaken using the existing process in an attempt to see how the system behaved under extreme loads, beyond those expected at the peak time. External consultants from Sun helped ensure this was done effectively. Performance

targets for the retrieval of data were set as acceptance criteria for the go-live of any future updates to the system.

4.8 The undergraduate go-live

With UCAS changing the way its application process worked, the project had to work to a very tight externally-imposed deadline to get the undergraduate admissions system ready. The project felt that this was achievable as this was an area of the system that did not require a large amount of business process change. Due to the tight deadline however, it was necessary for certain steps in the project methodology to be missed, including the production of some design documentation. In the lessons learned exercise held after go-live, it was recognised that this was a mistake and that in the future the full methodology should be followed. At the time of going live the team were aware of minor bugs in the system but only the problems with performance were considered critical.

Due to the steep learning curve for the technical staff in configuring the software, testing was completed late with almost no user acceptance testing being carried out. To ensure users had training in the system prior to go-live, this was interleaved with the testing. In a Valuta review of the go-live this was seen as a big mistake. Users complained that, even in training, they didn't get to see the whole system and when they questioned why things were missing, trainers were unable to answer them. In some training sessions, they were only shown parts of processes as the rest of the system had not been completed. In future go-lives, it was decided that if testing and training had to be postponed then so would the go-live rather than overlap the processes.

When the system went live in October 2007 it became clear that there were a large number of bugs in its configuration that prevented users from completing their work. A decision was made by the project management team to divert resource from other areas to work on fixing the bugs in the system. Prior to this, the university was 40% behind in the admissions cycle compared to the same period the previous year with respect to the number of applications processed and offers made. The work on fixing bugs reduced this to 10%. By the end of February 2008, all critical and high priority

issues had been addressed and the number being identified was significantly reduced allowing the team to enter a more stable support stage. Although extra time was dedicated to bug fixing, it was still common for some bugs to take weeks to fix, leaving the users not knowing what was happening and worried they would not be able to meet their deadlines.

While the changes in the UCAS application process meant that fewer applications were expected, the numbers received were much lower than expected and there was a fear in some colleges that this was due to the applicants experiencing problems with the system. Due to the performance issues, it was often taking too long for a user to apply and it was common for problems to be experienced when they attempted to log in to complete the process.

Staff in the admissions offices were also experiencing problems logging in and being affected by the poor performance. While this slowed down their work, the process was made harder as they had to learn how to use the system as they worked. As they had little training it was sometimes unclear if problems they experienced were due to bugs in the system or because they were doing something wrong. Even with most of the bugs fixed the system didn't do what the previous system did and many complained that it was clunky and unintuitive. One user complained:

'I have to go through lots of screens to do a simple job that could have been done on one and this is made worse as performance is still a big issue.'

It seems clear that by rushing to meet the deadline UCAS imposed the system was delivered before it was ready. It would appear that they failed to consider the full impact of going live with a sub-standard system not only on the project in terms of users support but also on the university with respect to undergraduate applications. Most staff who encountered the system would agree that it would have been better if they had taken more time to ensure it was ready. While extra resource may have been required to configure the existing system to cope with the UCAS changes this may have been a safer option. A contingency should also have been put in place to allow for failure to meet the deadline and deliver the system, that would have allowed them to still process the applications.

4.9 The postgraduate go-live

As the postgraduate admissions system was seen as one of the key areas of the project and it was to reuse some of the undergraduate system configuration, the team was keen not to repeat the same problems. Extra resource was allocated to getting it completely ready for go-live with it being given priority over all other work being undertaken by the project. The system finally went live in October 2008, almost a year late, at a time when the application rate would be low to allow any problems to be removed before it hit peak usage. While the go-live itself appeared more successful than that of the undergraduate system it became clear there were still issues.

There was a high level of concern regarding the usability of the software and infrequent users were experiencing large amounts of frustration with the system. This was a point discussed extensively during one Project Board meeting due to the high number of complaints coming from the colleges. The response time of the system due to the ongoing performance issues was adding to user frustrations, making the processes even more time consuming. One user commented that, as with the undergraduate system, it was slow and clunky with small tasks being time consuming and requiring lots of flicking between different screens. The Principal however had visited several of the schools and despite these issues he was pleased to report that they continued to engage with the system to make it work.

Many of the issues related to usability may appear small, such as inconsistent use of terminology and excessive use of acronyms, but have a big impact on the users. Some of the usability issues seem basic points that should have been considered during the design process and many users were quick to point this out. Staff are required to re-enter details that were provided in the application form in order to complete some tasks and sensible defaults such as supervisor name are often not provided. While the interface is problematic, it is making the new processes appear less intuitive and workable than they actually are. Users are recognising that the processes could be made to work if the system was improved but it is often hard to see past the software and the long ways it makes them do things.

Issues were also being experienced by applicants who were having difficulties uploading documents. This was in part a usability issue and also due to a bug in the system. Staff were then having difficulty locating the documents once the application has been submitted. Both of these issues were being worked on by the team, with hot fixes regularly being released. Some applicants were also experiencing problems when they apply with a third party helper such as an international agent. This is a complex issue which the team were aware of and further discussions are necessary to find a way to resolve it.

After the go-live the support desk was under significant pressure due to the high number of calls from both staff and applicants. The length of time to respond to calls caused even more frustration to the users. Many of the issues coming from staff were related to changes to programme information which they will be able to do themselves after the programme creation, approval and maintenance (PCAM) go-live. There were also issues with the offer library, a database storing all possible offers, which has continued to be a problem since the undergraduate go-live. The ability of the support desk to cope with the increasing number of calls was a continuing concern. Due to the increased concern about the financial state of the project, approval was not granted to replace the support team leader and this has also had a small impact on the functioning of the team.

The length of time applicants had to wait for a response to a support call, combined with the performance issues and the unintuitive nature of the interface led to concerns that applicants were abandoning their application rather than waiting to complete it. Shortly after the go-live, figures suggested that in some schools the number of postgraduate research (PGR) applications was only 60% of previous years. However, there was no evidence to suggest that this was due to the new system and suggestions were made that the current economic climate could have affected the number of overseas applicants. After the system had been in use for several months, the figures suggested that there was an increase in the number of applicants. However, the number of offers being made was failing to keep up with this increase. Comparative data was only available for one of the three colleges so it is hard to say how the university as a whole was coping. Of those applications that were received, schools were reporting that they were more complete than previously, which made the job of

administrative staff processing the application easier. The offer making process however still took longer, but it was unclear if this was due to problems in the system or the new processes or if it was due to user's unfamiliarity with them. If it is unfamiliarity, then a speed up in operations should be observable as they become more experienced in using the system.

4.10 Conclusions

Academics, have a great deal of autonomy in their work. Universities also exhibit characteristics of a 'professional bureaucracy', where it is the professionals that drive the organisation's performance and are more autonomous in there work [74]. Universities are also accountable in the work they do and required to justify the decisions they make whilst being customer focused. The issues encountered at the University of Edinburgh are similar to those seen in previous studies of attempts to introduce new systems and change processes. Many of the issues have focused around social issues and support Berg's view that problems are generally due to the workers blocking the system or the system failing to support the work that really goes on [155]. Although many would like to blame the selection of the system for it being more complex than anticipated, placing blame is not helpful. As one university staff members said:

'We work in a blame culture in that everyone wants someone to blame, which I don't find particularly helpful. They were oversold. I feel Tribal probably promised more than they could deliver but they other companies may have been the same.'

When the university planned to introduce the new system it stated increasing student satisfaction as one of their main aims. It is unclear if, through simply providing an online system, this will be achieved, with a wider variety of factors contributing more to this rating. While they also stated increasing the efficiency of their operations as one of the aims of the project the real motivations behind this may have been related more to standardising processes and ensuring everyone was working to the university regulations. When the new system was introduced at Ivy [57] the aim was to regain centralised control and it is possible that this was another agenda of the university although possibly not the project team. It is not clear yet how many of the project's

objectives will be achieved, but with the reduced scope of the project it is likely to be few.

While many problems have been encountered and the project has not gone smoothly it is important to remember a lot was achieved with the undergraduate and postgraduate systems. A project that is focussed on introducing change is always likely to incur some level of resistance from users and it is how this is managed that is important. Most of the issues described have their root in communication. The communications problems encountered will be examined in more detail in the following chapter, looking at the strategies being used and their relative merits and problems.

Chapter 5 Communication

In a project on the scale of GEOMETER, affecting the entire organisation, there are a large and varied number of stakeholders involved, each needing to be kept informed. The different stakeholder groups include academics, administrative staff and students, each with different needs and requiring different strategies for communicating with them. In an attempt to prepare for this challenge, lessons were taken by the GEOMETER team from a similar project, project Isodore, that had been undertaken at Oxford University. These lessons were incorporated into the Change and Communications strategy which was written with the aim of reducing the emotional impact of the changes the project would introduce and ensuring staff would be ready to embrace the new business processes. The extract below shows one of the key lessons they planned to learn from Isodore:

'The single most important rule in coping with or managing change is that communication cannot happen too often. Successful change happens at any level because of effective communications. We must communicate with anyone that is affected by the change. Even if the message is not positive it must be communicated.'

While good in theory, this document simply provided guidelines for what not to do and didn't really help with how communication with the stakeholders should be managed effectively. It recognised that a 'one size fits all approach' would not work and that communications would have to be tailored to the different stakeholder groups but did not specify how this should be done and this led to it often being forgotten.

As the project progressed to affect a larger number of people, the Change and Communications Team grew to ensure they could manage the process and make sure people were prepared. While their intentions were good it is difficult to know how to best communicate with such a varied group of people and it was made harder by the ill feeling towards the project. Despite having the resources available to communicate with the user community and develop new strategies for doing this there was still a dependence on email and large meetings. Trying to prepare people for change that

they don't want and successfully manage the messages being passed on requires a large time commitment and the team seemed to spend too much time rewriting documents so they could be passed on to users.

Figure 3 shows how communication flowed from the Project Board and Project Management in the centre, who regularly interacted with each other, out to larger groups. While the majority of interactions were bidirection between neighbouring rings, there were also a few occasions where communication missed some groups. There were even rare occasions, where Project Board members interacted directly with the Implementation Coordinators and wider user community. The line between the Project Board and Project Management shows the two-way communication flow between the two groups.

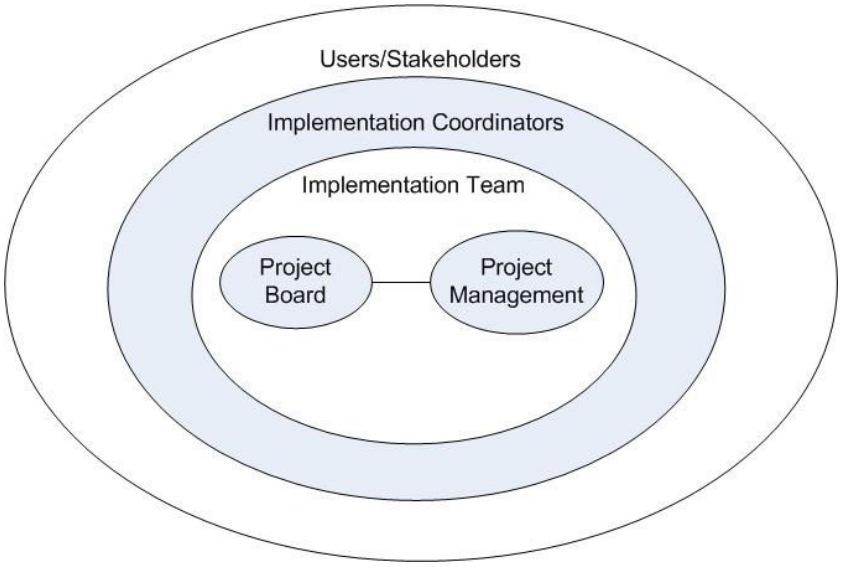

Figure 3 GEOMETER project outward communication flows

Communication in the project is not restricted to the wider university community. It also includes communication between the different streams in the team, communication with the Project Board and communication up and down the team hierarchy. As previously mentioned, many of the non technical problems encountered by the project appear to have their roots in communication-related issues and despite the team's best efforts, these proved difficult to overcome.

Figure 4 shows the basic structure of the project team after some restructuring, with the lines indicating the two-way communication flows between them. In this diagram, the team is shown in the centre to show that communications from anywhere in the team can potentially be passed to and from the Project Board and Project Management, in addition to these two groups interacting.

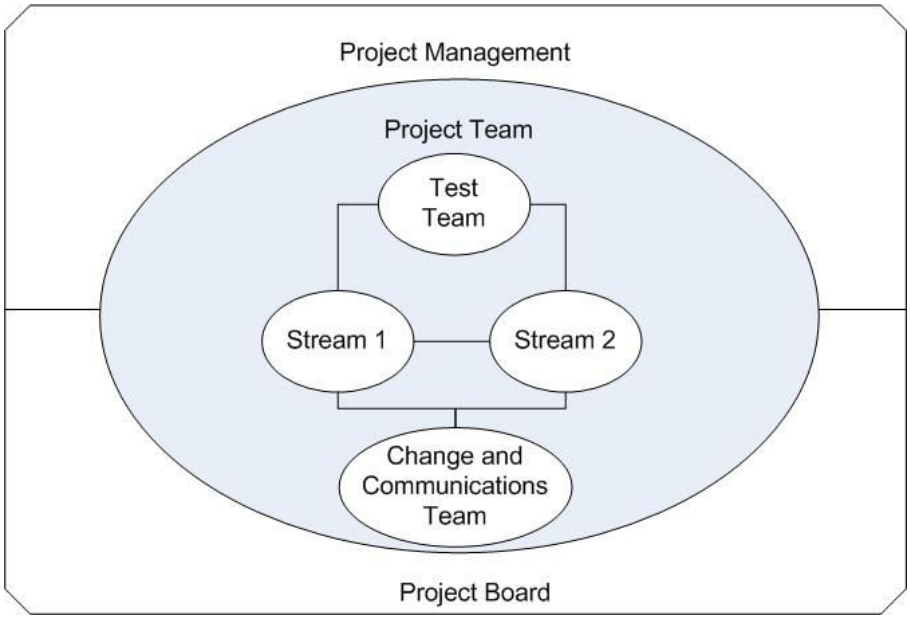

Figure 4 GEOMETER project team communication flows

Project Board meetings

The Project Board met once a month to review the progress of the project. The meetings were formal in nature and were held with members sitting round a large table with focus on the Project Director, Project Sponsor and Project Convenor. It was the Convenor's job to direct the meeting and ensure all items on the agenda were covered and everyone's opinions heard. At each of these meetings a selection of reports were presented and discussed regarding important issues facing the project. The reports were provided to the Board in an email prior to the meeting to allow members time to read them and form opinions on their contents. These reports were often presented to the Board by members of the project team however they would not attend the entire meeting. The reports would be discussed at length and any important decisions made. Later in the project it became common for the Change and Communications Manager to also attend these meetings and update the Board on the progress. Consultants from Tribal would also attend the Board meetings if they were

in Edinburgh at the time however there were often items on the agenda that would only be discussed without their presence, such as consultancy costs and dissatisfaction with the service they were being provided with. Minutes from the Board meetings were produced by the Project Secretary and distributed to the members within a week of the meeting. The next meeting would then start with the Project Convenor asking if everyone approved and the minutes and felt that they were an accurate representation of what had been discussed.

Implementation Coordinator meetings

These meetings were held monthly and generally started with lunch to get all participants talking. The meetings then took the form of a presentation, normally given by a member of the project team, at the front of the room and with the aid of PowerPoint slides. This would be followed by an open discussion in which any issues they had with what was presented could be discussed. As the project progressed it became more common for Project Board members from within the Colleges to attend the meetings and announce any big decisions that had been made. The effectiveness of these meetings will be discussed in section 5.2.6.

Team meetings

The meetings held within the project team were much more informal in nature and were normally attended by one stream of the project. The frequency of these meetings was dependent of the workload of the stream and varied from weekly to almost daily. While informal in nature, usually taking the form of an open discussion, they would normally have a particular topic to discus on which decisions needed to be made. Dependent on the stream and the importance of the topic being discussed, notes were sometimes taken and placed on the project intranet for reference.

While problems exist in the format of the different meeting types, these will not be discussed individually. The various communication problems that were discovered with the project as a whole will instead be described in section 5.1, focussing first on those related to communication within the project and then with the wider university community. While it is recognised that the university community is made up of groups of different stakeholders, for simplicity when describing the communication

issues encountered the university community will be treated as one. Attempts made by the project to overcome some of these issues will also be discussed.

The communication problems encountered include:

1. Structural barriers to communication
2. Critical information points
3. Hierarchical decision justification
4. Technical documents not being designed for users
5. Use of ambiguous notation
6. Too much information
7. Poor web presence
8. When problems occur it all goes quiet
9. Large discussions aren't effective
10. Two-way information cascading is difficult
11. Sharing is not encouraged

5.1 Communication within the GEOMETER project

5.1.1 Problem 1: Structural barriers to communication

During the study the structure of the project team seemed to cause issues with communication. The separation of the team into streams working on different parts of the system, along with a separate test and training team was suitable for getting work done. The communication necessary between the streams on a project where the work was so inter-connected however seemed to be missing. A meeting-based culture existed, with each sub-team meeting weekly to discuss their progress, but this was restricted to that group. People in one stream often had very little idea what those in the other were doing, even though their work was intrinsically related. This lack of knowledge then caused problems in other areas. If a member of the team went out into the user community and was asked a question that was not related to the specific part of the system they had been working on, they were unable to answer. They often couldn't direct the user to someone who would be able to deal with their enquiry. This frequently meant team members didn't want to go out and talk to users and their inability to answer questions left users confused.

The team was restructured in an attempt to remove the silos, with two streams being merged and people were able to move more freely between the groups depending on the tasks being undertaken and where their skills and experience were needed. After the undergraduate go-live, a lessons learned workshop was held and one of the issues recognised there was the lack of communication throughout the team. In an attempt to address this problem, it was decided that members of each sub-team would attend the other sub-group meetings and report back, allowing a more general understanding of the project as a whole to develop amongst the team. There were, however, still issues with areas such as testing being kept involved and informed.

The emphasis on meetings also caused problems when each team was very busy and work commitments prevented them from attending the meetings held by different sub-teams. It was not always possible to continue with your own work whilst attending meetings to try and keep informed about the rest of the project and attending those meetings about the work you were doing. As the pressure mounted and the work load continued to increase with future deadlines, this practice became unsustainable. People were already working extremely long hours to get the work done and in a project with a tight plan that had already experienced a large amount of slippage, time was precious. Some may argue that it is more effective to spend their time doing their own work than learning about what other people are working on.

The layout of the office, with some groups being upstairs and some downstairs also caused problems when trying to encourage communication between the different groups. Due to resource restrictions and having to work with the office space available to them, this was hard for the team to avoid. To help with this it is important to encourage informal communication and put in place mechanisms to make communication amongst the team easier. The communication still predominantly occurs in formal settings, although attempts have been made to encourage the team to socialise, for example drinks after work on a Friday. Attendance does however vary with a small group of regulars and people still seem to stay in small groups of either people they work with or people they were friends with outside of the project.

5.1.2 Problem 2: Critical information points

Another communication issue that is related to the structure of the team is linked to the organisation of the individual streams. Groups are often focussed on a figurehead who is responsible for communicating information to the higher levels of the project. As the Project Director said: *'everyone focuses around them and they become a bottleneck.'* Having critical information points is a problem that all areas of the project encounter. However, due to the hierarchic nature of some of the groups, when this person was away, for example due to illness or holiday, meetings and communication seemed to temporarily stop and this then impacted on what was achieved during this time. As all communication up the project hierarchy and to other areas was through this person, it was difficult for everyone else to find out what was happening in that area of the project.

Attempts have been made to try and discourage streams from developing a hierarchical structure and encourage a more flexible flatter arrangement. This however seems to have been purely through suggestion, with no way of ensuring it is happening. It also hits cultural barriers as people are more comfortable and familiar with working in a hierarchy, especially in settings such as universities which are inherently hierarchical in nature. As people became more aware of what others were doing and more emphasis was put on documentation of progress it became easier to get information when people were away. If tasks are worked on by more than one person this also helps to reduce the impact of the absence of anyone who may have been a critical information point. This means there is someone else to ask if one person is away. Prolonged absences and absences of several members of the same group can still however have an impact and affect communication.

5.1.3 Problem 3: Hierarchical decision justification

There were concerns within some parts of the team regarding decisions made by the Project Board. The justification of the decisions was often not communicated to those affected, leaving them to at times feel that it was the Board pushing their agenda and that the reasoning behind them was not sound. People were sometimes of the opinion that the Board did not have enough in-depth knowledge of the inner workings of the project to make certain decisions and didn't really know what they meant in practice.

It was the team who had to communicate the decisions to the users and they found it hard to justify these decisions if they didn't believe in them themselves or when they were aware the decisions were going to cause problems. Members of the wider university community also shared the view that the Board did not have sufficient knowledge about the workings of the university to know what was best for them. This was often because they were not aware of who was represented on the Board and who the members from their department were. They felt, like the team, that they knew their job best and should be consulted when decisions were being made that would affect it.

The Board having a more visible presence when announcing things to the users could have helped with this problem. Attempts were made to do this and ensure users were aware of where the messages were coming from and the justifications behind them. Emails to users announcing important decisions were changed to come from the Board, as they were members of the colleges and this helped show that it was not just the GEOMETER team making decisions but the university itself. This may have, in turn, helped the team when they talked to users about what was happening. It could have made them feel supported and helped to make the users more accepting of decisions. If the users were aware that the decisions were coming from the Board, the team may also have faced less of the negative feelings that existed.

More effort needed to be made when passing on decisions made by the Board to the project team to ensure they were clear, that they were informed decisions, and that everything had been taken into consideration. If decisions were made by the Board that affected the workload of the team, for example affecting deadlines or project scope, care needed to be taken to make sure they were well received and did not have a demoralising effect. Consulting with the team on key decisions may also have been beneficial.

5.2 Communication with the wider community

5.2.1 Problem 4: Technical documents are not designed for users

One of the areas where communication is extremely important in a project of this nature is communicating with the people it will affect. At the start of the project lots of information was being communicated to the stakeholders. However, this information was not in a very user friendly form. It often consisted of lengthy documents such as Business Requirements Documents (BRDs) that could be quite technical in nature. These were full of project-related jargon and contained lots of acronyms, often related to the software, which the team were familiar with, but which were confusing to others. Even some of the project team struggled to understand them fully without clarification from the person who wrote them and for the users it was difficult to know who to go to for this help. These documents were designed for those implementing the system so contained a large amount of detail. They were never really intended to be understood by users. The following excerpt from the postgraduate BRD illustrates this point:

'Upon saving an entry to SCC_VALU, a TUP is required to: go to SUB and get the ESB_CODE.SUB.CAMS value, and save this in SCC_AN01 (labelled 'JACS code'), if programme is PR go to SUB_UDF1 and get value and save to SCC_AN02 (labelled 'PR ATAS Required'), if programme is PT* go to SUB_UDF2 and get value and save to SCC_AN02 ('labelled PT ATAS Required'). The offer communications will then reference the IATAS clearance check, displaying the JACS code from SCC_AN01 and whether ATAS clearance is required from SCC_AN02, and ATAS Summary from SCC_NOTE.'*

Documents such as the risk registers were also confusing for those who did not know what they were showing. After one of the Valuta reviews pointed out the problems in the risk reporting that was being given to the Project Board, effort was made to redesign these documents to make them clearer and easier to understand. A simple table format was used, with risks colour coded to show the level of threat they posed to the project and indicate where dependencies lay. By separating the risk register into smaller tables and diagrams and removing the technical language it was easier for someone with less experience of the project to understand.

Efforts were also being made to produce executive summaries of documents such as BRDs to make their content clearer and easier to read however, these were difficult and time consuming to produce and some still caused confusion. More effort needed to be made to make people aware of who they needed to speak to about what and who they could contact for help outside the support desk, especially when people were leaving and regularly moving about within the team.

5.2.2 Problem 5: Use of ambiguous notation

Process maps were used in documentation and presentations to explain the new business processes to the potential users. This caused problems as these representations were found to be too abstract and open to interpretation. Although they were stepped through during the presentations, it was sometimes hard to follow them over several slides and people could look at the diagrams and fit the processes to how they wanted the system to work. This, combined with the confusion of the BRD then led to misunderstandings. Users would agree to things because they didn't understand what they meant. Similar issues sometimes arose in the opposite direction, with members of the team saying things were possible when really they weren't. This problem was reduced as the team developed a better idea of the software's capabilities and what could be achieved and gained a more complete view of the project as a whole. They also tried harder to manage expectations and developed more confidence in saying no. These factors combined, however, led to some users being disappointed in what was delivered.

When using process maps to present information to stakeholders more effort needed to be made to ensure they understood what these process maps meant in practice. This would have helped mistakes in what the team thought was required and what the users thought they were getting to be spotted earlier. Extra clarity may have been required when presenting the processes and it may have been necessary to be more exact in what they would mean in practice. As the project progressed, the team developed a better idea of how the processes would actually work in the system. However, this knowledge was only developed with experience in a particular project area and was not always transferable to new areas. There needs to be continued

communication between the team and the future users of the system to help spot and correct misunderstandings early, before they cause problems.

5.2.3 Problem 6: Too much information

As well as the lengthy technical documents, long emails were also used to communicate with stakeholders, leaving them with a feeling of information overload. One member of staff described it as:

'Whirling round in a sea of information, sometimes you can't find your way to the top. I sometimes feel I am drowning in it and trying to see the light and get up for air is quite difficult.'

Action points were often hidden amongst these lengthy communications and were therefore missed. People in roles such as Implementation Coordinators did not have time to read large amounts of information that may or may not be relevant to them. It is important to remember that they still have their regular jobs to do as well as acting as Implementation Coordinators. The use of blanket communication to all stakeholders was not effective in getting the right information to the right people and resulted in much of it being ignored, often by those who needed to see it. When people receive long emails they may read the first few paragraphs initially with the intention of returning to it when they have more time, but it is common for this not to occur.

For the users, organising the information they are sent was also difficult. Emails were often lacking clear subject headings and it was difficult to find them to refer back to at a later date. On the intranet page for support staff, guidelines were provided for how to write effective emails, including what to put as a sensible subject. These were however only used by the support staff and were not in a place everyone would think to look. Guidelines need to be provided for everyone on sending emails to users if this going to continue to be the main medium used for communication and some checking may be necessary to ensure that they are being followed. Action points need to be made clearer, maybe in a list at the start of emails as users need to be able to see at a glance if an email requires action and if so by when, so they can prioritise which

to read. The team often felt that the Implementation Coordinators were not engaging when they didn't receive a response but this could be due to them not even realising one was required. They need to remember who they are communicating with and only include the amount of detail that group will need.

5.2.4 Problem 7: Poor web presence

The GEOMETER project website was initially used to inform people about the project and what it was doing now and planned to do in the future. It was also a place to find key documents related to the project. It was however hard to find the information you wanted as some sections contained too much and it was difficult to see when new content had been added. When getting feedback from users it became clear that the information on the website was not clear and serving its purpose. In light of the feedback one team member commented:

'It's hard to find out exactly what GEOMETER is about. Although it is a change project you need to still say it is software and there is something live and tangible as well.'

A separate part of the website was dedicated to information for Implementation Coordinators including notes from previous meetings and outcomes of any workshops they may have attended. For some, the website was, initially, a useful resource for finding key information however this soon became out of date. One Implementation Coordinator voiced their concerns that whilst the website was being updated some of the more useful features such as the 90 day calendar, were taken away but not replaced with anything during the changeover time. Even though the website has been reorganised and updated, many users only visit it when referred to something in particular. Now the project is in the later stages and has two parts of the system live, the focus of the website has shifted to support and training materials. Although the organisation and layout of the website has been vastly improved it is still sometimes unclear which sections to look in for what. The static nature of the site also makes it hard to keep up to date with the latest activities in the project.

5.2.5 Problem 8: When problems occur it all goes quiet

Although a large amount of information was communicated to the university community in the early stages of the project, when things started to go wrong, people felt it went extremely quiet. This lack of information led to rumours starting and people wondering if the project was still going to happen, which can be dangerous in a project dependent on users' cooperation. One user commented saying:

'We were left not knowing what was happening. Sometimes others were getting information and we were left wondering why they were being told things and we weren't.'

Although the same user acknowledged that this may have been because other areas were more affected by the project's current focus, the lack of information made them question what was happening. There was a common feeling amongst members of the wider university community that honesty was important and that they would rather be kept informed, even if there were problems, than have no information at all. In Project Isodore's change documentation quoted in the GEOMETER Change and Communications Strategy this point is emphasised, stating that truth is more important during periods of change and uncertainty than an approach which only communicates good news. Most users feel for the team and are fully aware of the long hours they are working and the confrontations they have to deal with. They are aware of the difficulties in large projects but feel it is better to stand up and say we are in trouble than say nothing at all. Keeping people updated, even when nothing is really happening in their area would have helped maintain an awareness about the project and stopped people feeling they were being kept in the dark.

The Elements web based newsletter was created to help with this problem, providing bimonthly updates and information on what was happening in the different parts of the project. Another aim was to keep people aware of what would happen next in the project and anything they had to be prepared for. The articles in Elements were aimed at the users so were in user friendly language but as a new initiative it was unclear how many people were reading it and how successful was. Whilst this was a step in the right direction it still didn't completely overcome the problem of keeping people

in each area updated. Getting appropriate articles written in language appropriate for the users was difficult as those writing them were often more familiar with the topic and with a more technical form of writing. It was also more about the project as a whole and it was not possible for each edition to cover every area of the project. As only a few issues have been made, it is unclear if problems that were being encountered in the project would be covered or if it is more for disseminating positive messages about the project. The team needs to make a commitment to communicating honestly with the users even if things get difficult and future problems are encountered.

5.2.6 Problem 9: Large discussions aren't effective

The information distributed to Implementation Coordinators was supplemented by monthly meetings which generally took the form of a presentation followed by a discussion. As previously mentioned, like some members of the team, some Implementation Coordinators felt that decisions taken by the Project Board were not clearly justified and some worried that they were being made without the necessary expertise. A clear effort is needed to carefully manage the messages that are passed on to the users. When it was recognised that a decision may not be or has not been well received, it was often the case that representatives from the Board would attend the meetings and speak to justify them. This helped to show that the decisions had been thought through and that all considerations had been taken into account. The Change and Communications Strategy of the project states that this visible and vocal support from relevant university and college figures is vital and must be sustained throughout the project. More effort needs to be made to ensure this is the case.

There is general agreement amongst those who attended these meetings that they were good for information gathering but not for discussion. The discussions often became a case of 'who shouted the loudest got heard', with not everyone feeling comfortable voicing their opinion in front of a large group that includes people who they feel have a more senior position to them. It may also be the case that the opinions being heard are not representative of the group as a whole. They might say they are speaking for the rest of the users in their department when it is really only their personal opinion. Some people prefer to spend some time thinking about what they have been told

before deciding how they feel and voicing their opinion to the team, but they don't always know who to speak to about what.

The problems related to large group discussions are not unique to Implementation Coordinator meetings and have also been observed in question and answer sessions at the end of presentations given to the wider university community. The Change and Communications Strategy suggested that, unless on a small scale, meetings should be using predominantly for imparting information rather than decision making. Members of the team recognised that the meetings didn't work as a way of getting feedback. However, the team could not think of an alternative that could support this process and encourage engagement.

While the idea of having regular meetings seems a good way to promote discussions and find out what people are thinking, in practice they are not possible. People were often too busy to attend regular meetings, with their work taking priority, and, as previously discussed, the size of the groups can get too large to be effective. The notes from the previous meetings were available on the Implementation Coordinators section of the website but finding time to read these could also be a problem.

Very little informal communication appears to exist outside the meetings both between the team and the users and between other members of the university community. The Implementation Coordinators do not appear to communicate with each other outside the meetings, although one college did find it useful to meet up within the college before meetings to discuss any issues. People in the different colleges meeting outside the official meetings could help develop an understanding of each other's opinions and more of an acceptance of the standardised processes being introduced. Outcomes from these smaller more informal group discussions could also be fed back to the team, giving them a better idea of people's thoughts and opinions of the various parts of the project. The flexibility and informality of this communication allow it to take place whenever people meet up so not encountering the scheduling problem of large meetings.

5.2.7 Problem 10: Two way information cascading is difficult

As previously stated, the monthly meetings were good for gathering information. However, the Implementation Coordinators were then expected to disseminate this to other members of their department in an attempt to prepare them for the forthcoming changes. Their limited influence, often due to the role being delegated to someone with less authority than intended, and the difficulties involved in deciding who to tell what made it hard to cascade information. This was also seen in reverse, with the Implementation Coordinators finding it difficult to gather others concerns and report them back to the team. Communication up and down the university hierarchy is something that has been recognised as notoriously difficult and the problem is not unique to GEOMETER. The problem was noted in a Project Board meeting with one Board member stating:

'Cascading doesn't work; the gatekeepers don't open the gates, especially in multi-department schools. There are no mechanisms in place to cascade information.'

It has been recognised by the project team that the role of the Implementation Coordinators has not been working and an effort has been made to re-evaluate the role and try to ensure the correct people are in the job. A lot of this has been done in consultation with the existing Implementation Coordinators to try and find out where improvements need to be made. Further facilities and support need to be provided if Implementation Coordinators are going to be effective. They were initially intended to be key members of the implementation team and given tailored guidance and support but this does not seem to have been put into practice. They need recognition for their role so that other users are aware they are part of the project. This may help when trying to pass information on to those higher in the university hierarchy. If there was somewhere they could put information so it was accessible to the other users and where users could then comment on it this may help ease the process of information dissemination and collection and reduce the time and effort required. It may also help circumvent some of the hierarchical boundaries to communication that are present in a university setting.

Whilst people may be discussing the project amongst themselves, much of this information is not passed on to the team. If the team could stay aware of what people were saying they could spot and correct misunderstandings before they cause problems in the future. Managing expectations and reinforcing positive messages is seen as important to the project and an increased awareness of what other stakeholders think could be useful for this. Although face-to-face communication is ideal for building relationships and helping with this, in practice this approach does not scale. In a project with such a large number of stakeholders, meeting them all in small groups is not practical. As the project progresses it is an approach that if not supplemented by other effective communication mechanisms, is not sustainable. Actively collecting feedback is extremely time consuming and an effective way of gathering feedback efficiently in an easy to use form is required.

5.2.8 Problem 11: Sharing is not encouraged

After the problems encountered with the undergraduate go-live it was necessary for members of the team to go out into the offices and see the actual problems that were being encountered. Prior to this there was a reliance on the support desk for help with the system when users had problems or didn't know how to do something. The only other place users could go to for help was the FAQs on the website. These take the form of a list of questions which when selected take you to the answer. However this was very confusing for users. When they selected a question they were taken to a list of answers that are numbered but the question is not repeated, requiring them to remember its number to know which answer to read. Normally you would expect the answer to be the one that appears at top of the screen however this is not case and this causes further confusion when determining which answer to read. The FAQs are also difficult to keep up to date and don't always contain the types of questions a user would think to check them for.

During the project team's visits to the college offices it became clear to users that there were often easier ways of doing things that they had not been aware of. One user commented that these sessions were extremely useful and would have been even more so if they had been given that information from the start. There was a distinct lack of communication and sharing of information between the colleges, something

that does not appear to occur during any stage of the project. Some were aware of easy ways of doing things while others would spend a long time trying to carry out the same task. If a problem was encountered or a way to work round a bug was found this would remain in the college rather than be shared with other users. The team and support staff then found themselves repeating things to several users in different parts of each college.

There was also a feeling amongst members of one college that the project team saw them as just moaning for the sake of it and they found this unfair. They felt that when they reported a problem they were made feel it was their fault and that they were doing something wrong. When they became aware of others in different colleges encountering similar problems it helped act as reassurance that it wasn't just them doing things wrong. Problems did exist with what the system allowed them to do, as well as the bugs that were present. A more efficient way of sharing information like this, including work arounds for bugs could be useful for future go-lives, helping the users and reducing the workload for the support staff. The hours the support desk is open were extended and responsibility for the support of applicants was handed over to Registry. In the Project Directors update to the Board in February 2009 it was reported that the response time to support calls was around 10 working days for applicants and around 5 working days for staff and that the length of these waiting times was causing frustration. Effort needs to be made to reduce these times if confidence in the system is to be maintained.

5.2.9 Conclusions

Although many measures have been taken to address communication issues since the initial observations were made, further work on developing effective communication strategies is required to improve and manage communication in the project as a whole. One of the key lessons learnt from Project Isodore was that communication cannot happen too often and that successful change happens because of effective communication. The current methods do not appear to fill all of the communication requirements for the project as a reliance on meetings and face to face communication cannot be maintained in the long term. In the future, the Change Team will have to move their focus to other areas of the project and will no longer be able to dedicate as

much time to the support of current users of the system. Without this support there is a fear that the users will revert to their old methods of working, using their old spreadsheets and developing ways to work around the system and new business processes. While meetings and face-to-face communication are important for building relationships, there is a need to support these relationships and continue to reinforce positive messages about the project as it progresses, encouraging people to continue to realise the benefits of the new system and the processes associated with it. An approach needs to be taken that is scalable and capable of supporting the increasing user base that will come with each go-live. It is not suggested that face-to-face communication and meetings be replaced but other mechanisms need to be put in place to supplement them if communication as a whole is to become more effective. While the Change and Communications Strategy document recognises many of the issues that need to be addressed for effective communication and to ensure change, in practice they do not appear to have been addressed to the extent necessary for success. Unlike the technical problems faced by the project, communication appears to be an area in which some assistance can be provided and an area in which any help provided and knowledge gained can be transferred to other large scale projects in other settings. After presenting a report of these findings to the Project Director and the Change and Communications Manager a meeting was held to discuss them. Their response and any attempts made to address some of the issues will be described in the next section.

5.3 GEOMETER response to communication problems

This section discusses the Project Director and Change and Communications Manager's response to the communication issues identified. This response was provided prior to the disbanding of the Board and reduction in project scope. The diagram shows each communication problem and the response to it. Each of these responses is then discussed, outlining any changes they are making and any drawbacks to these new approaches.

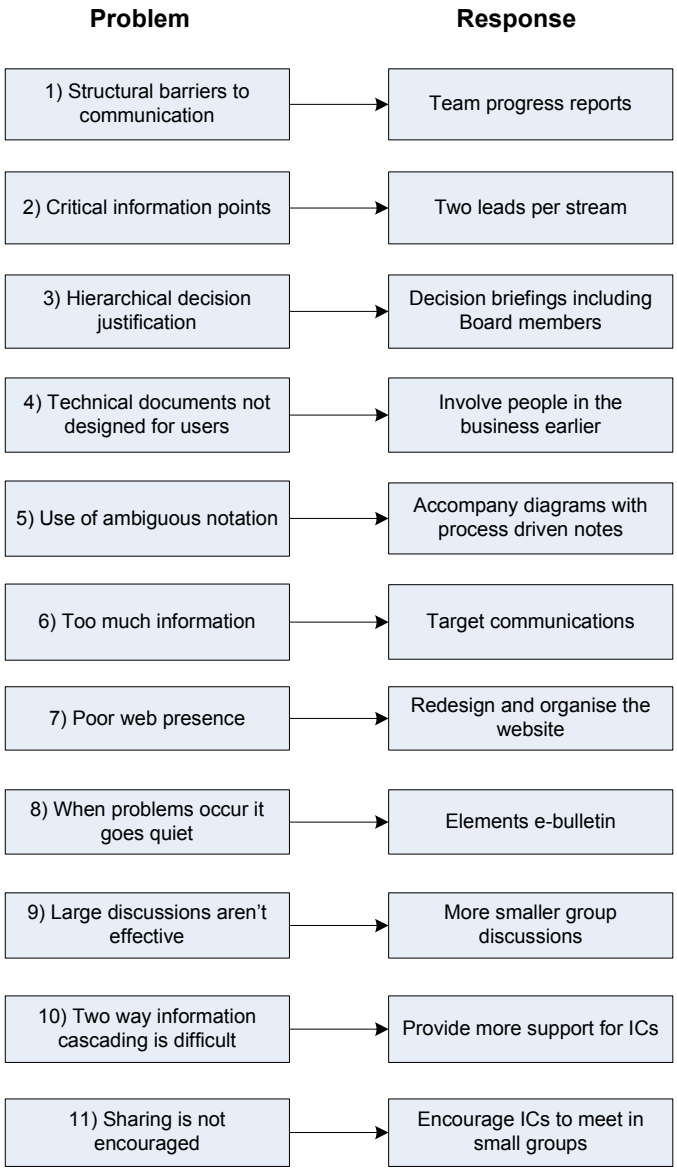

Figure 5 GEOMETER responses to communication problems

5.3.1 Problem 1: Structural barriers to communication

The Change and Communications Team recognised this as an issue and tried to address it through the generation of progress reports. These were to be used to give feedback to other areas. This helped with the problem of people sometimes being unable to attend meetings for each of the project subgroups while continuing with their own work. They recognised that it is a difficult issue to address and that it required more work, but progress was being made.

They were also aware of the feeling of 'them and us' with respect to the different floors, with the Change Team having had experience working on both. Both the Project Director and Change and Communications Manager felt that in an ideal scenario they would all be on one floor but resources did not permit this. They had to work with the office space that was available to them. While they acknowledged the problem, it was unclear what actions they were taking to try and remove the feeling of separation. By regularly moving the team around so that each group worked on both floors, they hoped to prevent a situation where one group was permanently separated from the rest.

While a more coherent view of the project as a whole developed amongst the team this knowledge would have been more helpful earlier so they could pass on information to the user community.

5.3.2 Problem 2: Critical information points

This is an issue they had noticed as being more prevalent in some streams than others. It was decided that each stream would have two leads so that when someone was off sick they hadn't lost the key member of the team and work could continue. An example was given of a group in which this didn't work as both leads were off sick at the same time. The team however continued to work well and started to make decisions after being forced to do so in order to progress. There were, however, problems with these decisions not being communicated to the rest of the team and the project managers, making it difficult to find out what was being done.

While the approach of having two leads does help overcome the problem of a critical information point, the hierarchical nature of the project groups still causes problems if both are away. The remaining team members may feel they lack the authority to make decisions or communicate them to others and may not know who to tell what to. If a flatter structure, as seen in some of the streams, was encouraged and supported this problem may have been reduced. If the approach of having two leads was to be successful and the leads were to take on a figure head role everyone else in the team must be aware of the procedures for decision making and communication so that, if the leads were away, decision making could continue.

5.3.3 Problem 3: Hierarchical decision justification

The Change and Communications Manager and Project Director differed in their opinions of how important this issue was. The Change and Communications Manager felt it was very important, as she had experienced the impact that decisions made at a high level could have on her team. She saw this as a crucial point that also came out when looking at the lessons that could be learned from the PG go-live. This session made it clear to her team that users also felt this issue needed to be addressed.

A suggestion was made that, when decisions have been made, briefings could be given to the team and Implementation Coordinators, possibly including members of the Board. These would include the justifications for the decisions made and allow them to be questioned by the other stakeholders if it is felt necessary. The Project Director recognised that it was important to get the Board to commit more to the project, especially at a college level. The Board often backed off when they were put under pressure by their peers, rather than standing by the project and the decisions that were made at a Board level. Getting the continued support of Board members when they were under pressure from members of their college may be difficult as they have to continue working with these people, as well as carrying out their role as a Board member.

If changes similar to these are put in place it may go some way to helping people see why decisions have been made and so feel happier that all factors have been considered. When Board members were used to justify the changes in the PG roles at

an Implementation Coordinator meeting it did take some pressure off the project team who were presenting them. The ability to question those responsible for the decision seemed to reassure some members of the user community.

5.3.4 Problem 4: Technical documents are not designed for users

This is a problem the Change and Communications Team were very aware of as they are often responsible for producing user friendly summaries of project documents. They are hoping to get people in the business involved at an earlier stage so they can produce documents from a business perspective. These documents would then be used to communicate with the users instead of the technical documents that are needed for implementation. This also applies to the generation of the process diagrams. It was noted that the processes may only get described at the step-by-step level when it gets to the stage of writing the user guides and this is clearly too late. A clear understanding of the processes is required much earlier so the team can ensure they are communicated correctly and that they actually match what is required. This also helps ensure that users understand the processes more clearly. The Project Director was aware of the technical nature of the business requirements documents but she was not aware of the problems that people were having understanding other documents such as the summaries of the risk register produced by the JIRA risk management system. Effort is now being made to format these in a more user friendly way, similar to the new format that was used to communicate the risks to the Board.

In the review of the postgraduate go-live and role of the IC it was suggested that, while the user guides are designed for users, they are too lengthy and a list of simple steps for how to do common tasks would be more helpful. This is a point that was also raised at a Project Board meeting after the go-live. Academics wanted more basic instructions they could quickly refer to. Production of these simple short guides is now being undertaken and their use should reduce the time and effort required on the part of the user to understand what to do. This will reduce the adoption cost, which can only be a good thing for gaining user support for the system.

5.3.5 Problem 5: Use of ambiguous notation

As previously mentioned, work is being done to ensure that the process diagrams are clear for explaining each step that is required, as users have commented that they can be too complex. Process maps are a technique that have been used successfully in other projects such as PiMS and, if they ensure that they are clear in their presentation and the explanations that accompany them, they may be the best way to show the new processes. Accompanying the diagrams with process driven procedure notes, as suggested in the lessons learned session, may also help ensure understanding.

5.3.6 Problem 6: Too much information

Attempts have been made to carry out more targeted communication. Those who previously sent long emails are being encouraged to reduce their length and be more concise. It was also noted that people feel the intray messages generated by the system give too much information. These are being examined to see if they can be made clearer. This helps to show the importance of clarity in messages and the difficulties encountered when attempting to produce them. While this is a step in the right direction, a standard format or some guidelines for emails to users may be helpful. This would address the issue of action points and deadlines being missed because they are hidden amongst the text. Targeting the communication to groups of users, as initially intended in the Change and Communications Strategy, should at least reduce the number of irrelevant emails people receive.

5.3.7 Problem 7: Poor web presence

Surprise was expressed that issues were present with the new website and the Director and Change and Communications Manager were very interested in where improvements could be made. It was noted that the website has been reorganised and redesigned but a full usability study of the new layout has not been carried out. The principal purpose of the site has now changed from communicating the message of the project to user support. The confusion of where to find things was noted and this will be considered when assessing the site's usability. The Project Director commented that she had taken time to adjust to where things are in the new layout. Effort is also being made to try and keep it more up to date. However, after past

disappointments users will need to be encouraged to start using the site again if it is to become a useful resource.

5.3.8 Problem 8: When problems occur it all goes quiet

Undergraduate admissions was never a priority area for the project but it had a disproportionate impact on it. When the problems were encountered everyone went into what the Project Director described as 'fire fighting mode'. They recognised that it is important not to forget about the other areas of the project and they hadn't realised quite how important continued communication would be, even if it is just a short email update. Although they state that they underestimated the importance of ongoing communication, it seems more likely that it was simply a case of forgetting and focussing on other things. The project was keen to learn from similar projects undertaken at other universities and the importance of regular updates, even if brief, was emphasised by those who worked on Project Isodore at Oxford University. The GEOMETER project clearly found this to be an important thing to remember as it is repeated in their Change and Communications Strategy. However, as this document was created at the beginning of the project and by staff who have moved on, it is unclear how often anyone looks at it. The problem of continued communication is one they are keen to address, as they realise that keeping awareness about the project throughout the university is important.

While it has been recognised by the ICs that the Elements e-bulletin in useful for raising awareness and provides them with a user-friendly document to forward to users, it is still not being read by large numbers of stakeholders. More needs to be done to increase readership.

5.3.9 Problem 9: Large discussions aren't effective

The Change and Communications Team are now trying to use the meetings with the ICs for passing on information to them as well as gathering feedback. The smaller group discussions used in the lessons-learned session were found to be much more valuable by both the ICs and the team. Doing this regularly however, as well as the

large monthly meeting, requires a large time commitment on the part of the Change Team.

In the lessons-learned session, they also found that lots of the IC's agreed that it can be intimidating to ask a question in front of those senior to themselves or ask a question unrelated to the topic of the meeting. This is something that hadn't previously been considered but is now being looked at. They have recognised that the meetings are often dominated by 2 or 3 people who are perhaps senior in position and who take a college perspective. It has also become clear that opinions often voiced are personal rather than representative of others in their department. Because others stay quiet, this doesn't become clear until later. An example was given of a member of staff who had been complaining throughout the process that it was unusable and that his department would hate it. When the other members of staff saw the system they actually liked it and couldn't see why they had been told it was so bad. Effort is needed to ensure that people of influence don't pass on negative views and that the ICs are all behind the project. This also emphasises the importance of getting more peoples' opinions and the need to overcome the problems of large discussions.

With the build up to the postgraduate go-live, the Change and Communications Team have found that there was a more positive attitude amongst the stakeholders. As the project progressed new groups of stakeholders became involved, who believed more in the idea of putting things online in the new system and this belief makes them more receptive to the changes required to get everything working.

5.3.10 Problem 10: Two way information cascading is difficult

When reviewing how the ICs work, the team found that many don't know who to pass information on to and what exactly their role is. The team recognise that this needs to be better defined and that they need to be clear what they want the ICs to do. More work needs to be done to make them feel part of the project, rather than just potential system users who can be used as information points. While it is acknowledged that cascading information in the university is difficult, some ICs are better at this than others. This, however, may be due to the position they hold in the university and their

experience in such a role. More support needs to be provided for those ICs who are struggling with what is required of them.

The team is now getting students involved to push the student-centric view, which was one of main aims of the project and feel it will be interesting to watch how the dynamics change. Feedback from the ICs also shows that they felt pre go-live communication for both the undergraduate and postgraduate modules of the system was great but that there was very little after, even on issues that were encountered and that this needs to change. This would suggest that a two-way communication pattern needs to be established that continues throughout the project, not just before an area is due to go-live. It also emphasises the importance of overcoming problem 8, when problems occur, communication stops.

5.3.11 Problem 11: Sharing is not encouraged

ICs are now meeting independently, in small groups, to discuss the project informally and this is something that the team should actively encourage. This sharing of opinions may help reduce misunderstandings and develop a more positive feeling toward the project.

The team had not been aware of the usability issues regarding the FAQ's on the website and this is going to be looked into when it undergoes a usability review. The limitations of the static nature of the FAQ's has been acknowledged in the lessons-learned session, with the suggestion of using a more interactive site like a wiki for the ICs. While this is being considered, previous experience with wikis has suggested that users see them as technical in nature and lack of understanding of what they actually are. Finding a user friendly program for creating this wiki would also be vitally important.

By moving the focus of the website to user support, it is hoped this will help with the problem of knowing who to contact when they have questions and efforts are being made to inform ICs of the relevant people for each area. The team have to make sure this information is kept up to date if members of staff leave or move area so it continues to be useful. In an attempt to deal with the large number of support calls

that are being received, they are now trying to identify recurring themes so response times can be improved, as they recognise that response times are also an area that requires improvement. With response times currently need improvement, how the support desk will cope with the volume of calls when more of the system goes live is unclear.

5.3.12 Summary

While efforts are being made to address the project communication problems, it seems that they have only just become aware of the fact that some of them existed. They are now trying to find a better way to extract information from the team when addressing issues. When users report issues they are often related to the business processes. The use of the JIRA risk management system has been found to be over-complicated by some users and is going to be replaced for users with CMS, a content management system which is seen as more user-friendly. They are also now asking users to attempt to quantify the benefit of a change request, forcing them to think differently and this will help with resource issues and prioritising of requests. The creation of the Change and Prioritisation Group has also helped with this issue. In January 2009 support for applicants was transferred to Registry, reducing the load on the support team but this load is likely to increase again with future go-lives. However, as the scope of the project has now been dramatically reduced, the impact of the go-live of any future enhancements to the system will be much less.

The lessons-learned workshop with the ICs seemed to bring forward a lot of the issues that needed to be addressed and emphasised the impact some problems were having. Clarity of information seemed to still be at the heart of many of the issues arising and it is important that these problems are addressed if support is to be gained for the new system. While the team could see the areas that needed improvement, finding appropriate strategies is difficult and determining which are most appropriate in which circumstances and for which groups of stakeholders is even harder. Although a variety of strategies were being tried to overcome some of the communication issues these all required a large amount of the team's time and as the project progressed this time was not available. While they hoped to continue to get the benefits from the small group interaction, finding a way this could be done in practice was something

they continued to struggle with. A 'one size fits all' approach was not possible and there was no 'silver bullet' that could solve all the problems. They failed to find a communications approach that could be applied to the variety of different areas involved in the project and that could scale with the planned scope of the project. Due to the impact of the problems encountered, further go-lives have not been cancelled and focus has moved to improving the usability of the undergraduate and postgraduate modules. Ensuring communication is managed effectively during this process will be important in gaining the help and support of the users that will be required for it to be successful.

5.4 Conclusions

While the GEOMETER project experienced a variety of problems with communication, these issues are not unique to the project. Many of the problems are general issues that are encountered in most large scale deployment projects. Getting information to and from a large number of different groups of, often distributed, stakeholders, and keeping this communication going throughout the life of a project is a complex and difficult task. The introduction of most new systems will involve a degree of change and effective communication is necessary to manage this process and minimise resistance. In order to ensure system requirements are met and that these reflect the needs of the users, continuous communication is necessary. Traditional approaches such as meetings, email and file stores are however often inappropriate for large projects as they do not scale to the levels necessary.

People are comfortable with the idea of meetings and a communication culture based around these is often quick to develop. There are however many problems with meetings:

- They do not scale well
- When you increase the number of participants scheduling becomes a problem
- People are reluctant to give up too much of their time
- Finding a suitable location of a suitable size can be difficult

- In large projects, the number of stakeholders will be so large it will never be possible to meet with them all.
- Those who cannot attend meetings may still have valuable inputs but these contributions are often lost.
- As the number of attendees increases the effectiveness of any discussions held in the meetings is reduced.
- Gaining feedback from everyone present is not possible
- Only those who are most vocal will get their opinions heard and these may not be reflective of the majority of attendees.

A project website can be used as an outward facing mechanism to communicate with the wider stakeholders. This can be used as a place to find out what is happening in the project. However, this also has many inherent problems:

- Keeping it up-to-date is time consuming and often not done on a regular basis.
- Finding out when a website has changed and what has changed is difficult.
- If it is used as a file store, users need to know the files are there, how to find them and when they have been changed.
- Email notifications of changes contribute to people's overloaded inboxes and may be treated as spam.

Email was one of the first widely adopted Internet communication technologies and its use has now become embedded in work routines, with most people checking it regularly. It is the most frequently used mechanism for communicating with stakeholders outside meetings and for gathering feedback. Its familiar nature, however, often means it is used in situations where it is not effective. Davenport found that 26% of people surveyed felt that email was being overused in their organisations ([156] cited in [157]). He also found that 21% felt overwhelmed by the amount of email they received and that it could sometimes diminish their productivity. Problems associated with the mass use of email include:

- An overflowing inbox can put people off reading messages, because of the amount of time it would take to find those that are relevant to them.

- Important information may be ignored or even deleted.
- Email is not effective for having discussions with multiple recipients.
- It's hard to follow discussions and understanding can be dependent on the order that messages are received.
- The sequential nature of email makes it difficult to keep all responses together so they become intermingled with the rest of your messages.
- Emailing files can result in multiple versions being in circulation at the same time, which can become a source of confusion.
- Determining who to send an email to can also be extremely difficult when trying to send it to everyone who is interested without blanket communication.

As described above, the traditional methods of communication have many problems that are exasperated when scaled up to the size of complex projects. An alternative solution is required that will provide for the variety of communication needs in a complex project, helping to support communication amongst distributed stakeholders.

Chapter 6 Online Social Networks

Effective communication in deployment projects is difficult and as the GEOMETER project showed, getting it right can be very important to the success of the project. The previous chapter outlined the many communication problems that were encountered in GEOMETER and the ability to alleviate the effects of some of these issues may support a project in its work. Online social network sites have seen huge levels of success in the social Internet domain and could provide a more scalable solution to some of the communication problems than the traditional methods of emails and meetings that are commonly used.

A report by the Nielsen Company found that two thirds of the world's Internet population now visit social network or blogging sites and their use now accounts for almost 10% of all internet time, overtaking personal email[158]. The popularity of such sites has continued to grow across the world with people being motivated to regularly check them in a similar way to personal emails. The sites appear to have the crucial 'sticking factor' that is needed and if this could be transferred to a project setting it may help gain the much needed engagement of the stakeholders.

Social networking sites provide a variety of communication mechanisms, allowing users to remain in contact with a large and distributed number of people. All social network sites have common features and the simplicity of their interfaces and the popularisation by mainstream media has helped open them up to a wide audience. Social network sites allow users to produce a profile describing themselves which they can restrict access to, connect to each other and navigate the connection lists of their connections. Additional Web 2.0 features are then integrated with this to enable user communication.

While such sites initially became popular with a young audience, as their popularity has increased the audience has become much broader. Almost a third of Facebook's global audience is now aged 35-49 and almost a quarter is over 50[159]. This would suggest that the use of these web technologies appeals to a wide audience, satisfying

their need to stay in touch and keep informed, while keeping others up-to-date on their activities.

The ease of use of such sites has also helped them gain popularity, with almost anyone being able to get started with very little computer experience. The focused nature of Facebook around friendship connections with other users appeals to a wide audience and its access controls help people feel more comfortable with the sharing of personal information. These factors have helped make it one of the most visited sites on the Internet, with over 2 million users worldwide.

With a wide variety of communication benefits from these sites being realised in the social domain, the next obvious step would seem to be to try and gain similar effects in a corporate setting. Most people are now familiar with social networking and blogging sites, even if they don't have an account themselves as they are regularly being mentioned in mainstream popular media. While a key issue with any new technology is gaining a critical mass of users, their familiarity with the use of the larger public sites and their interfaces could be transferred to a smaller private network minimising the adoption costs. If a private social networking site could be created for stakeholders in a project, it would allow everyone to stay in contact and keep up to date with what was happening in each area.

This chapter will look at the features provided by public social network sites such as Facebook and will examine if their popularity can be harnessed and the benefits that they could provide for communication in complex deployment projects. The chapter has the following structure:

1. This section will look at some of the features of online social networking sites and the benefits they provide for communication.

2. In this section, the possibility of using a public social network site such as Facebook in deployment projects will be assessed along with reasons why this may not be appropriate

3. This section will look at the possibility of using a private social network site in a project, before proposing the use of the open source platform Elgg, to implement a private social network.

6.1 Features of social networks

The size and popularity of social network sites has grown dramatically in recent years. Facebook is the second most visited PHP site in the world, and one of the largest MySQL installations anywhere, running thousands of databases[160]. It has also become one of the most visited sites on the Internet.

Social network sites are focussed around the idea of connecting and sharing with other users. Users create a profile to describe themselves and connect to other members stating how they are connected. Users are able to upload photos and videos to share with other members of the site. Once connected to other users they are provided with a regular news feed when they log in which keeps them informed of these users' activity.

Some of the common features of social networks will be described below, looking at the benefits they provide to users.

6.1.1 Communication features

Profiles

Profiles form an essential part of a social networking site and are where users provide information about themselves. This may include a photo that will be used to represent them throughout the site and put alongside any content they produce. A form of micro-blogging is often provided in the form of a status field that allows the user to enter a brief message of what they are doing. Other users that they are connected to are then notified of changes to this, allowing them to keep up to date with what people are doing. Profiles are a way in which users can find contact details, details about each others interests etc. and are a useful way of helping to determine if you wish to connect to them.

Photos

Most sites allow users to upload photos, which they can organise into albums and share with other users. This is one of Facebook's most popular features. According to Facebook the site currently has over 1.7 billion user photos. Different users can be 'tagged' in photos and this then provides a link to their profile page. Users are also able to comment on the photos that have been uploaded, allowing discussions to take place or feedback to be gathered. Flickr is a dedicated social network site for the sharing of photos and is extremely popular. Videos can also be hosted on some sites and commented on by users. Allowing people to put content in one place, where a large number of people they select can see it, makes the sharing of information quicker and easier and the large storage capacity makes it an ideal place for backing up photos.

The Poke

The poke is a unique feature to Facebook and provides the most basic form of interaction between users. While it was implemented without a specific purpose it is generally used to attract the attention of another user who is notified when they have been poked and by whom[161]. Its benefits may not be immediately obvious but it can often act as a precursor to further communication and provides a way of telling people you have not forgotten about them.

The Wall

Many sites provide a way of sending a public message to a user. This often takes the form of a comment wall. The wall is a space on a user's profile where other users that they are connected to can post messages, which will then be visible to any other user able to view that profile. These messages show the time they were posted and by whom. Any new messages appear on the user's individual news feed. This facility is generally used to leave short messages of a temporal nature where there is no concern over who can view them. The wall is often chosen for messages where time is important as they appear on the first page the users sees when they log in. In some sites, it is also possible to view the back and forth of messages on the wall between yourself and another user, allowing you to see the whole conversation together so making it easier to read.

Messages

The ability to send private messages to individuals or groups of friends, similar to email, is often provided on social network sites. While the use of messages is similar to email, it is not intended to replace personal email. Instead it is intended as a way for users to interact with each other privately through the site. Messages are generally used for briefer, more conversation-like communication than email and are likely to be chosen in circumstances where a message would previously be seen as too short for an email. Replies are kept with the original message so the thread of any discussion is kept together and displayed in a format which makes it easier to read than it would be in email.

Facebook has recently introduced a basic chat application to allow users to send synchronous messages, communicating in real time with those they are connected to. This integration of synchronous communication is often desired by users, putting everything in one place. However, more complete and established chat programs exist that are very popular. Many chat programs provide the ability to save conversations keeping a record of exactly who said what and when which can be useful for future reference.

6.1.2 Organisational features

Most social network sites provide ways of grouping users. These groupings can then be used to restrict access to content. The ability to create these groups can be restricted or open to any member of the site.

Groups

Groups or communities are often created around a shared interest such as a hobby or club. Membership can be restricted so the creator has control over who can join and can invite people to join and remove members if necessary. The group pages are often only viewable to registered members of the site. A group enables people to come together and discuss different subjects, providing them with a page showing a list of members and any activity. The ability to send messages to all members of a group is a common feature. By providing a space for discussions, it allows feedback to be gathered from the group and for asynchronous interactions amongst a larger

number of users. If the use of a group is to be effective it is important to regularly post new discussion topics to keep people engaged in the group and stimulate activity.

Some sites also provide an alternative to groups, which gives users more control over the features provided to members on their page and these pages can be made publicly viewable to non-site members if desired. Regular updates can be sent to group members. However, they are usually provided with an option to opt out of receiving these. Some of the more advanced group facilities allow the owner of the group to track its usage and be provided with statistics on things like how frequently it is being visited, by how many unique users, and who is contributing.

'Friend' Lists

Most social network sites are built around the ability to connect to other users. This can be a large and diverse number of people. The ability to organise this list of 'friends' and send messages to subgroups can be very useful. The way a user chooses to organise their connections is normally private and flexible to meet their individual needs. Such a feature is extremely beneficial to users who have connected to people they know in a social and business context and may wish to separate the content they see.

Events

Events are a useful feature that allows users to inform others about an upcoming event, including when and where it will take place. They can be created by individual users or associated with a particular group allowing the users to invite members to attend. A webpage is often created on creation of an event, which displays all relevant information. Access restrictions can normally be set on the event and any related content. If the event has a page this may provide users with similar features to their own profile, including the ability to upload photos and videos and post comments on the wall. Use of online events can provide a useful record of the attendance rate of events and the responses of those invited can be used to see if someone is regularly unable to attend for any reason. It does not however provide a mechanism for scheduling events for when users are available. Alternative applications outside social network sites which include people's calendars may be required to do this.

6.1.3 Account configuration

News Feed

Keeping up-to-date on what is happening on a social network site is important so many sites provide users with a news feed showing a list of the latest activity of users they are connected to. This feed includes things like status updates, file uploads, wall posts and reminders of any upcoming events or birthdays. These can normally be filtered allowing you to see only the information you are interested in. This at-a-glance knowledge when you log in to a site draws your attention to where new information has been added and provides you with direct links to view or respond to it. The awareness this provides makes it easier to keep up to date on users' activity, especially if you have a large social network of connections.

Privacy Settings

The ability to determine who can see your information is important as privacy concerns are high when sharing personal information. While many users still stay with the default privacy controls, sites offer the ability to control data to a fairly fine grain, including profile fields and photos. Most sites provide default options which restrict information and include groups such as everyone, only friends and friends of friends. Custom options can normally be created to include lists of friends and group members, giving users even more control over exactly who can see what.

Email notifications

To notify users of new activity email notifications are usually provided. Users can then select exactly what types of activity they wish to be notified of. These notifications help those users who don't check the site on a regular basis to know when there is new activity requiring action. If notifications are turned on for everything and a user has a large number of connections, the number of emails they receive could potentially be quite large. While this can contribute to information overload it is normally easy to turn them off.

Extensions

Many sites now allow users to configure their list of available features. Some are also expanding the default features of social network sites to include a more extensive

selection of Web 2.0 technologies. The inclusion of blogs on some sites allows users to give more detailed information about what they have been doing or what they are thinking and receive feedback on this. Wikis also allow the groups created to work collaboratively on a document without too much difficulty. These extra features all enhance the sites and add to the communication opportunities they provide.

6.1.4 Summary

By providing an important information and communication service to a pre-existing offline community, social network sites such as Facebook were able to use these offline behaviours to drive almost daily usage[162]. By giving users a high level of control of their account settings they are able to build up trust and give users confidence in using the site to share personal information. As with most Web 2.0 technologies, success is dependent on users. The more users contribute, the more useful the technology becomes. Some sites such as Facebook took advantage of this by increasing their audience to quickly build up a critical mass of users. Listening to the users is also important and many of the public sites are driven by the users' feedback, giving the users a sense of ownership and control. One of the key successes of social network sites is their ability to keep distributed groups of people communicating, even if it is indirectly, by providing users with a variety of simple communication mechanisms that require different levels of interaction. The simplicity of the interface also reduces the time taken to use the site and helps make it accessible to a large audience.

6.2 Social Networks in Projects

In this section, I consider how public social networking sites such as Facebook could be used to help communication in large scale projects and the drawbacks with this approach. With sites like Facebook being some of the most popular sites on the Internet, the likelihood of members of the project team and stakeholder groups already having accounts is high. These users are familiar with the interface and already understand how it works. If users already have an account this reduces the time taken to get started and using a site that they are already checking regularly would also help to gain a critical mass of users. Many organisations are capitalising

on the established user base of social networking sites to engage with their stakeholders although this is primarily being used for engaging with club members or customers. It is easy to see why using these sites would be attractive to support internal communications and there are many ways in which companies could use the features provided to their advantage for communication.

6.2.1 Targeting communication

One of the key problems observed in GEOMETER was determining who to send information to. As this was found to be difficult they resorted to blanket communication of everything to everyone, which led people to ignore large amounts of what they were being sent even if it was relevant to them. Social network sites allow groups to be created around shared interests. With large scale projects often involving a large project team split into sub groups working on different areas and a large variety of groups of stakeholders, this groups feature can be particularly beneficial.

Any member of the public sites can normally create a group, making it easy for the project team to establish those groups they require and invite people to join them. Although it is usually possible to create public groups which anyone can join, this may not be desirable when using a public platform, as control of who can participate and view information is likely to be important. Closed groups may be more appropriate, allowing only the content you choose to be viewable to non-group members. However, allowing users to choose which groups they join depending on the areas of the project they are interested in would be beneficial, allowing them to select what information they receive. To allow this on a public site, it would be necessary to have a group with access levels between that of open and closed groups, possibly where membership is moderated and users request to join. Very few of the public sites currently allow this level of control.

Using group pages, key updates could be regularly posted and the pages would give users a place to go where they could easily find the latest information. Team members would be able to target the information to each group, with the ability often provided to send messages to group members if needed. Using a social network site

instead of email for this could reduce the number of emails being sent. Users are also more likely to read information when they have actively gone to find it themselves, at a time that suits them.

6.2.2 More effective discussions

Creating a group would provide a space for discussions to be held. If a group was created for a group of stakeholders the team could post ideas which they would like feedback on. Group members could then use a discussion board to discuss these ideas, making it easy for the project team to gather people's opinions in a relaxed environment. By putting the discussions online it is easier to gather feedback from a larger number of users in a shorter time frame than would be possible in a discussion held in a meeting. The ability to gather their thoughts before sharing their opinion may also encourage more users to participate. Having the discussions online would also provide a useful record of who said what, which the team could use when addressing user concerns.

6.2.3 Easier sharing of information

Encouraging users to use the site to share ideas and issues they are having could also be beneficial. By discussing things online and making it easy to add your own experiences, information is more likely to be shared. It is easy for users to contact people across the organisation. With encouragement from the project team, users could help each other both in their understanding of what is happening and in the use of any software that is introduced.

The ease with which information can be shared on social network sites can also make the cascading of information easier. If everything is online it is easy to point users to a particular page or document that may be of interest. As mentioned previously, it is also easier to gain feedback on this information due to the ease at which discussions can be held.

6.2.4 Sharing of documents

While it is possible to upload photos and videos to most social networking sites, some of the most popular sites do not allow files of other types to be uploaded. Links can however normally be included to files hosted elsewhere, which may be useful, for example when gathering feedback on requirements documents. The ability to keep everything together, including the files would however make using the site more user friendly as some users may be confused if they are sent elsewhere to retrieve files.

6.2.5 Maintaining awareness

Difficulty was experienced in GEOMETER when the team developed silos. Groups could be used for people working on a particular area of the project to discuss ideas and share documents. By putting this information online and allowing the rest of the team to access it, everyone should be able to maintain more awareness of what everyone is doing. Care however would have to be taken to ensure access restrictions are set up correctly on public sites, due to the possibility of confidential information being discussed. The integration of services such as blogs to some sites could be used by team members to post brief updates on their work.

If the site was used by users of the new system to discuss the project, it would also help project team members to maintain an awareness of any concerns they may have or misunderstandings that might have developed and address these.

6.2.6 Knowing who to contact

One of the key benefits of social network sites is their ability to keep people connected. They work almost as a self-updating directory, storing people's contact details and providing simple ways of contacting them. This can be helpful for distributed groups who may not know each other. It is normally easy to view a list of members which can be browsed, with links taking you to that user's profile page where you can find out more about them. This can also be useful for stakeholders wishing to contact members of the project team. The key members of the team for that area of the project could be made clear when you view the group page. If kept up to date this is especially useful in large projects where staff change roles frequently

and team members leave and join, as this can become confusing for users. Combined with the ability to view the profiles of team members and send messages to them easily, it would make it easier for stakeholders to know who to contact about what. Being able to view someone's profile prior to a meeting with them can also be useful, allowing you to find out what they look like and to learn a little about them.

6.2.7 More effective meetings

The ability to create events could be advantageous to projects, especially if these events can be associated with groups. By creating an event for upcoming workshops, meetings or presentations, it is possible to invite members of the organisation to attend. When associated with a group it becomes easy to invite all the relevant people. Depending on the site used, at the most basic level, creating an event allows you to provide those attending with details of when and where it will occur and keep a record of who has responded and who will be attending. Keeping a record of who attends the meetings can be very useful to a project team in determining to whom they should target further communications.

The ability to post comments on a page related to the event is also very useful, allowing discussions to take place prior to and after the event has taken place. A link could be provided to the agenda allowing people to read it before hand and make comments. After the event has taken place a link could be provided to any outcomes which users could also comment on. The ability to continue discussions of meetings after they have finished in the same place as the record of what was said can be very useful to users who were unable to attend. By allowing them to contribute, their valuable input is not being lost.

6.2.8 Better web presence

Using a social network site would allow a project to maintain a more dynamic presence on the Internet. Unlike websites that are difficult to keep up to date, with lengthy processes being involved that have to go through certain people, updates can easily be posted on group pages by any member of the project. This ability to quickly and easily post updates or upload files might encourage the team to keep users more

informed on what is happening in their area. It can also vastly reduce the time between updates to content. The use of features such as RSS and email notifications also makes it easy to know when things have changed, and exactly what has changed which is a problem inherent to static websites.

6.2.9 Problems with using public sites

While it may seem to be an advantage that users already have accounts with the mainstream sites, these accounts will have been previously used for personal use and they will wish to continue to use them for this purpose. Their accounts may contain content they do not wish to share with work colleagues. While they provide quite fine-grain privacy controls, the most popular sites do not allow for the differentiation that many users would require if they are to use them for both personal and business purposes.

The use of status fields as brief individual updates can also be problematic as it again may be desirable to target these to different groups of contacts. A status message saying 'work is really dull' may be ok for personal contacts but would not be suitable for colleagues. A status message, which is more project specific, such as 'struggling to build the search to recognise the right codes' may be desirable for colleagues on the project team but not for other stakeholders or personal contacts.

By mixing the personal and business lives of users, more responsibility is put on them to be careful about what they post and who can see this. This then reduces some of the benefits of the site, as users are censoring what they post and this could affect the personal weak ties they are maintaining through its use. In their study of Facebook use in Microsoft, Skeels and Grudin found that, while users wanted to be able to discuss work information with colleagues, there was a high level of concern that this information may be inadvertently disclosed to the public[163], with some people finding that discussions could easily drift to topics that should be kept confidential.

Another limitation of using public sites is the inability to keep all content related to a project together. There is no way to link groups or have sub groups to create some

form of organisation. Each group is separate and it would be necessary to have links to each on a project page to allow users to see all groups that existed.

As previously mentioned, determining who can join groups and getting the access levels right on public sites can be difficult. It is, however, very important as if they are set up wrongly it could result in confidential information accidentally getting into the public domain. The project also has to be careful when selecting who to invite to join each group to ensure everyone can see all the information and contribute to all the discussions that are of interest to them.

Control of the information stored on the sites is also a concern. While a group administrator can edit information and content and remove members of a group, the data itself is still stored elsewhere, with the site controlling the database and its security. This may be a concern to some organisations. Not having the exact details of how and where their information is being stored can also make some organisations uncomfortable. The ability of the site to change its security policies and terms and conditions without consulting users is also worrying.

While the idea of using a public site to facilitate project communications would seem a good one, it may be more desirable to have a site that can be configured more to meet the needs of the organisation. The terminology used in the public sites including 'friends' and 'fans' is not ideal for use in a project and does not reflect the nature of the connections. If users have been active users of public sites for some time they will have established patterns of use that may have to change if it is to be used for work purposes. If the site were to be used during work time there would also be the temptation to spend time browsing personal contacts' updates, when they should be doing work.

6.3 Private Social Networks

Private social networks that run behind the company firewall provide an alternative to the mainstream public sites and offer the level of control often desired by organisations. By creating and controlling the site themselves, keeping it separate from public sites, the risk of employees inadvertently disclosing information that

should remain confidential is reduced. While access restrictions can be set on contact details on the public sites, use of a private site also makes users more comfortable disclosing personal information as they know that only those within the organisation can access it. Private sites are also free from advertising which some users may find distracting and off putting and organisations may be keen to ensure the usage patterns of users with respect to the project do not inadvertently give any advantage to competitors.

While some sites now offer a service creating and hosting private networks, this again raises concerns over the location of the database and worries about ownership and privacy of data. Social network sites can be created and run on servers within the organisation with minimal hardware requirements. Although many companies exist that will build and configure sites to meet the needs of the organisation, starting from the beginning is no longer necessary as open source packages are available that can be configured to meet your requirements.

By creating a private network the language used on the site and the look and feel of the interface can be tailored to be appropriate for the organisation. This can help give a professional feel while maintaining some of the informality in communication that makes social networks attractive. The use of a private site also helps keep the personal and private lives of users separate. While they may occasionally add personal content, this will be designed to be seen by others involved in the project.

6.3.1 Elgg

Use of an open source package minimises the set up costs to the organisation, making them more likely to give it a try. However, some minimal configuration will always be necessary. Elgg is an open source platform that allows you to create your own social network site. Like Facebook, it is based on a relational SQL database which stores all the information regarding users and content. Passwords are stored in encrypted form and the database itself is password protected. PHP scripts are then used to access the database and generate the web pages. Elgg provides blogging, file sharing, networking and news aggregation features with additional plug-ins to extend its functionality and provide features such as wiki pages and a calendar.

An online network of developers who work on the system also use a version of the platform for discussing issues and problems, with a repository for patches to fix any bugs that are found, providing on going support.

Like most social network sites, each user has a profile page where they can input details about themselves and the individual fields can be configured for their specific context. An example can be seen in Figure 6. Connections can then easily be made via these profiles to other users of the site.

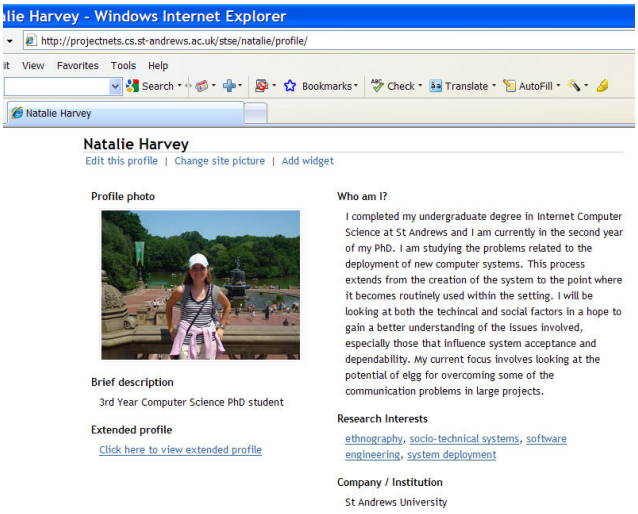

Figure 6 An Elgg user profile

The ability for groups of people to get together and discuss things online is particularly useful for projects and is provided through the creation of communities. Each community has its own profile page describing its purpose and listing its members. Communities can be created by any user and this user can then invite people to join and moderate membership if they wish. While it is generally the case that users choose to join a community of interest, it is possible through manipulation of the database to put users in some communities by default.

Blogs provide the main method of adding content to the site, with users being provided with a personal blog which they can post information to, including images, videos and links to files. Each community also has its own blog where any of the community members can post information. Like most blogging engines it has a

simple and easy to use interface which allows content to be added quickly, minimising the effort required by the user. The ordering of blog posts, with the most recent appearing at the top, makes it easy to see new content and past posts provide a useful record of discussions and decisions made and who was involved.

Users can add comments to the posts (Figure 7) allowing the discussion related to that topic to be kept together and making it clear who said what and when, one of the key benefits of such a system over email. The sequential ordering of the comments also makes discussions easier to follow than if they were carried out using a mailing list.

Each user and community also has their own file repository, which they can organise using folders of their choice and to which documents of many types can be uploaded. This is particularly beneficial for documents such as minutes and agendas for meetings and requirements documents and specifications which may require discussion. The system does not however provide any version control of the documents uploaded and if a new version were to be added it is important to remove the old one.

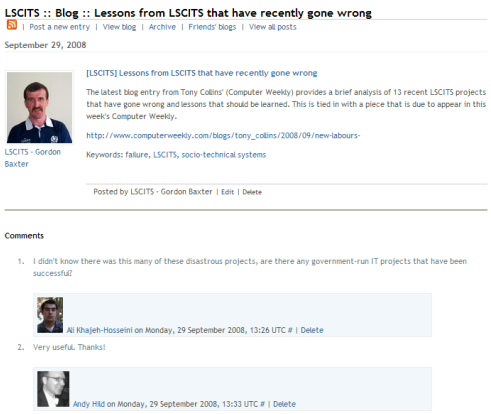

Figure 7 A discussion on Elgg

Access controls and security

One of the key concerns with any online system is security and privacy of information. This is addressed particularly well in Elgg with the ability to set access controls on individual content uploaded to the system, including files and blog posts. The default options are private, public and logged in users however these can be

supplemented by finer grained controls if desired, including communities and groups of people you are connected to. While the emphasis is on the user to set the access restriction, the default is logged in users ensuring that, if this is not changed, information still remains within the project.

The system also operates a spam control mechanism and the ability for users to flag unacceptable content. While these features should not be necessary in a project, they give the organisation greater control over what is and isn't acceptable than they would have on a public site where the policies are set externally.

Keeping up to date

One of the key issues with online systems is keeping aware of new content. The Elgg platform provides a variety of mechanisms to help with this. Each user, blog, file repository and keyword has an RSS feed associated with it, allowing users to check for new content without logging in to the system. Individual blog posts can also be marked as interesting, allowing users to keep up to date on new comments that are made to them. Users can choose to turn on email notifications which will send you an email when new content has been added, however exactly what you are notified of cannot be specified. Once logged in to the system, the User Activity section, as seen in Figure 8, acts as a news feed, providing at-a-glance knowledge of all recent activity. The variety of features provided by the site to keep up-to-date with new content helps to provide users with the Facebook-like awareness of project activity that many users desire[163].

Tags

Organisation of the information on the site is provided via the use of tags. Users tag content with keywords that describe it and these can then be searched for or browsed via the tag cloud. The ability to easily find information is important if users are to be encouraged to use the site and the use of tags helps create an organisation that is flexible and tailored to the specific project.

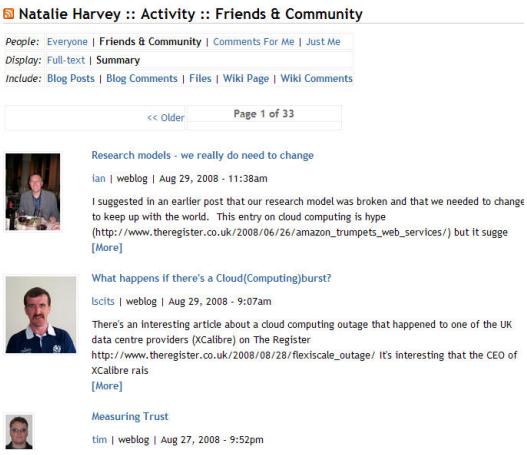

Figure 8 User Activity feed in Elgg

Additional features

Extra plug-ins can be easily added to Elgg to provide additional functionality. These include a calendar plug-in which allows a user to create events associated with a community, and a messages plug-in allowing users to send each other messages within the site. It has been suggested that the use of Facebook encourages more frequent contact than email [163] and including an extra way to communicate through the site may help replicate this on a private network. A wiki can also be added and the collaborative working aspect of wiki pages may be beneficial for the preparation of project documents.

6.3.2 Conclusions

Many organisations use Facebook as a way to encourage their employees to keep in touch and interact outside work as they believe this will help increase productivity. Organisations are also now using Facebook pages as a public presence on the site as part of their marketing effort. There are, however, many limitations to the use of sites such as Facebook and additional features regarding the organisation of groups and information may be desirable to make them more useful. There are also implications for security and privacy of data. Keeping control over the content of a site is important to organisations, especially on new projects where information may be sensitive. As SelectMinds found, a large number of organisations are not comfortable with the use of such an open public site[137].

Social network sites do, however, have a large number of benefits for communication, providing a place for project groups to discuss ideas and concerns and allowing the team to keep aware of feelings among stakeholders. Skeels and Grudin found that while users were concerned about combining their personal and business lives on Facebook, they still desired much of the information and tools it provided for use in their work projects[163].

With the benefits of social network sites being acknowledged, an alternative to the mainstream public sites is necessary so organisations can have the control they desire. This needs to be designed to meet their needs and those of the project. Private social network sites internal to an organisation provide this alternative, provides a safe environment for communication that can be configured to their requirements. Learning from popular sites like Facebook can help build private networks that users will find easy to use and beneficial to the project. The success of sites like Beehive at IBM demonstrates that such sites can be effective for staying in touch and sharing expertise but the question is whether their use can be extended to be used as a communication tool to keep discussions alive and two way communications on going among large numbers of distributed stakeholders? Open source platforms such as Elgg provide a cheap and easy way to get started, with minimal hardware requirements and installation costs. Their use can be aimed at the context of a project without the associations and norms people may have already developed towards their use of public sites.

The next chapter will describe the process taken to develop Elgg for use in a large scale distributed research project and an administrative systems project.

Chapter 7 Developing Elgg

In this chapter, I present the method used to investigate the use of online social networks using the Elgg platform. The primary question is whether the use of such a site can improve communication amongst stakeholders in large scale projects? It is also interesting to see if different groups gain different benefits and what these are. While analysis of usage may indicate areas in which the site is beneficial, it will not provide a definite answer to the question and will possibly suggest further areas for investigation. Due to the large number of problems encountered in the GEOMETER project and the constraints on their resources, it was not possible to test the approach there so alternative case studies have been used.

At the time of development version 0.9 of Elgg was being supported. However, this has recently been superseded by version 1.0 in which a large number of changes have been made to both the interface and the file and database structure. While version 0.9 is no longer supported it was decided to continue with this version as no easy path to upgrade was available and experience had been gained in its organisation. As with tailoring ERP systems, there was also the chance that upgrading would cause configuration changes to be lost.

When describing go-live strategies for groupware systems, Orlikowski suggests two options: deploying the technology widely in the belief that through experimentation and use over time, creative ideas and innovations will flourish; or prototyping the technology in a representative group of the organisation on a pilot basis and then deploying it to the rest of the organisation, once the technology's capabilities and implications are understood[20]. A combination of both of these strategies was chosen for deploying the Elgg social network.

As the system being used is an open source platform that requires configuration, an evolutionary approach was taken to develop the site. This was necessary to ensure bugs were removed and to help tailor the system to meet the requirements of different users. As many of the system's features are implemented through the use of plug-ins, an evolutionary approach also allowed many of these to be tried to see which are most

useful, allowing less useful plug-ins to be removed. The size of the user group was slowly expanded and the site was applied to different scenarios in an attempt to investigate its usefulness. This way the required structural and cognitive changes learned through the pilot project can be transferred. The system was in operation for a long period of time to allow sufficient data to be gathered on the use of its various features to provide an insight into its possible benefits and, if useful, will continue to be maintained.

If users find the site beneficial for communicating there would be an expectation that a wide variety of users consistently log in and provide content. The difference between the number of users logging in and actively participating and those that simply use the site for information gathering will also give an indication as to users' motivations for using the site.

A combination of both quantitative and qualitative data has been collected, with the qualitative data being used to accompany the analysis of the figures. The quantitative data is collected via the weekly execution of SQL queries on the database behind the site. Semi structured interviews were used to find out in more detail what people thought about its use. The data collection process is explained in more detail in section 8.1.

This chapter presents an outline of the development process and subsequent implementations of the system in two project settings.

7.1 Preliminary Feedback

The site was initially deployed locally within the Dependable Socio-Technical Systems research group in the Computer Science Department. Over a period of several weeks, users were encouraged to experiment with the different features of the system and to actively participate in its use. They were encouraged to use it to document what they were working on and to open up or continue discussions with other members of the group. If any bugs were spotted they were reported through the system by tagging a blog post with the keywords bug and Elgg. These were regularly checked for and prioritised, based on the development time required to fix them and

how often they would be encountered. The proximity of the users' offices to that of the system administrator and the regular meetings held by the research group meant it was easy to get in contact and discuss any problems they were having and clarify any areas that were causing confusion.

After this initial period of use, semi-structured interviews were carried out to identify any key issues with the system that needed addressing before opening it up to a larger user base. From these it was clear that there were areas where improvements could be made to make the site more usable and guide future users.

In the interviews, several users raised issues regarding aspects of the interface they found confusing including the inappropriate labelling of certain sections and the variety of controls being used. While it is recognised that there are a large number of controls used and that their use is sometimes inconsistent, most public social network sites use similar ideas. Although it may not be entirely intuitive, after a short period of use you become familiar with the layout. One user commented that although it may not follow good HCI principles, most interfaces don't and described the interface as 'quirky but usable'. Using the feedback from these interviews, any confusing names were changed to ones that gave an indication of their functionality in a hope that this would improve the site's usability.

After the site had only been in use for a few weeks, the amount of experimentation with the different features seemed to quickly slow down. This, however, is a phenomenon observed in the introduction of most new systems [31] and the introduction of new features can often help increase it again. It was decided that this was not a major problem, as the primary benefits that can be gained from the use of the social network system come from its basic features.

Related to the lack of experimentation was a lack of awareness of certain features of the site. In the user documentation, the decision was taken to focus on the basic features that were needed to get started and allow users to experiment with the others if they desired. This meant that sometimes potentially useful features such as the ability to organise files into a hierarchy and the use of widgets were missed. Others, which they were aware of such as the calendar plug-in that it was thought would be

useful, were ignored due to issues in their usability. RSS was also seen as a potentially useful feature. However, guidelines were needed to make users aware of how it works and the benefits it could bring. It was decided that users should be made aware of some of the site's more advanced features and these were posted on the 'Getting Started with Elgg' community, which was designed to help users with how to use the site.

One of the main issues that came out of the interviews was that users were unsure of when to use which feature and that this had led to inconsistencies. Although this may not cause problems with a small user group, it may be more problematic when opened up to larger numbers. The idea of the test period was to allow users to experiment and it was hoped that in doing this best practices would become clear. This, however, did not happen with most finding their own individual ways of working. The main issue was when community spaces should be used, as opposed to individual ones. As it was decided that some guidelines for use were necessary, decisions were made in discussion with some of the current users as to when each sections' use would be most beneficial. Guidelines were then produced and posted on the site in the 'Getting Started with Elgg' community and circulated via email. Some users also commented that it was hard to determine when to use email as opposed to the site. It was decided to leave this to the discretion of the users in the hope that norms would develop over time.

As with many social network sites, the term used to connect to other users is 'friend'. Some users commented that this was not reflective of the connections they were making and that it might be a little too informal for use in a work setting. While this point was recognised, during discussions it was difficult to find a term that reflected the variety of connections being made so it was decided to keep 'friend' until a better option could be found.

The use of the tag cloud also caused problems, with some users being unfamiliar with the idea of tagging. One of the problems was the use of similar tags meaning the same thing, for example the use of plurals. By allowing users to select tags from tag cloud as well as creating new ones it was hoped this would be reduced. As the amount of content on the site increased the size of the tag cloud grew and this made it

virtually unusable. It was suggested that it be made domain-specific in the hope that this would make the more relevant tags easier to find. This change was implemented. The limited search capabilities of the site were also discussed and, although requests were made for a more complex full text search, the development time for this was deemed too great. Instead the search functionality was extended to allow a combination of tags to be included using basic Boolean expressions.

Most users simply adopted the default access restriction of 'logged in users'. This was not seen as a problem as very little confidential information was being shared on the site. If the site were to be opened up to the public at a later date, it may become more of a concern. Past research into the use of access controls on private social networks such as Beehive has suggested that they are adopted much less often than in public sites as people want to share and gain feedback and are aware that the access is already restricted[122].

Overall users seemed to feel that the main issue with the site was simply one of adapting their work practices and adjusting the way they think to incorporate the site's use. The lack of a hierarchy also takes some time to adapt to, with the site being used by professors, post doctoral researchers and PhD students. Everyone, however, agreed that it had made threaded discussions much more efficient and that it could develop to be extremely useful for sharing information with the different sites across the project.

7.2 Expansion to LSCITS

After developing and configuring the system through a period of experimentation with a small group, the next phase was to expand its user base. As many communication problems occur due to the distributed nature of teams, it was decided that this would have to be a feature of the next test group. In this section I present the second round of testing, using the site with a large distributed research project. I will briefly describe the project and why it was a suitable case study, followed by the process used to introduce and administer its use.

7.2.1 LSCITS

LSCITS is a large-scale research and training initiative involving researchers from five UK universities. While the initiative involves both a training and research programme, focus for this experiment was the members of the research programme, which is due to run until 2012. At each university a group of researchers is investigating one particular area of the research agenda although much of the work will involve communicating with the partner institutions. Expanding the system to include all LSCITS members increased the user numbers to 33.

The selection of LSCITS as a case study may not seem completely obvious as it is a research project rather than one involving system deployment. However, it shares many of the same characteristics and hence has similar communication problems. Like many large scale projects, the members of LSCITS were spread across the UK making it difficult to schedule regular face to face meetings which large numbers can attend. Although the majority of members are from an academic background, they were from a variety of disciplines and at different levels of education, making it similar to deployment projects, which involve a variety of stakeholders.

The principal investigators on the project recognised that email was not efficient for having discussions with large numbers and that an alternative was necessary as these discussions were useful for research. In previous projects they had attempted to use shared file repositories and wikis to encourage collaboration and bring the project together as a whole. However, these had been generally unsuccessful, failing to gain enough users to be beneficial. It was often desirable to gather feedback from other members of the project on research ideas and documents and something was needed to facilitate this process. It was also necessary for the principal investigators to be able find out what everyone was working on, so that they could produce reports on the projects progress. While email could be used for this it did not provide an archive of previous work and they were not viewable by all members of the project.

The project had already been running for a year and as it had an upcoming plenary meeting this seemed the perfect time to introduce a new system. The division of the project into smaller research groups based at different universities also made it an

interesting case to study, as it would provide the ability to observe how communities within the site are used. The recognition that there were communication problems and that something was needed to help made them open to trying a social network site. A public blog had already been established for the project for announcing information to the public, further demonstrating their willingness to try Web 2.0 technologies. The involvement of our university in the project also meant it was easy to gain access and help promote the site's use.

7.2.2 Getting started

It was initially intended to re-configure the site after the feedback from the local installation, removing features that did not prove to be useful, and to go-live with a clean installation. After discussing this with the existing users it was decided to focus on making changes that would improve usability and continue to use the current installation. This also avoided copying the existing data to a new installation as no quick and simple method existed to do this. By keeping content on the site we hoped this would encourage new users. Once the site was ready user accounts were created for the members of the LSCITS team shortly before their next meeting, which most would be attending. While there was a chance that they may delete the initial email containing the login details effort had been made to ensure they expected it and were aware of what it would be for.

At the meeting, a demonstration was carried out by one of the principal investigators and early adopters of the site using a demonstration user account. This allowed the key features to be shown, including how to set up your profile and how to make and comment on blog posts. Although some guidelines had been created with suggestions of how to use each feature of the site (Appendix D) it was decided not to emphasise these and see how the new users chose to use them. A simple user guide (Appendix C) and these guidelines were linked to in a blog post and users were pointed to this for extra help. While a community was created for general group discussions about the project, membership was left as optional with users being told that it existed to encourage them to browse the site. It was decided to leave it to users to decide if they wanted communities for each university or just one for the larger project rather than

prescribe how the site is used. This would allow the creation and use of communities to be observed.

As with any new system, top management support was seen as critical. In the LSCITS project, two of the principal investigators were keen to make the site a success and determined to lead by example, setting up their profiles and actively participating. It was hoped that by doing this and making people aware that they could find out about things sooner by checking the site it would encourage the new users to log in. The continued use locally was also seen as beneficial as this helped build content and show the site was being used regularly.

Chapter 8 will look at the data collected from the site regarding its use and what this suggests. The results of semi structured interviews held with the users will also be discussed to see if they corroborate the findings.

7.3 ASP

ASP, an administrative systems project, is being led by Business Improvements at St Andrews University. Business Improvements is a university department responsible for managing the business systems and data flows involved in university administration and its activities include the procurement or in-house development of new business systems. The project was established to improve the university's information infrastructure in the areas of Human Resources, Payroll, Finance and Research Grant Management through the implementation of a single integrated system. The project's main aim was to enable these university units to provide a high quality of service to the rest of the university and any external bodies that require it. The project's objectives include improving data management, increasing the transparency and accessibility of data, improving data quality and integrity and providing staff with the skills and knowledge required to do this through the use of the new system.

Prior to the project, the last major investment in systems for these areas was in 1999 and budgetary concerns were often the lead concerns when making system choices. This project intended to first critically evaluate the current systems and the quality of

the data they provide to determine where improvements are needed and what is actually required and then choose a system based on these findings. Like many projects aiming to introduce a new system, its focus was not purely on the technology but also includes the current business processes of the units. These may need to change to improve efficiency and allow the project to fully achieve its objectives.

The initial core project team had approximately 25 members from the respective business units. However, a larger number of members of the university community were also involved. The project team were responsible for choosing and delivering the system on time and on budget and implementing any changes to business processes. For a project of this scale, they estimated a length of 30 months with a go-live date of October 2010.

A Steering Group was established which reported to the Principal's office and they were responsible for overseeing the project. Their role is similar to that of the Project Board in the GEOMETER project. Their responsibilities included setting the project framework and deliverables, monitoring its progress and ensuring the relevant resources were available to the team.

After becoming aware of the work that had been undertaken in studying the GEOMETER project and the use of Elgg in LSCITS, the Project Manager was interested in any advice that could be given to help them in their project. A meeting was held in which the problems encountered in GEOMETER were discussed and the Elgg site demonstrated. From here it was decided to go ahead with a deployment of Elgg for the project and a further meeting was held to determine how the site should be configured.

The initial plan was to use all the features of the site including the wiki, calendar and messages plug-in, and to use the site as a project website. However, it was unclear how beneficial this would all be to the project. The site was configured to match the St Andrews University look and feel and guidelines were created explaining how each feature would be used. As the structure of the project was unknown at this stage, a single community was created for the project team with users being automatically placed as members. An email was sent to the project team including the user guide

and guidelines produced and explaining that they would receive login details shortly. The site was then demonstrated at the kick off meeting for the project.

Initial feedback from the meeting was mixed, with many being confused as to exactly why they would use it and what each feature was for. There were also issues with respect to the terminology used in the site, with the terms wiki and blog being unfamiliar to some users. In response to the feedback from the meeting, further changes were made to the configuration of the site, including removing the calendar plug in and wiki and modifying the language used. As the project started up, communities were created for each of the subgroups and populated with members. It became clear at this stage that the project team would include a lot more than the core 25 members that were initially planned. At the time when the site was fully populated with users and all the communities were created, it had 23 communities, including one to which everyone was a member, and 121 users.

After a short period of time it became clear that the site was not being widely used. The project manager gathered feedback and suggestions for improvements from some of those who had used the site. In light of this feedback, further extensive configuration was undertaken removing a large number of features from the site and simplifying the interface. The aim was to make everything as easy to access as possible and minimise the effort required to use the site. The site now had only community blogs, shared file repositories and personal profiles.

An email was then sent to all users on the site informing them of the changes. This included updated versions of both the user guide (a simplified version of Appendix C) and guidelines for use (Appendix E). It was hoped that the email would stimulate people to go in and have a look. At this stage there were many problems with users having lost their login details and it became clear that some had never received them, possibly due to their email clients treating them as spam. Effort was made to ensure everyone had their details and, at the request of some users, 3 training sessions were held. In these sessions, the simplest way to use the site was demonstrated, focussing on the way in which the majority of users would use the site. While the leads in each sub-group would be responsible for uploading project related files and posting new discussions, the majority of users would only be expected to add comments.

Feedback from these sessions was positive and further suggestions were made on how the site could be improved.

One of the suggestions made was for more extensive email notifications to remind them of the site and make them aware of new information. This feature was implemented for all new content to communities in which users were members of and turned on by default for all users. It was felt that by turning it on for everyone and forcing users to log in to opt out they may either be encouraged to log in and change their settings, or, on receiving an email notification, follow the link and log in to view the new content.

The site was then left in use in the project with team leaders being responsible for uploading minutes to meetings for users to discuss. How the site was used and the usage patterns will be examined in the next chapter, looking at usage statistics from the database.

Chapter 8 Data analysis

The aim of the investigation was to try and improve communication amongst distributed participants in large scale projects through the use of a private online social network site. At the time of this analysis, Elgg has been in use for approximately 12 months within the LSCITS project and approximately 9 months in ASP. Its use will now be examined to see how successful it has been.

There are 5 parts to this chapter:

1) The data collection process used to gain the qualitative and quantitative data is briefly described.

2) The results of the LSCITS site are presented, looking at the quantitative data on site usage.

3) Use of the site is examined further, looking at the motivations behind its use and the experiences different users have had. This is done using feedback gathered in a series of semi structured group interviews with members of the project. User's perceptions of the benefits gained and the impact they feel it has had on communication is also be discussed.

4) Results from the use of the ASP site are discussed in this section, looking at the quantitative data collected from the database.

5) A discussion of the feedback received from users of the site is presented. Reasons for the use or lack of use of the different features are examined and users' opinions of the site and its use are discussed.

8.1 Data collection

As all content entered on the site is stored in a database, weekly SQL queries were run on the various tables and reports generated for analysis. The SQL queries can be found in Appendix A. Each type of content was stored in a separate table in the database, with information regarding when it was added and by whom. While the results from the database do not show the benefits, if any, that are being gained from using the site, the usage patterns should give an indication if users are finding it helpful. A larger number of people logging in will indicate that they are motivated to use the site. The qualitative data from the semi-structured interviews should help to reveal what these motivations are.

By querying each table, it will be possible to show which features are getting the most use and this could be an indication of which are providing the most benefit. The perceived benefit on the part of the user will be used as a measure of the usefulness of the site, with those directly related to communication and collaboration being of most importance to the experiment. This will be derived from the discussions with the users.

Due to scheduling issues when arranging interviews with users of the LSCITS site, it was only possible to meet with 5 users at Bristol, 3 at York, 3 at Leeds and 1 at Oxford. However, as their level of use and role in the project varied it should provide a good representation of the feelings in the project. It was also decided not to interview users from St Andrews. Previous feedback had been gathered from them and their levels of use had remained much higher than at other universities. It was also felt that their closeness to the experiment may bias results. Due to the busy schedules of many people in the university, it was not possible to meet with users of the ASP site. Instead feedback was gathered via email from 6 users at various positions in the project and who showed varying levels of use.

8.2 LSCITS qualitative data analysis

8.2.1 Logins

While an attempt was made to create a log in table to store who was logging in and when, the data stored in this table contained too many errors to be useful. Many log in entries did not have corresponding log out entries and vice versa, and while this could be due to users often not logging out there were other problems with the data. Some entries were missing user names, possibly due the way sessions were stored in Elgg interfering with the usernames being entered. Instead, the user table was used to analyse logins. This stored the last activity date of each user, and when queried weekly, could be used to give an indication of the number of people logging in.

During the first couple of weeks, the site had only a small number of users who were experimenting with its use, several of which were not on the LSCITS project. While it has continued to be used by these local users, the activity of those who are not members of LSCITS has not been included in the statistics analysed. When opened up to LSCITS, the user base increased vastly and it is from this point that the data was collected. Using the weekly data from the user table, a table was created to store the number of users logging in each week. This value was then converted to a percentage of the total number of LSCITS users to give an indication of the level of use. The use of a percentage allowed the slight increase in the number of users when LSCITS gained new members to also be taken into account. Figure 9 shows a 4 week moving average percentage of LSCITS users logging in to the system, up to the point of writing. A moving average has been used to minimise the effects of usage fluctuations and help to show the general trend of use.

This graph shows that after only a few weeks the site quickly established a login rate of over 50% of users. The maintenance of this level suggests that critical mass was quick to be established, with users finding a benefit to logging in and the trend also appear to be for a gradual increase in the number of users logging in.

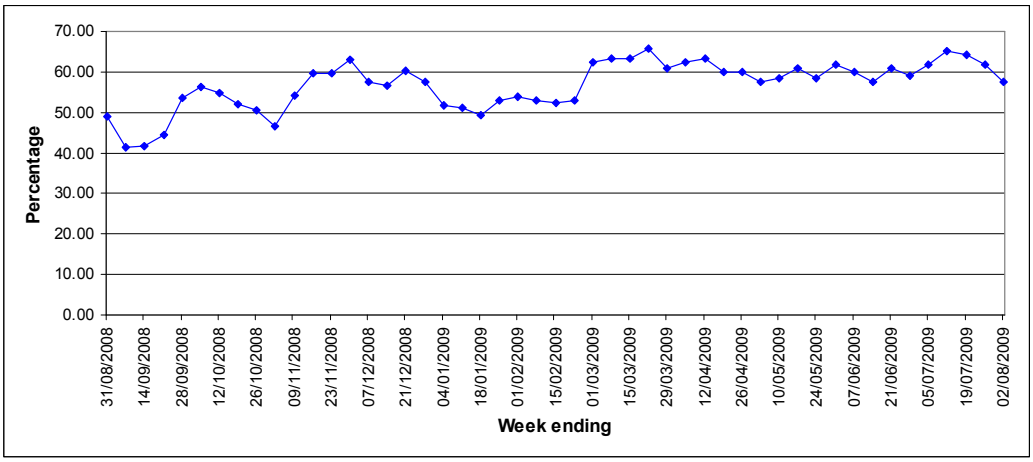

Figure 9 Percentage of LSCITS users logging in

In order to examine this further, it is necessary to look at if these users are actively participating in the site or only logging in as passive users to read content added by others. High levels of active use will suggest that the site is being used for communication with other researchers on the project, rather than merely as an information gathering tool. This is not to say that passive use is not useful as this is a form of one way communication. How useful the site is for others wishing to find out what people are working on is, however, dependent on everyone adding content. Figure 10 shows the number of users logging in relative to the total number of users on the site and how many of those logging in are actually contributing content.

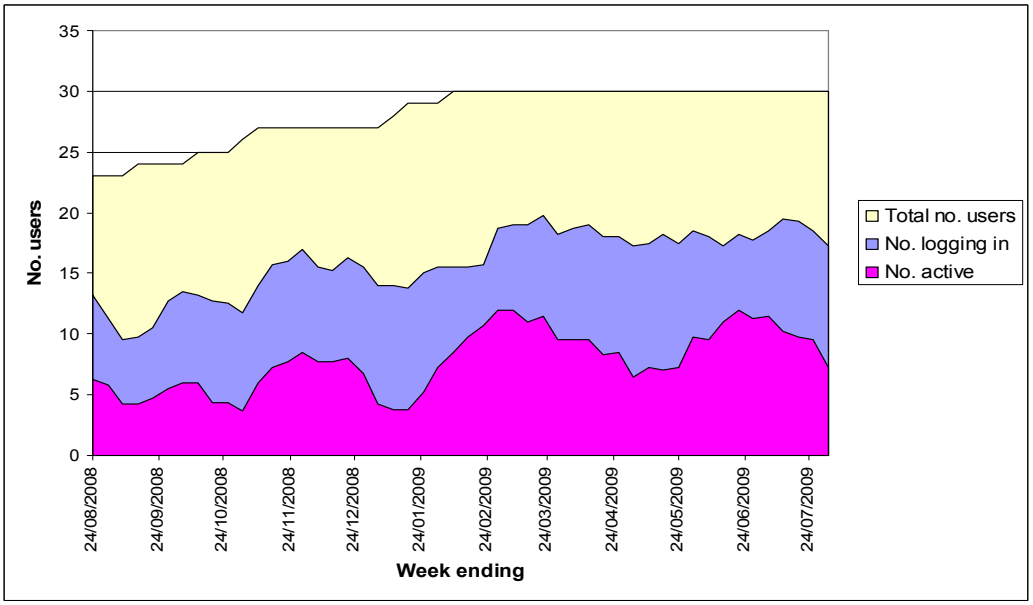

Figure 10 Active and passive use of the LSCITS site

While it shows a considerable difference in the numbers actively and passively using the site, there has been a gradual increase in both over time. This is positive and suggests that, as more users begin to use the site and more content is added, it is becoming more useful. The more users the site has and the more content that is added, the higher the motivation could be to log in and check it. The only considerable dip in site activity is over the Christmas and New Year period where active use dropped considerably. It is interesting, however, that passive use only experienced a small dip, with users still checking the site. This suggests that for a group of key users, logging in to check for new content has become part of their daily routine. While these results are positive, it is unclear where the activity is coming from and if certain universities, in particular St Andrews, are dominating the usage. The high percentage of users logging in, however, would suggest use at other sites, with St Andrews only having 5 members and accounting for only approximately 16% of the LSCITS team.

Appendix B contains graphs similar to Figure 10, showing the usage patterns of the site over time at each of the participating universities. While it was expected that the level of use at St Andrews would be higher and fairly consistent, it was also expected that the other universities would follow similar adoption patterns. Although there has been a gradual increase in use at all of the universities there is considerable variation in when this occurred.

The introduction of progress reports in October 2008 seems to correspond with the sudden increase in active use at Oxford. This should be clearer when the use of the individual features and the frequency of use are examined further. An increase in use at Bristol was also seen at this time. The patterns of logins and activity at Leeds and St Andrews are fairly similar and consistently high in comparison to those at the other universities. The considerable differences in the patterns of use at the different universities are surprising. Further investigation is required to see to what extent their use of the site varies and why this is the case.

In order to determine more clearly if use is spread across the project; a desired outcome as it is intended to increase communication across the universities, it is necessary to probe more deeply into how each university uses the site. Figure 11

shows the average percentage of weekly use at each university and what proportion of this includes active participation. A percentage has been chosen to make comparisons easier, as the number of researchers at each university varies considerably. While this shows that use at St Andrews is considerably higher than at the other universities this is to be expected as it was the university at which the site was launched, and its use was actively promoted there from the start.

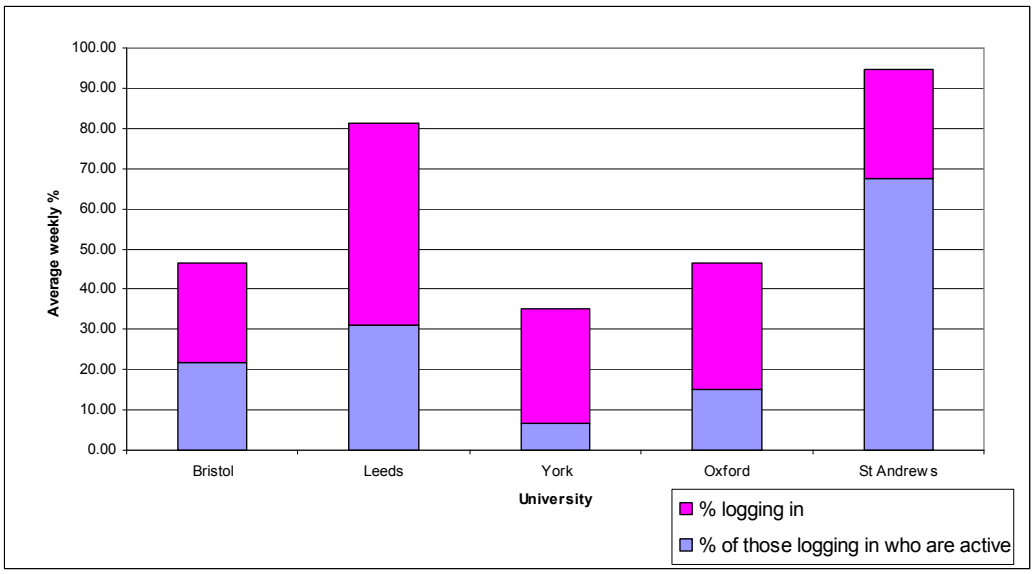

Figure 11 Weekly active and passive use across the LSCITS universities

This also shows that Leeds has a very high rate of users logging in. However, the percentage of those who are active is considerably less and similar to that at Bristol. The chart also makes it clear that York and Oxford have much lower levels of activity in the site on a weekly basis. When taken on a 4 week basis, as seen in Figure 12, the figures change slightly, most notably showing an increase in the number of active users at Oxford. This could be due, as previously suggested, to the monthly progress reports that are submitted. However, as not everyone submits these it will only be clear when the types of contributions are investigated.

It is also interesting to see that, when looking over a longer time frame, the domination of St Andrews is a lot less prominent, with Leeds having similar levels of activity. When taken over a month, the figures also show a fairly consistent high level of logins over the participating universities, including York, even though the level of active use there is much lower than everywhere else. This will be examined

further in the semi-structured interviews with the users in an attempt to find out if there are reasons why they are choosing not to participate, and what benefits those who are logging in are gaining from reading the content added by others. The high login rate across the universities on the project is, however, an indication that some benefit is being gained from using the site and this is supported by the maintenance of this rate over the 12 months it has been in use. The nature of this activity and if it includes communication with users at different universities will only become clear through talking to the users about exactly what they use the site for.

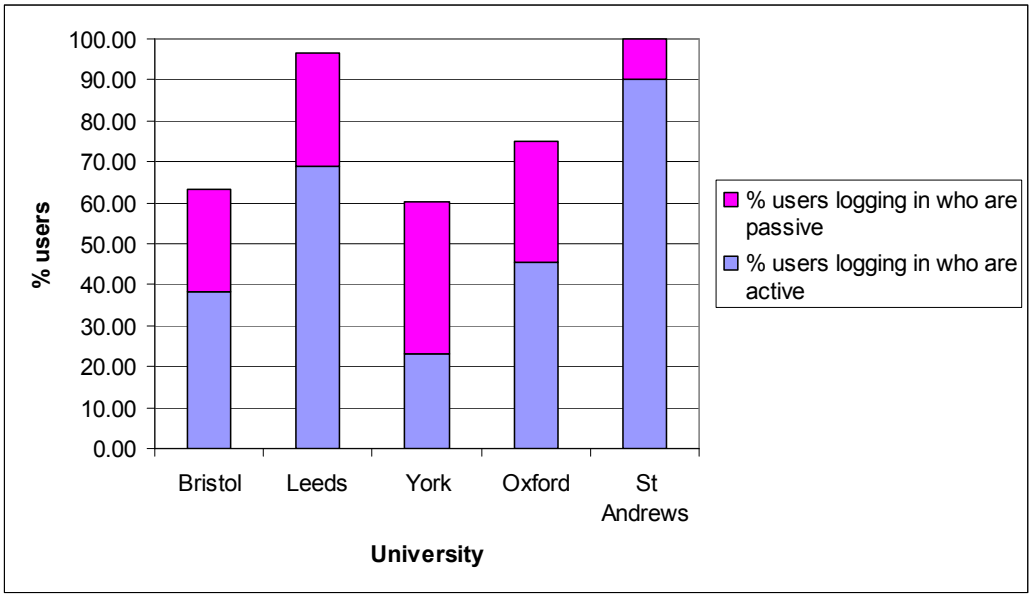

Figure 12 Monthly active and passive use across the LSCITS universities

8.2.2 Feature use

The social network site provides a variety of ways of adding content including blog posts, comments and files. Looking at which features are being used most it should be possible to see how the site is being used and where the benefits are to be found. When comparing the figures for the number of contributions of each type it will be necessary to consider what they would be used for and how this would affect their expected level of use. While all the features could be beneficial, you would maybe expect higher numbers of comments compared to blog posts if discussions are held on the site and possibly a lower number of file uploads in comparison. Although use is often dependent on the nature of the content, with posts on certain topics often attracting larger numbers of comments, a fairly consistent level of use has been seen

for each type of content and this can be seen in Figure 13. As expected the number of comments fluctuates considerably, with it seeing much higher levels that other types of content at times, possibly due to particularly active discussions. The number of blog posts also increases after the introduction of the monthly progress reports. The number of files being uploaded to the site has remained fairly consistent throughout its use. The end of the graph sees a drop in the amount of activity on the site. This is in part due to it being the summer period, with many people going on holiday.

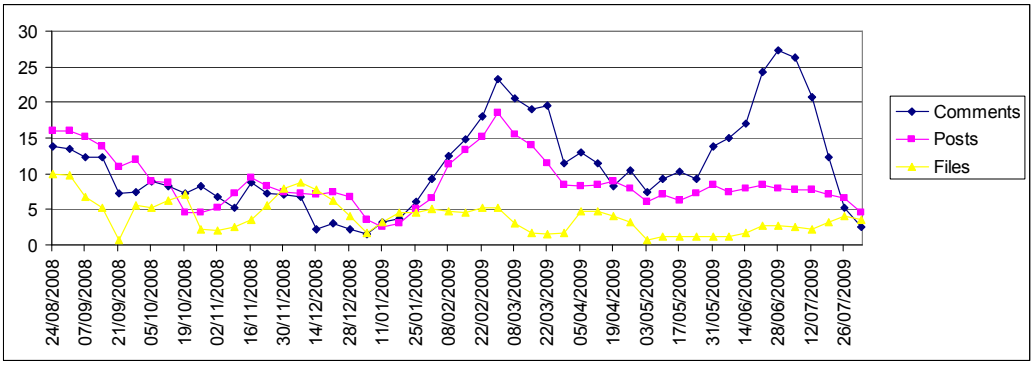

Figure 13 Feature use on the LSCITS site

By splitting use across the different universities, it should be possible to see if there are any general patterns in use. While it is expected that the exact levels of each type of activity will vary at each university, a similar pattern should be observed.

Figure 14 shows the average number of contributions per head over a four week period. This has been calculated by dividing the mean number of contributions of each type by the number of users at that university. This also shows the differences in the level of activity at the different sites.

Despite the differences in the number of contributions, both Bristol and St Andrews appear to have the expected pattern of use, with comments being the most frequently used feature followed by posts and then files.

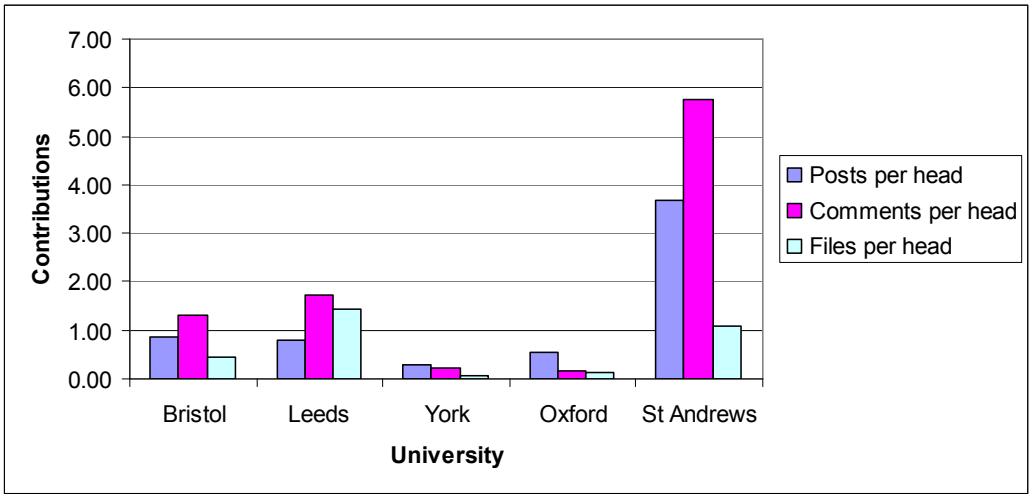

Figure 14 Average monthly contributions per head of each type across the LSCITS universities

This chart again demonstrates a very high level of use at St Andrews. Perhaps more surprising is the low level of active use at Bristol in comparison to Leeds which has considerably fewer users. The pattern of use at Leeds is also interesting, as while comments are higher than posts, the number of files being uploaded is higher than at all the other universities.

Figure 15 shows more clearly the makeup of the usage at each university, particularly York and Oxford who have very low levels of use. By looking at the percentage of total use each feature contributes it is easier to compare the usage patterns across the universities.

Most notable on this chart is the dominance of the use of blog posts at Oxford. Combined with the relatively low levels of use for comments and files, the lower levels of weekly participation and the date at which active use at Oxford increased, it would suggest that this is due to the site being used predominantly for monthly progress reports. These take the form of a blog post and closer inspection of the titles of the blogs posts made by Oxford supports this theory.

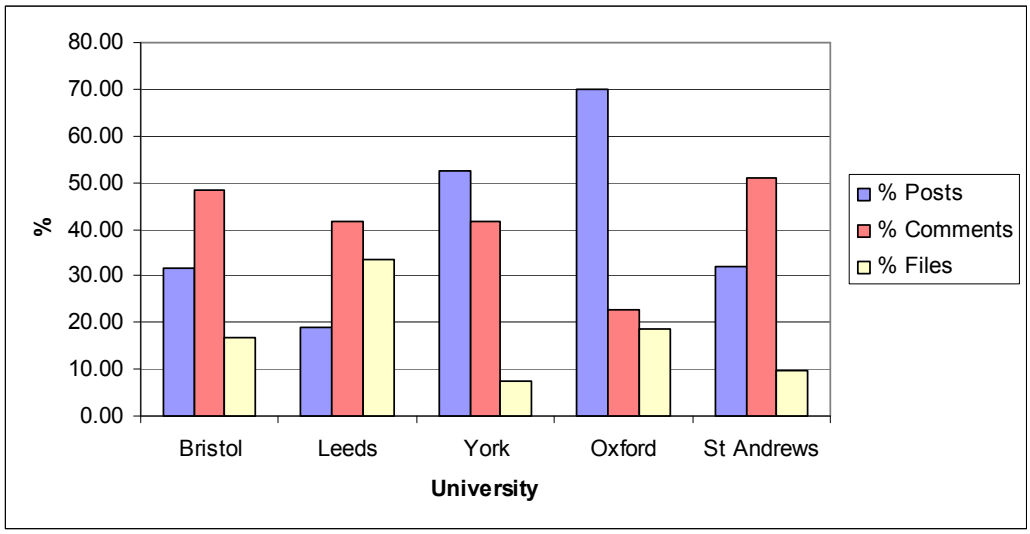

Figure 15 Percentage of contributions of each type at the LSCITS universities

The high number of files being uploaded at Leeds is again clear, especially in comparison to the other universities. It has been suggested that this could be due to the researchers being based in the Leeds Institute of Health Sciences rather than in a computing department, so do not have access to dedicated file servers. Leeds is also the only university to create their own community and this appears to be predominantly used as a shared file store. The semi-structured interviews will allow the true reasons behind this to be discovered and the findings will be discussed in the subsequent section.

While the level of use at York is lower than at the other universities, the features being used would appear to suggest that when they do participate it is to join in discussions and share work. The high levels of use of comments would also seem to suggest that St Andrews, Bristol and Leeds are using the site for discussions that may previously have been held via email. However, without statistics on email use, it will only be possible to find out if this is the case from user opinions. The high levels of use at these sites for discussions could also be due to the nature of the work they are doing and the support of the principal investigators based there. The reasons behind this will be examined further when looking at the results of the semi-structured interviews with the users.

8.2.3 Summary

A high level of logins across all the participating universities suggests that the site is providing some benefits to its users. The high numbers of comments also appears to suggest that it is being used for discussing work and ideas, something that it was designed to encourage. The introduction of monthly progress reports has also had a positive effect on the use of the site, giving users a reason to log in and contribute. It is hoped that when they log in to do this they may also be motivated to contribute to other discussions that are taking place. How users feel about these progress reports will be discussed later.

While the use of the different features at most of the universities follows a similar pattern, the differences in the levels of active use at each are surprising. The high number of file uploads at Leeds is also interesting and both were investigated further in the interviews with the users to try to determine the reasons for these variations. Although the statistics would appear to be positive, whether any benefits have been gained with respect to communication can only be discovered through talking to the users.

The next sections describe the results of these discussions at each university.

8.3 LSCITS qualitative data analysis

8.3.1 Bristol

The meeting at Bristol was attended by regular active and passive users and one very infrequent user. It became clear that the reason for this low level of use was partly due to their role in the project and partly due to difficulties they experienced in knowing where to look for things. They commented that they had no previous experience with online social networks. The rest of the group all had Facebook accounts which they used for personal purposes, and a couple had recently joined Twitter for use on the project. While they found experience with other online technologies beneficial, it was felt that the Elgg interface could be improved a lot to make it more usable and intuitive to new users. It was felt that if it were to be put in

an environment where people were from a less technical background it would need to be more user friendly to encourage them to use it.

There was a general agreement that the site was a positive thing and they had found it useful for a variety of reasons. While some found it easy to get into the habit of checking the site regularly and have found it has become part of their routine, others commented that whether it was worth checking was often dependent on the amount of new content that had been added. As the site has gained popularity the amount of content being contributed has increased and this has helped motivate users to log in more frequently.

While the discussions are not always directly related to what they are working on they still found them interesting to observe and see how they progress, even if they don't feel able to comment. The organisation and structure it provides to discussions was also seen as a key benefit, with one user comparing it to the use of email saying:

'It's much better having it on a website you go to when you want to read it and it's more organised because it keeps all the threads together. You can go and see the whole thread there but with emails it just gets messy. If they came into my inbox I would probably put them into a folder and probably not read them.'

This general lack of satisfaction with emails for threaded discussions seems have helped motivate users to discuss things on the site. An added benefit appears to be that people are reading and contributing to discussions they may previously have ignored.

The introduction of progress reports was seen as an extremely good thing, especially for project management as it makes it easy to see who is and isn't engaging with the project. They were introduced to increase inter-site visibility and, as a side effect, hopefully stimulate engagement with the other members of the project. Prior to their introduction it was felt that no one really had a sense of what everyone else was working on. Many commented that being able to read those submitted by others was interesting and having a record of their own work in one place was also useful to see how they had progressed.

When discussing the usefulness of the site in general, it was felt that the level of contributions was extremely important. If very few are contributing, its usefulness decreases. It was also felt that the likelihood of overlap in their work could contribute to the benefits gained from using the site, although it was suggested that facilitating communication in any project should be a good thing especially where change is involved. One of the researchers shared their experience of past projects in industry, explaining that when the changes are not communicated clearly to those they affect things can go wrong. Using a social network site could help as an extra communication channel.

Another benefit that many mentioned was the closeness of the working relationships it had helped them to build with the researchers at St Andrews, who are all very active on the site. One commented, *'I have them as people I interact with on an almost daily basis.'* This increase in communication and the ease at which these working relationships have been established can be beneficial in ensuring ongoing collaboration on the project.

While there was generally an agreement that the site was useful, everyone was also in agreement that an improved search facility was necessary to stop old posts from becoming lost and obsolete. It was suggested that communities could be used to introduce some structure to the site and help with organisation of information. However, it was thought that this might be viewed as creating silos, even if everyone was able to join and that with a project of this size it wasn't necessary. The use of tags to organise and search for information was again recognised as problematic with people using different terms for the same thing being a common issue. Something like a Google search was desired however it was recognised that there are issues related to the commercial confidentiality of some of the information which may prevent this from being possible.

When the possibility of using Facebook was discussed, it became clear that this had been given serious consideration by the project and that its inability to easily share files other than photos contributed to it being rejected. The issue of commercial confidentiality was again a concern explaining:

'You can imagine dealing with documents that have been sent to us by industrial partners where we have signed confidentiality documents and, at least while it is on a University of St Andrews server, you feel you have at least some proprietorial sense of responsibility over it.'

The ability to be more certain of who has access to the information was seen as important. An example of a problem with control in Facebook was given to illustrate this point and why using a private site was better. Facebook gives users access to photo albums of people they don't know if they are connected to one user, tagged in one photo, or if someone they know comments on someone else's photos. The recent changes in the Facebook terms and conditions related to the ownership of photos was also a concern. The nature of the content on people's existing Facebook profiles was another issue and seen as unsuitable for a work environment. There was a desire to keep their personal and work information and networks separate.

The low level of use of the wiki was also explained as a combination of many factors including a lack of understanding of exactly how a wiki was supposed to work and the inability of the news feed to clearly show changes that had been made. However, it was recognised as a potentially useful feature. It was however noted by one user that there are better wiki sites available that they were more likely to use.

Summary

Everyone was in agreement that using the site had provided a wide variety of benefits to them and that they had found it useful in getting to know what everyone in the project was doing. There was still a concern, however, that some members of the project were not engaging with it and they could not understand why this was the case. Despite this, the Principal Investigator at Bristol summed up their feelings saying:

'It was a really great thing to have and it turned out to be exactly what we needed, well it was the least worst best option. There was nothing similar and, without it, I think we would have been in a lot of trouble.'

This shows that while it does have its problems, these are not related to the concept of using a social network site and do not prevent it from being a worthwhile tool in the project.

8.3.2 Leeds

Three of the four researchers at Leeds were able to attend the meeting to discuss their use of the site. As a small group, they used the site primarily for external communications with researchers at the other universities. For internal communications, face to face meetings were preferred as they were only along the corridor from one another and everyone was in the office on most days. As the statistics show, a large number of files had been uploaded to the site by people at Leeds. This was because when the project was starting out they had a need to share a large number of documents and the local solutions didn't provide the structure that they required.

While document sharing was the basis of their initial use of the site there was also an agreement that is was useful to be able to passively see what other people were interested in and what they were working on. There was a general feeling that if this was done over email it would be too much. When the project started everything was done via email to project mailing lists and this led to a concern about responding, with a fear of overloading people. One described it saying:

'I've seen concern that there were too many emails as people were commenting back and forth. This has facilitated collaboration in that you're not worried about putting up comments on things. You can get 20 emails just from one project in your inbox so with this you are more willing to put up a one line comment.'

As well as reducing the number of emails and increasing the likelihood of participation in discussions, it was felt that the site provided more structure to these discussions. One of the benefits found from using the site was that threaded discussions became easier to follow and it took away the issue of where to place your comment in an email. Everyone seemed to agree that, while it would not replace email, it could complement it as there were some things that it was able to do better.

As the statistics show, the researchers at Leeds frequently check the site for updates as although they admit being sceptical about its use at first, they now feel it is a useful source of information on what is happening in the project. The frequency is justified by one, referring to the amount of new content:

'Every other day I make sure I have a good look because every other day you probably only have to look at 2 pages. If it's any less frequent you are looking at 4 or 5 and you as a result miss stuff because you can't actually absorb 5 pages worth of information at once where as one page you can actually read it properly.'

Another reason behind this frequent checking is to make sure nothing is missed. It was agreed that the lack of a decent search facility and organisation of the information made it difficult to find older posts and that while there was a lot of good stuff on the site much of it was forgotten. The problem with the use of tags was clear, with the vast amount of variation in the use of the same tag. It was recognised that this was a problem and a lot of thought had been given as to what could be done to improve this. Suggestions such as the use of some form of structure for filtering information, like in an eBay search, was seen as a possible solution. The issue of where these categories and structure would come from was something no one could answer, with an agreement that it would have to evolve and come from the project. It was suggested, however, that in the case of LSCITS the lack of cohesion across the universities would make finding a simple organisational structure for topic headings difficult. However, if these had been available at the start maybe the organisation of the site would have been improved.

While everyone working on the project at Leeds had previous experience with some form of online technology and agreed that this could help, it was felt that the site was generally easy to use once you got used to the interface saying:

'I think if you understand basic Web 2.0 with the interfaces there is no real challenge. There are very strong similarities with these applications even though they have very different backgrounds.'

This supports the idea that people's familiarity and experience with sites such as Facebook can be transferred to using private sites for work purposes. Combining this ease of use with the benefits they gain from using the site, they could see no reason why someone would choose not to use it. Although they recognise that everyone is busy, it was felt that they should be able to find a small amount of time in their day to check it. One described it saying:

'I check it very regularly as the way I look at it is that it is part of my job. I am hired to research on LSCITS and this is one of the ways we are doing it. Saying I don't have time to check it would be like saying I don't have time to check my emails or I don't want to turn up for work.'

It was felt that maybe the real reason some were not using the site was that they didn't feel the need to communicate with others on the project at different universities and this was something that they found strange. Despite the researchers at Leeds coming from a more sociological background and working on a very distinct area, they still felt that discussing ideas with others in the project could beneficial. They were, however, in agreement that is can sometime feel like there are too many channels to check and integrating them together would be useful. One mentioned the use of Twitter by some members of LSCITS as another source of information, however they checked this much less often as checking too many sources each day can start to become time consuming. As people have got used to checking their emails on a daily basis it was suggested that email notifications to tell you when there is something new may be of benefit to some users.

While the site is now used by many to post progress reports it was felt by Leeds that although this reflection on your own work could be useful, only those in a managerial role would find reading them interesting. There was a feeling that combining this more formal communication with the discussions on Elgg could cause tension and shift its purpose from the '*fairly free informal medium ideally driven socially by the research assistants to a reporting tool'*.

The increased levels of communication and visibility of discussions had recently brought to light a conflict between some of the universities and their ideas on a

particular topic. Sorting this issue out was seen as extremely important to the future of the project and, without the site, it was felt it may have taken a lot longer to surface and could have caused many more problems.

Summary

The general feeling at Leeds is that the site is very useful for keeping informed about people's interests and what they are working on, although there are areas that could be improved to make it even more useful. Leeds University actually has its own installation of Elgg which the group are planning to introduce to their department and the feeling at the initial demonstration was that people were willing to give it a try. The introduction of this site to the wider department shows recognition of its potential and that it has been found to be a useful tool. It is recognised that it is a complementary mechanism for other communication channels and that its use may even make visible communication problems that you weren't previously aware of that need to be addressed. The overall conclusion seemed to be that it is unlikely that every researcher at each of the universities on such a project will collaborate and use the site. However, the fact that many of the researchers chose to use the site and stayed with it through the early days when there was less content and reliability issues existed, suggests it can be helpful.

8.3.3 York

As the statistics from the database show, active participation on the site at York is low in comparison to some of the other universities involved in the project. One of the primary aims of the meeting with users at York was to find out why this was the case. Of the three people in the discussion, one had never logged in to the site; one was a passive user and the other an infrequent contributor. All of the researchers had used other online sites on different projects. However, these were primarily used as file repositories rather than for informal communication. These sites were actively managed and there use for official project documentation was mandated. The ability to share things when working with international collaborators was also given as a benefit of using electronic communications. While these sites differ considerably from Elgg in their intended use, the motivations for using them are interesting. It became clear that everyone was in agreement that putting things online and keeping

everything related to the project together was a good thing. One summarised this saying:

'Being able to go to one place and find all the relevant things is actually very helpful and the reason I do use the other sites is because they enable me to do that. Of course I also get prompted when something new or interesting has arrived.'

The use of email notifications by the sites used in other projects was seen as a positive feature, providing users with a link to the new content. This was seen as especially important as lack of time was cited as the key reason for not using the site. One researcher explained:

'I am very busy and 200% of my time is allocated let alone 100%, so actively going and looking for more work is not something I am going to do. I'm not going to look at Elgg on the off chance there is something there I am interested in. I really don't have the time to do it.'

It became clear that they found allocating time to go and browse the site impossible and, with multiple things competing for their time, the need to actively seek the information was a barrier to its use. While one user acknowledged that they do use Facebook this was only done when they *'have 30 seconds with nothing better to do than stare into space'*. One of the motivations behind the use of such a site was to reduce the number of emails being sent. However, it seems that managing emails has now become part of people's everyday routines and that they have gained experience in quickly filtering them to see what is useful. It was felt that providing more email notifications of content may prompt them to at least go in and have a look but it would still be dependent on the nature of the content.

One of the other reasons given for the lower level of use was the sometimes trivial nature of the discussions. There was a concern that while the idea of having discussions is good, they often lack structure and it is hard to see if any conclusions are being drawn. It was acknowledged that while the bouncing around of ideas can be helpful to those with more time it often leads people to tend towards the '*trivial and mundane, or the half thought out thought'*, where if they didn't have the site maybe

they would spend more time generating a more considered and thought out response to a discussion.

There was a strong desire to be able to find out how discussions ended and which were most popular. One idea which had been experienced in another project was that of a weekly digest however it was acknowledged that there would be a lot of skill required to produce one that was not just *'quantised noise'*. If however it could indicate which discussions had been most active and who had participated it may be helpful in determining if there is anything interesting to read or anything they should contribute to.

The provision of links in the notifications to take users directly to the new content was also seen as beneficial, as they experienced difficulties in finding things on the site. It was felt that this lack of structure could also prevent it from being used more actively. When describing another site that they use in a different project one summarised this saying:

'None of these things are perfect but it has been well enough designed that the level of pain to find anything is small even if I haven't been prompted by an email. I can actually find stuff I know is there.'

This emphasises the importance of organisation and ease of use. While it was agreed that more structure would help, it was also acknowledged that this must come out of the project and that the lack of work packages and individual work projects in LSCITS could make this difficult, although it may evolve over time. If structure is put in place it is important that this is just the right amount and that it can be changed with the project so that it remains useful.

One final point that came from these discussions was that researchers are often working on many projects, each with their own channels to be checked and that organising this can be difficult. There was clear need for everything to be put together in a unified way, so there was one place to go to for a distilled summary of activity on them all, with the use of multiple sites sometimes becoming confusing as each works in a different way.

Summary

While the level of use at York is low in comparison to other universities in the project, they were able to provide many suggestions that could stimulate use and improve the site. With time being a short resource it is clear that little things that minimise the effort required to use the site; be it notifications of changes, different views of information or being able to post and view information on the move are important. These could be critical in increasing the number of active users on the site and gaining the support of those who are quite happy with the way things are. Most are working on multiple projects and convincing them to use something different to what they are familiar with requires them to be convinced of the benefits. One user summed it up nicely saying:

'If you started your research career with something like Elgg or Facebook or Twitter and this was your natural way you trained yourself to work you would probably be able to use it in multiple projects, but if you have trained yourself to work in this fragmented style that we all did because we have worked in multiple projects for years we are used to managing projects through email or telephone. It's not that we can't change, it's impossible for use to break this and there is little value for us to do that.'

This is an important point that applies when introducing anything new to a setting and convincing users of its potential value will be extremely important.

8.3.4 Oxford

A meeting was held in Oxford with the most varied user of the site. It is clear from looking at the history of activity at Oxford that the other users predominantly use the site simply for submitting progress reports however, the fact that the login records show occasions when they log in without contributing would suggest that they are also reading content submitted by others. In comparison to some of the other universities, Oxford has a relatively low level of active use outside these reports and it was important to try and find out what the reasons for this were and what motivates participation when it does occur. The feeling seemed to be that the need to collaborate closely with researchers at some of the other universities was what was

driving their active participation on the site and that when some of the other members of the project have this need they may start to use the site more actively. He felt that until this happened, they may continue in their current pattern of use. While it was recognised that the interface had its quirks he did not believe this would effect how much people use the site, as it didn't take long to get familiar with these.

More active participation had been seen recently due to the closer collaboration with Leeds in organising a workshop. This was being done using the wiki facility which he felt was extremely useful. He was familiar with wikis as he had used them on previous projects and for group work as part of a teaching course. It was felt that the ability to clearly see who has changed what was very helpful and much better than using email where it is easy to miss a vital change and read messages in the wrong order resulting in confusion. He feels the introduction of web technologies such as this to a project can reduce the number of emails being sent out to mailing lists. While wikis are seen are beneficial by people who understand them, it was noted that in experience on a previous project working with industrial partners, the policy makers were worried about security and felt more comfortable with the use of email, a technology they were familiar with. This could be an issue in the future if the site was expanded to include the LSCITS industrial partners or put in a different context. However, it was felt these feelings would not be transferred to all web technologies and that the use of social networks may be accepted.

When discussing the frequency of his contributions it was interesting to note that he felt his low number of contributions was possibly due to coming from a technical background where it was important to make sure something was technically correct before sharing it. This made him less willing to comment on discussions he did not know a lot about and only post things when they had been given thorough consideration. He commented that social scientists may be more likely to contribute to discussions as they are used to communicating more freely. While the level of contributions had been low, the ability to read what other people had been working on and see how their work had progressed was seen as extremely useful. He could see how this could also benefit those managing the project. It was felt that the discussions may be more useful to people just starting out in their research to share ideas without a view to collaborating on anything in particular.

The benefits of having an online system with everything in one place had also been noted, especially when collaborating with people overseas where time differences can make arranging meetings or phone conversations difficult. Although it was felt that the different features of the interface were not necessarily the best available, they were fit for purpose and having them all together made things easier. In a job where travel is involved, the ability to access the information from anywhere at any time is also seen as extremely beneficial.

An added benefit that has been experienced through use of the site is the ability to quickly build and maintain strong bonds with other members of the project at the different universities. It was thought that, without the site, this would have required a large investment of time which is often lacking. The ability to easily share things with these colleagues has also helped with any collaboration being undertaken.

While the site was seen as being useful the lack of a decent search facility was again mentioned. An example was given where he tried to find one of his own posts with little success and in the end found it on Google due to it being a public post. It was felt the speed and accuracy with which Google could find it would be an extremely helpful improvement to the site. When it was explained that this could be due to a tagging problem it became clear that he wasn't aware that the search was tag based. This may suggest that users are not aware of the importance of the tags that they attach to content and maybe if they were they would give the process more thought and try to reuse existing tags where possible. This could then in turn reduce some of the problems that are being experienced related to tagging.

Summary

The lack of active participation by members of the project at Oxford other than for progress reports is not necessarily a sign of a problem with the site. The site was seen as useful, however it was felt that there needed to be a strong motivation for participating, and collaborating closely with members at other universities was seen as providing this motivation. It was clear however that, even though the level of participation in discussions was low, these are still being read with interest. The poor quality of the search for finding specific posts was again seen as the major flaw to the

site and improving this while reducing the time to access different features could be extremely beneficial.

8.3.5 Interviews summary

Despite the varied activity patterns seen in the charts, the interviews revealed that the users' feelings towards the site were very similar and any concerns they had were often shared across the universities. The key points from the interviews are summarised below.

1. The site is good for discussions

Despite the scepticism of some over the usefulness of the discussions, the majority of users across the different universities found the site helpful for discussions. Everyone seemed to be in agreement that the use of email for discussions was inefficient and that the site was much better for this. One commented on how they feel when email is used for discussions with large groups of people saying: *'It's annoying, it just gets messy'*.

By putting the discussion on the site it is easier to follow and clearly see who said what. It also provides a structured template for discussions, helping make them easier to read. The use of the site has also made people more likely to read and contribute to discussions without the worry of contributing to, or developing a feeling of information overload in your inbox. Another user expressed their feelings towards its use and that of email saying:

'For having wider discussions there is definitely a place for it. This can define structure so it lends itself to more ordered discussion. I think there is scope to complement email.'

The recognition that it is not intended to replace email is an important one. This agrees with the idea a 'one size fits all' communication mechanism does not exist to meet all the communication needs of a project.

2. It lacks a decent search

While there are issues with the interface and the lack of a decent search it was felt that these did not prevent the site from being useful. It was however agreed that this was the major problem with the system and that it often resulted in good information being lost as time passed. As one user said:

'I think there are 122 pages, how likely are you to go to page 62 to find something. You are never going to press next 10 times.'

It is often the case, that over time, good discussions end because people are no longer aware of them. If they do not appear on the first few pages of the activity feed they are often ignored. This adds the concern that if there is a large amount of activity and you don't check every day, good posts could potentially be missed by a large number of users.

Despite a tag based organisation and search being used on the site, it was felt that improvements were necessary as this was not fine grained enough and there was no way to link similar concepts e.g. BT and British Telecom, unless everyone was very strict in their tagging. While the use of tags has been successful on many websites, for LSCITS, the tag cloud exploded and became almost unusable. The most frequently used tags now returned too many results to be helpful in finding what you were looking for as one user said:

'Probably with one of the most popular tags, the chances are if you are looking for a specific message you don't want to wade through 65 other messages to find the one.'

Many suggestions were provided to improve the structure of the site and make it easier to search, including the integration of a Google search and eBay like categorisation. It was agreed that the problem of defining the structure is often very difficult. It is recognised that if you are to impose structure it needs to be flexible enough to change with the project and its changing interests. As one user said:

'You need to be able to change the structure when you have content on the site which is difficult and you need to be able to do it without too much pain.'

There was agreement across the universities that while the lack of search was a problem with Elgg, the ability to define the structure which may help with organisation was in part a problem with the project. Despite the need for the structure to be flexible it was agreed that some structure needed to be put in place in the beginning and that, unfortunately, with research projects like LSCITS, this was ill-defined.

3. Good to have everything together online

It was felt that putting everything in one place and online was a good idea, making it easier to know where to find things related to the project. As researchers are often travelling, the ability to access the information on the project from wherever they are was seen as extremely beneficial. Putting everything in one place was also seen as useful so you knew exactly where to go for things related to LSCITS. One user commented on this benefit saying:

'Although the interface features aren't the best and there are better out there having them all together in one place makes it better.'

While some users had found a better wiki service elsewhere this added to the number of channels that needed to be checked and as this number increases it can become time consuming and difficult to remember them all. With LSCITS alone there is already three in use, including email and Twitter and many researchers are also working on several other projects. As one use commented:

'If you have 15 different things to check every morning then you spend the first 2 hours doing that and it puts a strain on your work day.'

4. Email notifications would be helpful

It was felt that an increase in the use of email notifications may stimulate others to log in more frequently. When describing what motivates them to use other sites, one user commented:

'I get told about things I need to know. The emails come with an explicit web reference to the thing I need to look at so I can look at the email, yes I do need to look

at that, go and do exactly what I need to do and come back out, so it minimises the time.'

The site currently allows users to turn on email notifications and this then notifies them of new comments on discussions they have started and any on discussions they have marked as interesting. While the ability to turn these on is available and most users were aware of this feature, there was a feeling that simply notifying you of all new content would not be beneficial. The use of email notifications was however seen as important as everyone working on the project is very busy and having multiple sources to check for multiple projects can be time consuming. Making it easier for users to know when something needs their attention and how to get to it could help, however as one user said there is a danger, even if categorised, of it just becoming *'quantised noise'*. The excessive use of email notifications could lead to overloaded inboxes and replicate the problems of using emails for threaded discussions.

Users at one university suggested the use of a weekly digest that would say what had happened on the site ordered by how active the discussions have been. When this idea was suggested to users at other universities there was a general feeling that some form of digest could be beneficial, helping them get a quick view of recent activity and if anything requires their attention. It was recognised that while RSS could be used to notify you of new content it was not able to provide this kind of extra information that can help you better decide if it is of interest.

5. Increased awareness of everybody's work

The introduction of progress reports to help manage the project and increase engagement has seen many benefits for the users of the site, both for reflecting on their own work and keeping aware of the work of others. Use of the site has allowed an increased awareness of what people are working on to develop. People at the different universities are now much more aware of exactly what individuals are working on, rather than just having a general feeling that their work is progressing in the area that university is responsible for in the project. One principal investigator described the situation before the site:

'At each site people were quite content with what was going on. People would ask me about what was going on here and I would say oh it's going pretty well. I would do the same to the other principal investigators and they would say the same. Other than when we have our quarterly group meetings we didn't have a sense of what people were doing.'

Now the ability to read people's discussions allows everyone to develop a better idea of what everyone's interests are and their opinions on topics important to the project. It is also possible through these discussions and the progress reports to follow how people's work develops over time and see where new ideas are coming from. Several users commented on this being interesting to follow.

6. Closer working relationships

The increase in levels of communication across the universities and the increased awareness of people's ideas and concerns has helped build and maintain stronger and closer working relationships across the project. Some users commented that as St Andrews users are particularly active on the site they have almost become people they interact with daily, rather than collaborators at a distant university. This suggests that if used actively, it can help overcome some of the obstacles of working in such distributed groups and bring about continued cross group engagement.

It was also recognised that while close working relationships between researchers at the different universities do form on projects like LSCITS, these often require a large investment of time as they meet infrequently. It was felt that use of Elgg had reduced the time needed to form these bonds and made this process much easier. One user commented on the development of these relationships saying:

'I think what really was useful is getting close especially with St Andrews people who are a lot on Elgg and particularly the other PhD students, I got a lot closer to them through discussions on Elgg and also Twitter.'

8.3.6 Conclusions

It would seem that any negatives towards the site are mainly related to the specific technology and configuration used and not to the idea of using a social network site. The positive feelings towards the site despite these issues seem to suggest social network sites can be helpful when distributed groups need to communicate.

8.4 ASP qualitative data analysis

As with the LSCITS deployment of Elgg, weekly queries were run on the database of the ASP site. From these the data was aggregated to produce charts for analysis. At the time of this analysis, the site has been in use for approximately 9 months and the data collected should give an indication of its use. By looking at the logins it should again be possible to see how widely adopted the site has been, and the use of the individual features should give an indication of exactly what it has been used for.

8.4.1 Logins

As with the LSCITS site, there were problems with the log in table so the same method of analysis has been chosen. The last activity information from the users table has been used to indicate how many users are logging in each week. As the size of the project team grew considerably during the first few weeks of the project a percentage of users logging in each week has been calculated. These values have then been used to generate a 4 week moving average to reduce the impact of any random peaks and toughs in activity. Figure 16 shows the results of this.

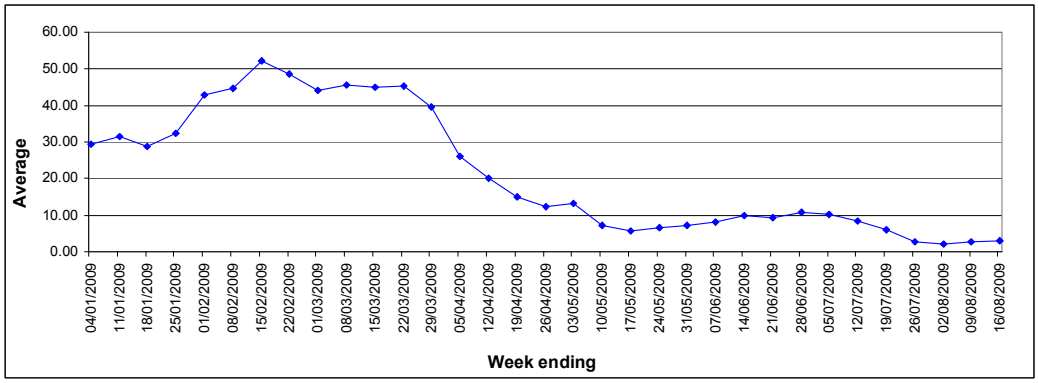

Figure 16 Average number of users logging in to the ASP site each week

This shows that between February and March approximately 40% of users were logging in each week. Given the number of users the site has this is relatively high and would appear to be positive. After this point the number of users logging in however drops dramatically to less than 10%. This could be due to users being dissatisfied with the site or due to a lower level of activity in the project. The exact reasons for this will only become clear when speaking to some of the key members of the project team. If the activity in the project has been reduced you would also expect to see a decrease in the number of new files and posts being made during this period.

Before looking at the use of the different features of the site and their levels of use, the overall level of active use should be examined to see how much the site is actually being used for communication. Figure 17 shows the average number of users logging in and how many are actively participating on the site. While it shows a peak in the number of active users at the same time as the large increase in the number logging in, there is still a huge difference in the number of active and passive users.

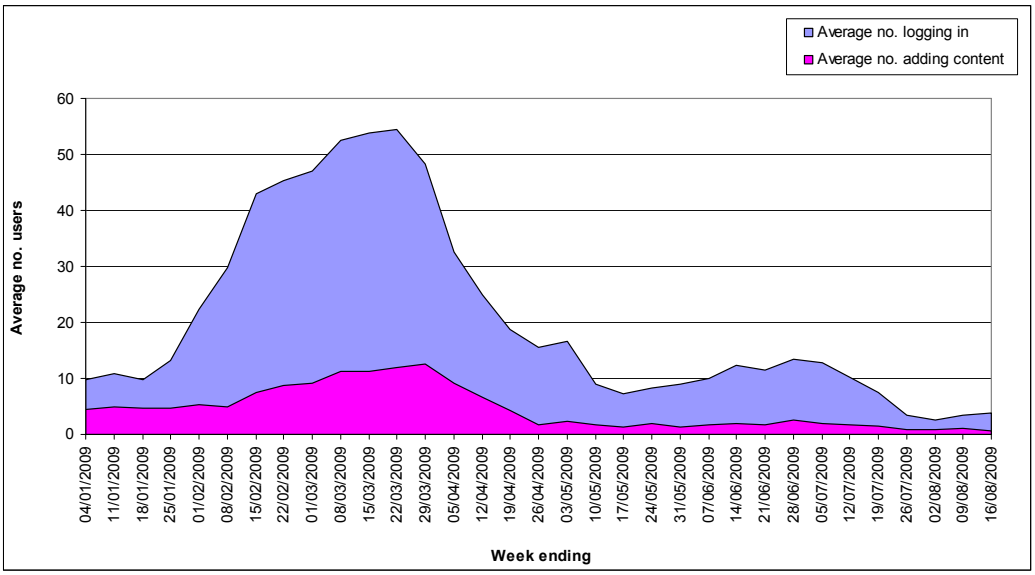

Figure 17 Average number of active and passive users logging in to the ASP site

It would appear that the majority of users are only using the site to read content and, while this could be a beneficial, it would suggest the site is not being used for large amounts of informal communication. The easy sharing and distributing of information is, however, positive and it may be that the project management are using the site to keep everyone informed rather than for gaining feedback. Further

examination of the features which are being used will be required to determine if this is the case.

8.4.2 Feature use

If the site is being actively used for communication a larger number of comments than blog posts and even fewer file uploads would be expected. Figure 18 shows the average percentage of contributions to the site of each type.

This, surprisingly, shows file uploads accounting for a much larger percentage of total activity on the site each week. While it was expected that the number of comments is greater than the number posts, blog posts make up only a small percentage of the sites use. In order to determine exactly how the site is being used, the use of each of the features will have to be examined further.

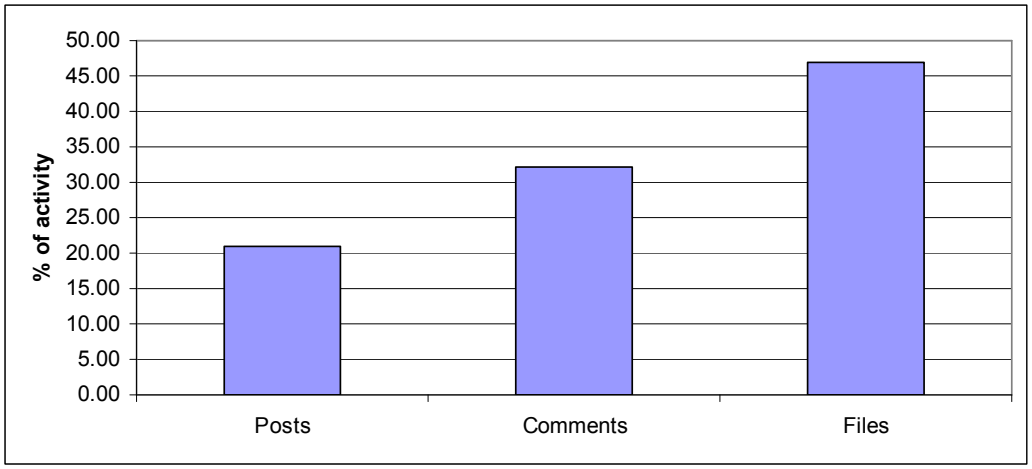

Figure 18 Percentage use of each feature on the ASP site

File uploads

Figure 19 shows the average number of weekly file uploads to the ASP site as a four week moving average. This has remained fairly high throughout, however this number did drop at the end of March. Prior to this a large number of project documents were being shared on the site. This could be due to the stage the project was at, gathering information and generating requirements documents and recommendations. The site is now mainly used for sharing meeting outcomes, including documents containing any minutes for approval. The gradual increase again

after the drop in March may be due to increased levels of activity as the project enters a new stage.

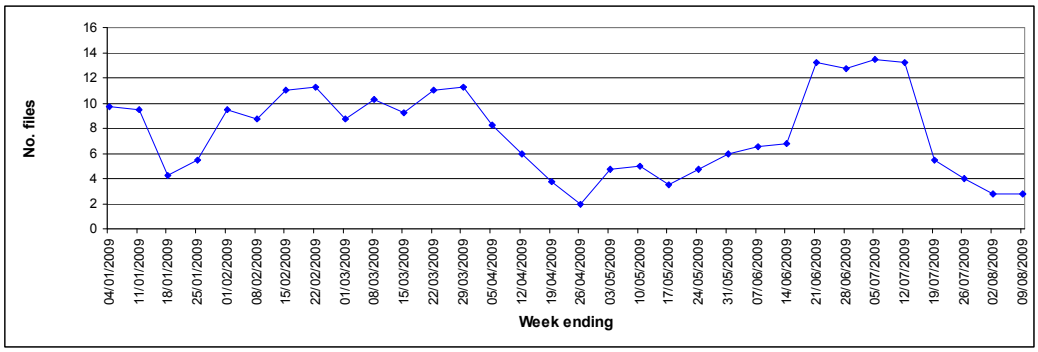

Figure 19 Average number of files uploaded to the ASP site

The project is organised into sub-groups, each with a module team leader, and this structure has been replicated in the site using communities, with the team leader as the community owner. Due to the nature of the files being shared on the site, it is predominantly the module team leaders doing the uploading. As one person can be the leader of more than one group, the number of users likely to be uploading files is reduced further. Figure 20 shows the average number of users uploading files to the site.

The relatively low number of users who are uploading files would seem to confirm this theory. An increase in the number of users uploading files can be seen at a similar time to the increase in site activity. During this time each group were meeting to discuss the project and the outcome of these meetings were being shared on the site. When these meetings had finished the documents being shared were higher level management documents, being uploaded by only a few key project members.

The small increase that is now being seen in the number of users uploading documents could again be due to the increase in activity among the groups as the project moves into another phase and more input is required from them.

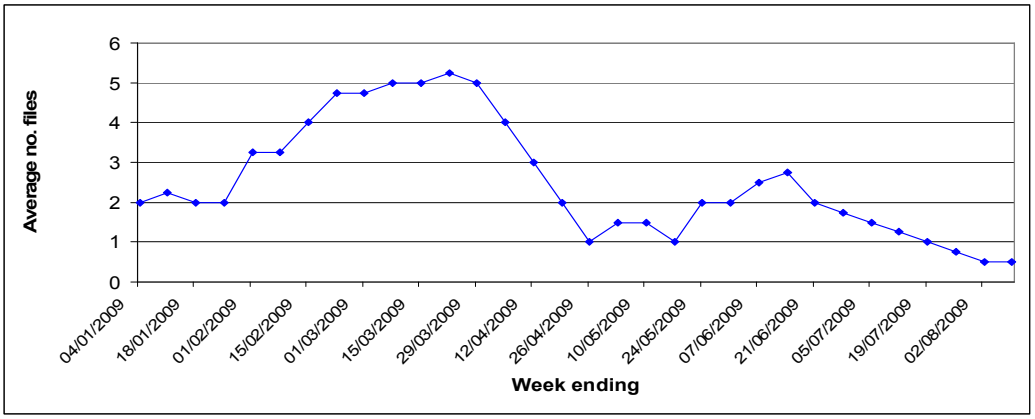

Figure 20 Average number of users uploading files to the ASP site

Blog posts and comments

As use of the site is intended to increase communication in the project team, the number of blog posts, combined with the number of comments, should help indicate if this is the case. Figure 21 shows a 4 week moving average of the number of blog posts to the site. This graph again shows a peak of activity between February and March and this corresponds with the number of file uploads to the site.

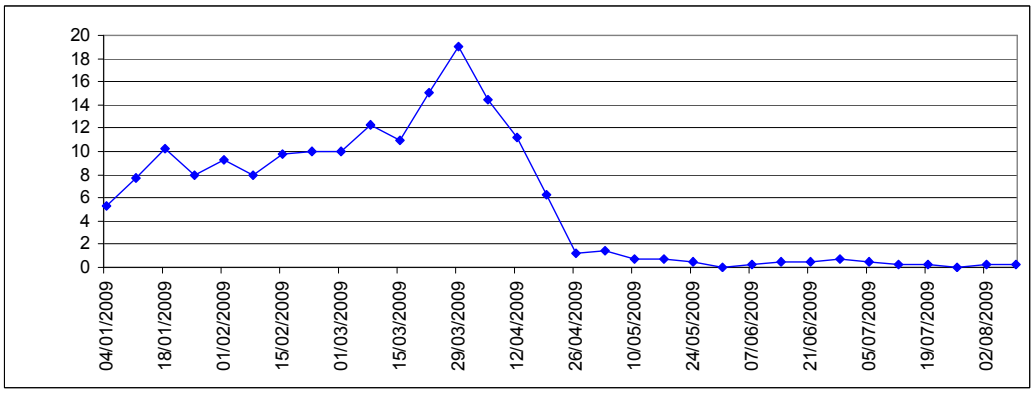

Figure 21 Average number of weekly blog posts to the ASP site

Each time a file is uploaded to the site that is important, users are pointed to it so a blog post was created with a link to the file, making it easy to find and opening up a discussion on its contents. If these discussions have taken place on the site you would expect a high number of comments at a similar time. Figure 22 shows the average number of weekly comments.

It is clear that at the start of the project the number of comments was fairly consistent, followed by a peak at the end of March. There is then a very rapid drop in the number of comments and this has failed to recover. This may be due to a change in project activity and a lower number of files being posted to the site for discussion. It will, however, only be clear if the rapid drop in activity on the site is due to the project through talking to users. The relatively high levels during the early use of the site and the peak in March have clearly had an effect on the average used when looking at the percentage make up of each type of activity on the site.

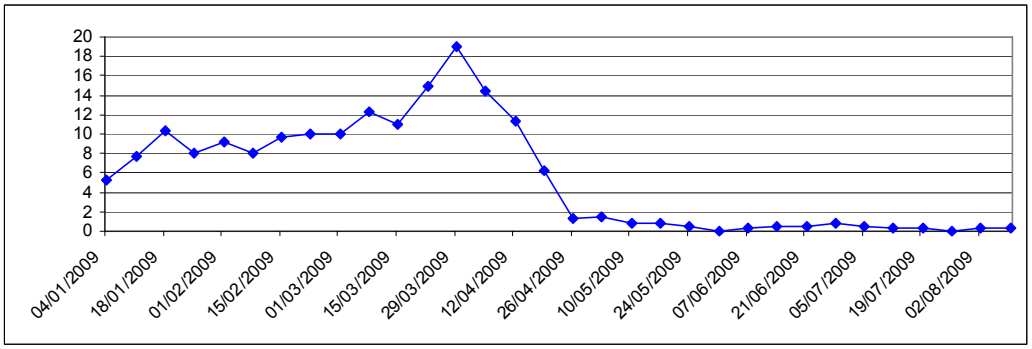

Figure 22 Average number of weekly comments to the ASP site

While it is expected that, due to the structure of the project, the number of users uploading files and posting to the blogs will be relatively low, the number of users commenting on discussions should not be affected by this. If the aim is to get feedback on meetings and project documents, and the site has encouraged this ongoing engagement, you would expect a larger number of users to be commenting. Figure 23 shows the average number of users commenting on the site. This shows almost the same pattern of as the number of comments being added, suggesting that it is not simply a small number of users adding more comments when the level increases. The number of users commenting, while at times higher than the number who are posting files, is still low compared to the number of users the site has and the number logging in for the same period. This is disappointing, as it would appear to suggest that the users are not finding the site helpful for discussions.

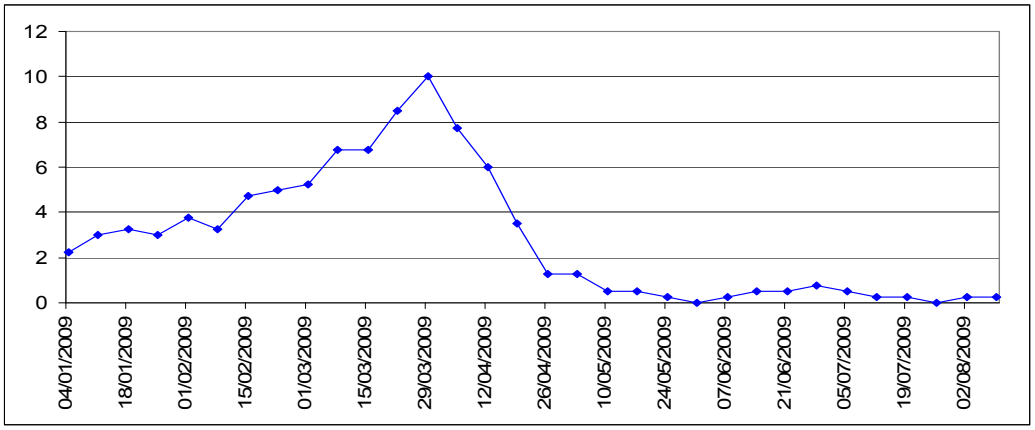

Figure 23 Average number of users adding comments to the ASP site

The level of activity in the project and how much they feel they want to engage outside the meetings may also affect the level of site use and only though talking to users will it be clear if this is the case.

8.4.3 Summary

Despite the site being introduced at the beginning of the project, it has not managed to gain and sustain a critical mass of users. While the low levels of use are disappointing, through talking to the users it should be possible to gain and insight into why it was not adopted to the same level as in LSCITS and this should help to determine what factors influence the successful use of social network sites in projects.

8.5 ASP feedback qualitative analysis

After the disappointing level of use of the ASP site, feedback was gathered from the users to try and determine why this was the case and if anything could be done to improve it. It was important to find out if it was the idea that was the problem or the specific site being used and the way it was introduced.

It was clear that too many users were added to the site too early in the project. Many felt that most of these users only had a very minor role to play in the project and, for that reason, did not need to contribute outside the meetings they were scheduled to attend. As one user said:

'*We were trying to make it too wide for use and too many people involved had such a small area of input, it was not worth their while learning to navigate ASP and even log-on!'*

This opinion was not however shared by the Project Manager who felt getting large numbers to participate was a key part of the project and the site was beneficial for doing this without people getting *'swamped with email'*.

It was also recognised that module leaders, who, at one point, had almost daily involvement with the project could have benefited from using the site to interact with each other. The slightly higher levels of use seen on the module team leaders community would appear to support this.

As there was a desire to use the site to gain feedback on files, the main problem people had was keeping a record of which version of the file was on the site compared with the project's shared file server. If they received feedback on the file and wanted to edit it, they then found this difficult as they were not sure how they should do this. As the site did not provide these facilities, processes needed to be put in place so people knew what to do. Despite this issue, there was a feeling that having the files and communication in one place and being able to provide feedback was a positive thing. They just felt that more clarity was needed in exactly how the different features should be used. The confusion can be seen in the extremely high number of file uploads, many of which did not even require discussion. One user described the situation saying:

'We ended up with shared files on our server, with all the documents being loaded twice!'

It was believed that the decision was made by some team leaders, not to use the site as it could not provide version control and collaborative editing. It was, however, also recognised that it had been clear this was not provided at the very start and that this was not the purpose of the site.

Those who did use the site felt that it was hard to navigate at the start and to know where to check for new information. Many commented on the initial confusion when presented with multiple areas to add information and the difficulty in finding information once it was there. This is a similar issue to that faced on the LSCITS site and was, in part, solved through the inclusion of links to new content in email notifications and the removal of several features. The navigability of the site however remained a problem for many users, with early experiences impacting on their opinions of the site and their willingness to try the new configuration. Email notifications did, however, help users who had busy schedules, similar to some of the researchers on LSCITS. As one user said:

'I need email reminders simply due to the volume of things I deal with. I don't have time to log on to a site everyday to see what's going on.'

Several users felt that proper training should have been given on how to use the site as its intended purpose was not clear. They also felt that people's lack of experience with web technologies made it difficult for them to adapt to using the site and that training may have helped with this.

After speaking with several of the module team leaders, it became apparent that they felt they should have been more involved in the configuration of the site. As the Project Manager had made the decision to present the site at the kick off meeting this had not been possible as the teams and team leaders had not yet been decided on. It was felt that more time should have been spent developing the site with the key users before presenting it to the rest of the users, as this may have removed many of the features not needed by the project. This would also have been an opportunity to remove any confusing terminology such as 'blogs', which, as one commented, *'meant absolutely nothing to the majority of users'*. It was also suggested that these key users should have been given specific instructions on how to use the site given the purpose that had been decided, so they could encourage others to do the same.

One team leader commented that, while she had encouraged others to use her community, usage of the others was dependent on the keenness of their respective team leaders. It was felt that some module team leaders were actively discouraging

use of the site. Several reasons were suggested for this, including their negative opinions towards it and the features it provided. It was however also suggested that they felt if others in their area didn't contribute ideas they could get exactly what they wanted from the project instead.

It was also suggested that the lack of use may have been related to the project itself, rather than the idea or the site. The failure of past projects by the same managing group to deliver what they promised, meant some viewed them negatively and felt that this project would be the same. If they didn't feel it would deliver they saw no reason to engage with it. The project itself had also been rushed, with the idea only being conceived a few months before it was launched, as one key project figure said, *'no one really knew what the project would do'.*

The idea of using a social network site was actually viewed quite positively by many in the project. It was seen as a good way to gain feedback and have discussions in a cross-departmental project. One user commented that:

'Email is a nightmare to manage for things like this and we are RUBBISH at having shared spaces on servers that are available to staff in different departments.'

The large number of communities created however made discussions across the groups more difficult, as users were unable to add themselves to communities they were interested in. Membership was instead restricted to those in that part of the team and these were often people with only a low level of involvement in that area. As one user explained:

'There may have been people involved who don't really have any direct involvement in these areas. I know I was included in a community which I only have limited involvement in with my job so would not have been able to contribute much to any debate in this area.'

This organisational decision may have been due to a lack of understanding of the technology and exactly how it could be of a benefit to the project and also an attempt to keep everyone involved. Despite all the communities, one user who was a member

of several commented that they only really checked the main project group community for important updates.

Many users liked the 'personal feel' that having photos attached to your profile and contributions gave, especially as it was such a large project, with team members working with people they may never have met before. The general look of the site was seen as being good on the surface; it was just the organisation and access to information that caused some problems.

While many agreed that the idea was good in principle, it was felt that as users didn't know why they should use it and as use was not mandatory or in some areas encouraged, it failed to get the levels of use it should have seen. Some early users who found the site confusing prior to its reconfiguration stopped using it. If the site were to get the users it needed, as one user said:

'It just needs to be kept simple and easy to maintain or people will revert to email and file sharing'.

Summary

While the site had low levels of use, in principle the idea was seen as positive, especially on a cross departmental project like this one, and a need for such a technology was recognised. The main points to come from the feedback are:

- The initial configuration was too complicated, keep it simple or users will try it once and then stop
- Knowing how to use the site and its purpose is crucial and this was not clear
- Getting the key users involved in the configuration so it meets their needs is important
- People's level of involvement in the project will effect how likely they are to use the site and the ASP site had too many users
- The success of past projects will effect people's opinions of the current project and in turn their likelihood to engage

- If people use it, it is better than email for discussions and getting comments on files
- The personal feel of the site can help build relationships when working with new people

Chapter 9 Conclusions

The initial goal of this research was to investigate how the development of systems based on the configuration of an ERP or ERP-like system could be supported. The approach taken was socio-technical, in that it was not only the technical issues around configuration that were of interest, but also the social and organisational issues that influenced the development and use of the system. It was initially assumed that the lack of support for the technical activity of configuration would be the principal problem faced by the project. However, as it transpired, this proved to be incorrect. Social and organisational issues were the most significant problems facing the project so the focus of the research changed to how support could be provided for project communications. The results are relevant to all projects, not just the development of ERP systems.

The GEOMETER project intended to introduce a complete student life cycle administration system to a large university. An observational study of the project was carried out and this further demonstrated the complexity and large number of potential problems encountered when undertaking a large scale deployment project. When a project operates on a large scale, it often involves a large number of distributed stakeholders with varying needs. Communicating with these stakeholders is vital to the success of a project. However, traditional communication mechanisms such as face to face meetings encounter problems when scaled up to the level required. Despite their best attempts, the GEOMETER project team were unable to gain extensive user engagement with the project, with meetings and emails failing to meet their needs and communicate effectively with stakeholders.

To help with this problem and allow ongoing communication across distances, with large numbers of people, the idea of using a social network site in a project was investigated using the open source platform Elgg. Private social network sites were introduced to two different projects and the results observed. The LSCITS research project, involving approximately 25 researchers at 5 UK universities was the first case study used and a variety of benefits to using the site were observed. A similar site was also configured and put in place in an admin project that was just starting up and

was also based in a university. Statistics regarding the use of the two sites were regularly collected and a series of semi structured interviews with users were undertaken to determine the success of the approach. Unfortunately, due to the large number of problems being encountered in the GEOMETER project, and constraints on their resources, it was not possible to test the social network site with them.

9.1 Lessons learned from GEOMETER

The observational study of the GEOMETER project provided valuable insights into the issues faced when attempting to deploy an ERP system. The project unfortunately became another example of a project that failed to come in on time or on budget, and failed to deliver what it planned. ERP systems are complex and choosing a system that fits your organisation is important as extensive configuration can be difficult and time consuming, as the GEOMETER team found.

Planning a project on a large scale is a complex task that requires estimations to be made as to how long tasks will take to complete. This is extremely difficult and accuracy in this only comes with experience. Plans therefore need to be adaptable and constantly updated in light of the progress being made. It is important if slippage occurs, that tasks do not become compacted together in order to meet deadlines and that enough time is allocated to testing and training.

While the project had the support of key figures in the university, this support was not very visible to the wider university community. The importance of this support cannot be underestimated as organisation wide support for a project is necessary if it is to be a success, especially in a project attempting to bring about organisational change. Without this support, users can resist the new system, making things difficult for the project. As a result the project may fail to meet many of its objectives.

Universities are complex organisations and the academic calendar can make scheduling project related activities difficult. The power distribution in a university, with the academics holding more power than their position in the university hierarchy would suggest can also cause problems when determining whose support is most important and trying to gain engagement with the project.

The GEOMETER project believed that their system infrastructure would be able to cope with the new system and as such postponed extensive load testing. When the system went live they then encountered huge performance issues. Ensuring the system infrastructure is able to cope with the added load of a new system is important. Undergoing load testing and updating the infrastructure if necessary will help ensure the system has an acceptable level of performance.

Communication with users is essential to gain their engagement with the project. Their knowledge and influence can be extremely useful to a project team and help ensure that the system that is deployed meets their needs. Communicating with a large and varied group of stakeholders is however difficult and a 'one size fits all' approach will not work. Ongoing communication, especially in time of trouble is important to ensure support for the project is maintained. Letting everything 'go quiet' as seen in GEOMETER leads to rumours and negative feelings developing which can have a detrimental effect on the project. Communication in large projects is a multi-faceted issue and a variety of techniques need to be used to address each of these areas. Traditional methods of communication including meetings and emails fail to scale to the levels necessary for large projects and alternative complementary mechanisms are required to allow for the necessary ongoing communication with the stakeholders.

9.2 Lessons learned from LSCITS

The LSCITS experiment provided valuable insights into how social network sites should be introduced and the benefits they can provide to a project. As the first experiment, it provided an opportunity to develop the approach of using a social network site in a project and useful lessons were learned which can be applied if such sites are to be introduced to future projects.

The nature of their work means academic researchers are very busy, often working on multiple projects as well as having teaching and administrative commitments. Shortage of time is a common feature of people involved in projects, especially for stakeholders where the project is not their primary focus. Initially there was a dependence on users checking the site for updates, which many found difficult. There

was a feeling that they need to be informed when there is something new to see so they don't waste time. While RSS feeds are in place, the importance of this kind of awareness information was not given enough consideration. It was originally felt that focusing on the basic features of the site in the user guide would be the best approach, leaving more advanced concepts, such as RSS, to be discovered through experimentation. At a later date RSS was added to the user guide and the new version uploaded to the site but it is unclear how many read this. It is clear that users need to be made more aware of the features the system provides for delivering awareness information.

When people are working on multiple projects, they often have multiple channels to check for information. Other projects may have online file repositories, mailing lists and other systems which need to be checked and similarities between these systems can make their use confusing. When configuring a social network site emphasis needs to be placed on making the interface as clear and easy to use as possible. Drawing attention to new information on the site is even more important when there are several systems competing for a user's time.

The importance of integration with other technologies also became clear during the LSCITS study. Having multiple channels to check can be time consuming so integrating these to provide easy access is important. The growing popularity of Twitter and its use by some members of the project added another channel to be checked and making the process of checking all of the channels quicker and easier for users would be beneficial.

Despite many initial teething problems with the site and its configuration, early adopters remained consistent with their use. These users were extremely helpful in noticing and notifying us when they spotted bugs and problems with the system. This helped make the site more stable and reduced the amount of time bugs remained in the system. If the site crashed for any reason, their quick notification of this helped to minimise any down time. It showed that if people can see the benefits of something they will stick with it despite problems, in a hope that they can help improve it over time.

The importance of pre-populating the site with posts so that there are existing discussions to comment on and examples for people to see was also demonstrated on the LSCITS site. During the initial period of local experimentation, the site was given to users with no existing content. This made it difficult for them to know what format posts should take and starting the first discussions was difficult. When it was opened up to the rest of the LSCITS project the site already had a large amount of content. This existing content helped users to see how the site could be used and also gave them discussions to start commenting on. This is important, as not all users will be likely to open discussion themselves - this has been seen in the use of the site and the activity patterns of users.

The use of a social network site in LSCITS had the support of the Project Director and several of the principal investigators. This support helped promote the use of the site and encourage others to participate. By showing an active presence on the site and 'leading by example' they showed their belief in the idea and its use. If users can see the site in use, especially by prominent project figures they are more likely to do the same. The high levels of promotion by the principal investigator at St Andrews helped the use of the site to become part of their daily routines.

The importance of guidelines for use of the site in the initial stages was underestimated. While guidelines were produced these were very general and in no way enforced. The guidelines were also only circulated via email and it is possible that they were not read by all users. When starting a site, it is now clear that guidelines for use should be given to users when they are introduced to the site and that they should give clear instructions as to the purpose of the site and its features. This will help clarify any areas where confusion may arise such as when to use personal and private spaces, and the use of access restrictions making it easy for users new to the site.

The use of the site for progress reports was introduced a short while after its initial introduction. Every member of the project was required to submit a brief monthly report describing what they had been working on. The hope of the Project Director was that as well as helping him keep aware of people's progress, it would stimulate more activity on the site. While this did increase the number of users logging in it is

not clear if making use mandatory is an effective way of stimulating activity in other areas. It did, however, allow previously passive users to gain experience in using the site and gave them more confidence to participate actively when they felt they had something to share.

As the amount of information on the site grew, the importance of easy access and organisation became clear. Older discussions were being forgotten and were often almost impossible to find again due to a lack of organisation of information on the site. This problem was exacerbated by the poor search facilities provided by Elgg. The lack of defined work projects in LSCITS meant that determining any organisation prior to the site's introduction was difficult and there are still no definitive areas of work that can be introduced. While a list of more general topics is available and possible collaborations are now clear, a project with a more defined structure and purpose may be more suitable for organising information on the site. Users are unlikely to go back through pages of old posts to find what they are looking for.

The use of the LSCITS site demonstrated that there are communication benefits to using a social network site and that users will participate if they are interested in the project and can see these benefits.

9.3 Lessons learned from ASP

The introduction of an Elgg site into the administrative systems project was chosen in an attempt to further investigate the potential of social network sites. The shared setting of the project with the others studied and the involvement of a large number of people in different university departments made it an ideal candidate. Unlike the GEOMETER project, ASP was only in its very early stages and didn't have a full project team established at the point of the site's introduction. The project was primarily in the requirements gathering phase prior to deciding if they needed to procure a new system.

Unlike in LSCITS, the results for use of the ASP site are disappointing. It failed to gain the critical mass of users required for it to be useful. When the site was created it was unclear what it was needed for and which features would be used. As the project

hadn't actually started, they were still not sure how it would be structured or what work would be carried out. Due to this lack of information and, possibly, a lack of understanding on the part of the key project figures regarding what the site could be used for and the benefits it could bring, all features were left in. The rush to get something in place for the project kick-off meeting meant that the site was in its most basic state, with very little configuration having been carried out when it was presented to the initial members of the team. It has been commented since that, if it had been presented in its current state after the extensive configuration work, it may have been more widely adopted. This emphasises how essential pre-planning is when a new technology such as a social network site is to be introduced into a group.

The strategy used in LSCITS of starting with a small group of users and then expanding to include the whole project may have been more beneficial in ASP and would have allowed configuration to be undertaken to make the site easier to use and more suitable for their needs before presenting it to a larger audience. Unfortunately, due to project constraints, the decision was made by the Project Manager to go with the site at the first meeting. The lack of understanding regarding what the site could be used for and what the project needed from the site meant that information regarding the potential benefits could not be effectively passed on to the team and mixed messages where being sent out. Better definition at the start could have led to a clearer understanding developing.

The project was eventually split into smaller groups, each with a team leader. Active promotion of use of the site by these team leaders may have helped it to be adopted by group members, similar to the promotion by the principal investigators at some of the LSCITS universities. Rather than talking to all of these team leaders to see how the site could be used to best help them, the Project Manager decided to create communities for each of these sub groups. This splitting of users into small groups meant it was hard to find out about things happening in other areas unless you were aware that the communities existed. It also made the stimulation of activity very difficult. Visible interactions promote activity, however each of these groups only really had one key member so it was not possible to easily show the site being used for discussions and that key figures in the project were actively engaging with it. In larger projects like GEOMETER, where the groups are much bigger, creating so

many communities may work better however, in ASP it may have been beneficial to have a few larger communities around more general topics on which discussions could be held. This would also prevent silos developing within the team and help a complete picture of the project to develop in people's minds, overcoming one of the problems experienced in the GEOMETER project.

The decision to use the site for continuing discussions outside meetings by posting minutes and agendas seemed like a good idea. In practice, however, this did not stimulate the activity required. This could be because unlike in LSCITS, people did not feel they needed to discuss things further and that they contributed all they needed to at the meetings. The uploading of these files to the site also led to confusion about its purpose, with many thinking it was an additional file store or a file sharing mechanism. This then led to questions about why it was needed and why it didn't provide features they required for managing the files. Emphasising the purpose of the site and making sure everyone understands this is important if it is to be beneficial and if introduced to another project, extra effort would be needed in this area. The clarity of its purpose in LSCITS and what it should be used for may be one reason why it was able to gain a higher level of use.

The level of commitment people had to the project at this early stage could also have had an impact. As seen in GEOMETER, users are sometimes slow to engage until they at least know what is happening, for example they are getting a new system. It was possibly too early to introduce the site to ASP and introducing it to such a large number of people, rather than the core project 25 as initially intended was possibly unwise. These additional members had only a low level of involvement in the project and, for this reason, their motivation to engage in using the site was much lower. There is a lower likelihood of them checking for updates outside of meetings and when they are not expecting anything important.

The project has now changed focus again and, rather than procuring a new system, they are assessing their business processes, something which they had intended on doing before. Due to this, it is unlikely that the site will see much use in the future months. If this had not occurred and a new system had been procured there is a chance that this may have stimulated more discussion amongst the users, who could

not see the potential impact the project would have on them prior to this point. A new Project Manager took over the project and began reviewing if the site could be made useful for them or whether to abandon it completely. This new manager has however already moved to a different department in the university and the future of the site and even the project is uncertain.

9.4 Applicability of results to GEOMETER

The results of the study of the GEOMETER project illustrated the wide range of issues faced by large scale deployment projects. It is clear that introducing an ERP system to an organisation is very difficult and getting a fit between the organisation and the software requires both configuration and organisational change. For projects like this to be successful, user engagement is important and maintaining their support throughout the project is vital if the software is to produce the results desired. In GEOMETER, the communication strategy failed to provide for ongoing communication among such a large number of stakeholders, with a focus on meetings and emails which they themselves recognised as inefficient. Using a social network site could potentially help with this problem. While the results from using Elgg in the LSCITS project are positive and have shown communication benefits, these have not been demonstrated in the GEOMETER project itself and the likely applicability of the results to projects like GEOMETER needs to be considered.

Although the LSCITS project was a research project there are similarities to GEOMETER which suggest that the results may be transferable. While GEOMETER was a bigger project, LSCITS involved a large team of geographically dispersed researchers, making communication difficult. The researchers on LSCITS have differing interests and backgrounds, similar to the variations observed among the different groups of stakeholders in GEOMETER. Both projects also have a hierarchical structure, although in LSCITS this is less formally enforced.

One of the major concerns of the project team in GEOMETER was the ability to engage academics in the project. They were also concerned that they would not use anything new. The LSCITS project involved a large number of academics (also suspicious of new things) and their use of the Elgg site suggests that if they can see a

benefit to using something they are willing to try. While the university setting caused problems for the GEOMETER project, the study of LSCITS use of Elgg suggests that some of these issues, such as hierarchical communication barriers, can be overcome. In both projects all participants have a need to keep aware of what is happening and communicate with others involved to ensure success. While the site has not been shown to increase the likelihood of success, the increase in levels of communication across geographical locations can only be seen as positive and has helped improve working relations across the universities involved.

Several members of the LSCITS project mentioned that they were working on several projects and that this impacted on how much time they could dedicate to using the site. They also commented that with so many different sources to check for information on different projects, as well as becoming time consuming, it could also get confusing. With a project like GEOMETER this problem would not be encountered, as the majority of the project team were only working on the project and nothing else. It may be an issue for some of the stakeholders in the wider university community who are involved in various roles, however, the site could be used as their primary source of information on the project, instead of the project website.

The better defined structure of deployment projects such as GEOMETER, with sub-groups of people working on specific areas, could also help avoid some of the problems encountered with the organisation of data on a shared social network. The ability to create communities for different topics or for people working on different areas would help to structure the information and provide each group with space to discuss the project and share information. Multiple communities were not used on the LSCITS site due to the relatively small number of users, and ASP showed the problems when communities are too small. This would not be a problem in a much larger project like GEOMETER. The success of the site in LSCITS, despite a lack of structure, would seem to suggest that putting structure in place in another project could only add to the benefits, increasing the usability and speeding up access to information.

If a site were to be created for a project like GEOMETER, an assessment of their communication needs would have to be made before it was configured to ensure it

met these requirements. Unlike LSCITS where it was introduced and people were left to use it how they felt best, guidelines would have to be created to ensure people knew where to look for what, and what each function was to be used for. This would help enforce some consistency of use, which would be needed in such a large project. A more structured approach would help gain users quickly, especially if effort was made to inform people of the benefits of using the site and if leading people in the project were seen to be actively promoting it. The pre-population of the site with some information and structure would also help both in the finding of information and in convincing users of its usefulness. If all these actions were taken it should be possible to replicate some of the benefits seen in LSCITS.

While the differences in the nature of the two projects could introduce threats to the validity of the results observed in LSCITS, there would appear to be sufficient commonality between the two projects and the communication issues they face to suggest that the results might be applicable.

9.5 Critical evaluation of the Elgg experiment

Despite the positive results of using Elgg to help communication in the LSCITS project, the way the experiment was carried out could have had an impact on the results. Many lessons can be learnt from the experience and if an Elgg site were to be introduced to another project, these could help it gain a critical mass of users and become a success.

From talking to the users it is clear that structure needs to be put in place from the start. The decision to let the structure evolve over time was made for this experiment, as no clear definition was available for how the project would be structured. It was unclear how users would choose to use the site. Giving the site some more structure, including possible communities, would help users in navigating the site and finding information. It is also important not to make it too structured as seen in ASP with many communities, as this can impede communication. The organisation of information was not a problem initially, but as more content was added to the LSCITS site, navigation became difficult.

The use of a tag cloud for the main organisation of the site was not successful in LSCITS. In large public sites such as Flickr, the use of tagging has been seen to be successful, with a folksonomy developing over time. In LSCITS however, this took a long time to develop and as users were interested in different areas, this led to low levels of tag reuse. Only the more general terms were used and these were used so often that they were no longer helpful. By pre-populating the tag cloud with relevant terms and encouraging users to choose these before creating new ones the tag cloud may be more effective. While an attempt was made to do this, meetings with some of the potential users to discuss these may have helped ensure they were the terms likely to be needed. Encouraging users to check for existing tags before creating new ones may also have avoided the problems of similar tags being used for the same thing and may have helped to group similar information together. This could then help with the problem of using tags for searching the site. However, it was agreed that integration of a full text based search was essential in any future versions of the site to help ensure that useful information could be discovered.

When use of Elgg was expanded from the local users to LSCITS it was still unclear exactly how it would be best used, so no set guidelines were produced. If guidelines were produced for when to use each area and feature, these would have helped enforce some consistency and this, in turn, would help users know where to look for information. It would also have made it easier for users to learn how to use the site and become familiar with its features. Many found the initial period of use confusing as they didn't know what to put where and this may have caused some users to abandon the site.

After a short period of use with a larger user base, a reassessment of the site, as done in ASP, should have been made. This would have allowed any improvements to be made to make it more beneficial to users and any plug-ins that were not being used to be removed. In doing this the interface would have been less cluttered and it would have been clearer which features were important. Some of the suggestions made when speaking to users to assess the site, were simple ideas that, if introduced earlier, may have helped encourage users to log in regularly and possibly contribute more often. While some adaptations were made as the use of the site progressed, an on-

going development, in line with the perpetual beta idea, may have been advantageous to the project.

The plug-in that provided the wiki feature was introduced after the site had been in use for some time. The introduction of this plug-in was explained in a blog post however this may not have been read by all users. Better guidelines for when to use the wiki as opposed to blog posts may have helped users take advantage of its benefits. Despite this, use of the wiki is slowly increasing now users are aware of its potential. In the initial stages of use, some things that would have been better on the wiki were put in blog posts and vice versa. With experience, it is now clearer under which circumstances each feature is beneficial; however this could not be said at the time of introduction.

Putting everything together online has been seen to be advantageous and providing a way to structure discussions and post updates on your work has been seen as helpful by many of the site's users. It is not however clear if blogs are the best Web 2.0 technology for doing this and using other such technologies, integrated with a social network site may provide similar results. It is clear that more effort needs to be made to ensure that the site is as easy to use as possible and takes very little time out of people's busy schedules if it is to quickly gain a critical mass of users.

When the site was originally set up, it was felt that RSS feeds were the best way for people to keep up to date about new content. Although email notifications were included for certain features, it was felt that these may add to people's overloaded inboxes so the feature was not developed further. It is now clear that people are used to checking their emails regularly and have developed mechanisms for efficiently filtering them, so email notifications may be more useful than anticipated for triggering logins. Understanding users' behaviours like this can help to develop a site that is more widely accepted and gains a larger regular user base quicker. Better integration with technologies such as email and now Twitter may also help reduce the number of channels users need to check and make them more likely to use the site.

The experiments with the site made it clear that not all the features provided were of equal importance to a social network site and that some were unnecessary. The

ability to share information and discuss ideas was crucial to the site. Extra features such as calendars and the ability to send messages to users do not seem to be necessary and are not popular. While the ability to connect to people is crucial to a social network site, the ability to do this via friendship lists does not appear to be as important as the ability to come together and discuss things as groups. It is clear that no one feature set will suit every project and with some a more minimal approach may be desired for simplicity. In these cases having both personal and community blogs and file spaces is not necessary and the use of those for the communities may suffice.

Despite the many quirks in the Elgg interface, users in LSCITS stayed with the site through the start up period and learnt to use it. These quirks however may have put some people off as they find it too confusing and that it takes too long to learn how to use. If a social network site is to be useful, ease of use is extremely important and a simpler more intuitive interface that is easier to navigate than that provided by Elgg may be required. The fact that users still regularly logged in to check the site does however suggest that the need to communicate is great and that tools to help are required.

Due to the possibly confidential nature of some of the information being shared and the need for control over the experiment, the decision was made to use a private social network site. The extra control this provided over the configuration of the site was, in the end, crucial, as tailoring the site to meet the needs of the individual project proved to be very important. While initially it may not seem important, the ability to tailor the look and feel of the site also proved useful for ASP as it had to match the university image to be included on their site and this would not have been possible if the public sites were used. The feeling of security and confidentiality of information provided by using a private site was also reassuring to many users, making them more willing to contribute and share. In projects such as LSCITS, where information from industrial partners has been shared on the guarantee it will be kept within the project, these reassurances are extremely important if the information is to be discussed on the site. Although public sites are popular and users are familiar with them, the feeling amongst users of the LSCITS site was that keeping their public and work lives separate was important. If social network sites are to be used to support project

communications in future projects, the extra benefits provided by private sites would make them the more suitable option.

9.6 Benefits observed

The aim of the study was to investigate if a private online social network site was effective in supporting project communications. The results of the study showed a wide variety of communication benefits from use of the site. These benefits included a more complete awareness of people's work developing across the project, which in the case of a research project, helps people spot future collaboration opportunities. This could also be helpful for members of the project team in deployment projects, to see who is working on things related to your work and stay aware of their progress. Being able to maintain awareness of what is happening in a project can also help stakeholders keep up to date on the progress of the project. Putting updates, like the progress reports, on the site, allows a large number of users to be quickly informed about your work.

One of the primary benefits people found from using the site is the structure it provides to threaded discussions. These would previously have been inefficiently carried out via email. Threaded discussions done via email are hard to follow and revisit at a later date. By putting all the messages related to a discussion together, in chronological order on one page, the use of the website provides much needed structure, making them much easier to read. The ability to easily carry out discussions on the site encourages more cross university discussions to be held and more users to participate in them.

Instead of being colleagues working on the same project but having very little contact, through the use of the Elgg site, many of the researchers are now in regular contact with people at the other universities on the project and consider them people they interact with on an almost daily basis. These strong working relationships have developed, through the site providing a mechanism for this ongoing contact.

The site was used as a complementary communication mechanism alongside other channels including email, Twitter and phone conversations. The levels of

communication through these mediums prior to the site being introduced and the current levels of use have not been measured and the inclusion of this information could help show how much the communication patterns of the project team have changed.

9.7 Threats to validity

The initial investigation into the GEOMETER project provided a valuable insight into the problems encountered on a large scale deployment project. While the introduction of the Elgg platform to the LSCITS project showed positive results, the ability to study the impact of the use of the site in GEOMETER and if it helped alleviate some of the communication problems observed, would have provided more concrete evidence for the benefits it can provide.

A study of the use of Elgg in GEOMETER or a similar project would help to discover if the benefits observed in LSCITS could be more widely applied, however this has not been possible. At the time of development, the GEOMETER project was encountering too many problems and undergoing a large number of changes for a site to be introduced. While it was suggested that a trial with a small number of users be carried out, they decided that it would be too risky and that it would require extra resources to monitor, which they no longer had available to them. There was also a concern that the site would be used to increase negative feelings towards the project. The reliability of the results of any study carried out would also be questionable due to the problems in the project and people's feelings towards it at this time. As the project had been running for a long time people had also come to expect communications via certain channels and the introduction of something new would require extra effort to ensure uptake and as previously mentioned, the project was now operating with limited resources.

LSCITS is a relatively small project, involving people primarily from a computer science or social science domain. It could be argued that their interest in these subjects had an impact on their use of the site. While the users did not feel this was the case, it cannot be ruled out as an influencing factor. The development of the site at our university and the use of LSCITS members here for the initial period of

experimentation caused much higher levels of use here compared to at the other universities involved in the project and thus these results cannot be seen to be representative of general use. Instead they show how use can develop when there is a commitment to using the site from all those participating and when users are involved throughout the development process.

As with any qualitative study many of the results are interpretative, however by combining the statistics from the use of the site with semi structured interviews it should help to validate the results. It was however not possible to interview all participants in the experiment in LSCITS or ASP and for this reason, despite a wide variety of people being interviewed, valuable insights may have been missed.

9.8 Future Work

While the experiment with LSCITS revealed practical benefits to using a social network site, it also pointed to areas where further development and research are needed.

If the Elgg platform were to be used in the future, it would be necessary to develop some of its functions further, to meet the requirements of its users. While the platform can be developed further, it is important to note that this is not the only available social network platform and that use of an alternative should also see similar results.

The main focus of any future developments to Elgg would be adding much needed structure to the data it stores. Development of a full text search would make it much easier for users to find information and prevent old discussions from being lost in the site. Development of the tagging system for categorisation would also allow structure and organisation to be more easily added to the data which in turn would aid navigation of the site. This would need to be developed and tested with users to ensure it met their needs and provided the ease of use they required.

The interface also contains many quirks that are not fully intuitive to users, including the use of two different photos to represent a user and the processes required to carry

out certain actions. The site could be developed to make it easier to learn how to use; possibly reworking some of these features and hopefully in turn gain more extensive user support.

The development of the email notifications feature to allow the user to tailor them would also provide additional benefits. The inclusion of a weekly summary email with quantified information would be a useful development that would require a large amount of consideration to ensure it provides the information users need. The inclusion of these additional features related to email notifications could potentially trigger more users to log in and contribute to the site.

Although many LSCITS members were using the site, it was recognised that not everyone was regularly logging in. For this reason some posts were being duplicated and sent via email as well. Better integration with email, allowing users to use it to post information to the site at the same time as sending information to the mailing list or vice versa may help to reduce the work involved. During the experiment Twitter also saw an increase in popularity. Several LSCITS members subsequently started using this for more brief updates. Providing an easy mechanism for integration with Twitter may be useful to some users, reducing the number of channels they are required to check for information.

While the results of the experiment with LSCITS have shown the potential of using a social network site, the introduction of such a site into further projects of varying sizes and in settings outside the university domain would help verify these findings. LSCITS is a relatively small project in comparison to deployment projects such as GEOMETER, which involve large numbers of stakeholders outside the project team. Application to a project like this would provide a variety of areas in which the site could be used and show if it can help reduce some of the communication problems encountered. It would also be useful to see if involving users more in the development process helps the site to establish a critical mass. It would be valuable to investigate if the use of a site can help a project team communicate with their stakeholders outside meetings and presentations, in the same way that it helped people at the different LSCITS universities maintain ongoing communication. The experience gained during the LSCITS experiment can be applied to these new

applications to hopefully improve the results further and the lessons learned from the ASP site could potentially help ensure future success.

9.9 Final Conclusions

Undergoing a year long observational study of the GEOMETER project revealed the wide variety of issues encountered in a deployment project and allowed an understanding of the complexity of such a project to develop. Doing fieldwork is extremely beneficial for gaining an understanding of a problem and context before attempting to develop a solution. Carrying out such a field study provided valuable background to the research. It also showed how with no training in this kind of study and no background in sociology useful insights can still be gained from observation.

While initially it was thought that it would be technical issues that support would be needed for, the study challenged these assumptions. It made clear the impact of social factors on a project and changed the focus of the study to communication and its support. Without this background research in a real world setting, a solution may have been developed for a problem that didn't really exist or had very little impact. Instead the study revealed the real issues, allowing the research to change direction. If a small amount of fieldwork had been carried out in GEOMETER prior to their undertaking of the project, maybe they would have understood their organisation and the processes involved better. With this increased level of understanding they may have been better placed to configure their system and develop new processes to meet the users' needs, potentially encountering fewer problems.

ERP systems are complex and their deployment requires a combination of business process reengineering and system configuration in order to get a 'fit' with the organisation. While a combination of these tasks was attempted in GEOMETER their over ambition and lack of understanding of both the system and the current work practice of the organisation led to a wide number of problems being encountered. Communication with users when undertaking such a project is vital to gain and maintain their engagement and support. Without this support the project will struggle to meet many of its objectives however getting the communication strategy right to gain this support is difficult. While traditional methods of communication are often

relied on these have many problems and fail to scale to the levels needed for large scale project. Alternatives are necessary and a variety of techniques need to be used to allow ongoing communication with stakeholders.

While their use is not successful in all scenarios, the experiment showed that social network sites have the potential to help communication among distributed professional stakeholders with diverse requirements. If the stakeholders have a shared motivation or goal, success is more likely, although it is not guaranteed and a wide variety of other conditions are required.

It is clear that you can't just put a social network site into a project and simply expect it to be used. The communication requirements of the project first need to be understood and the site designed and configured to best meet these requirements. While projects share similar features and may encounter similar problems, each will have slightly varying needs and these need to be addressed and the feature set adapted accordingly. Ongoing tailoring to continue to meet the requirements of the users and the specific communication needs of the group is then needed, if the site is going to gain and maintain a mass of users and this is crucial if the site is to be successful. A clear understanding of what users require from the site and what it can help with is also needed by the project management if they are to promote the use of the site, lead by example and help gain support.

Providing users with an integrated range of social media, including blogs and wikis, as seen in Elgg, gives users a range of modalities for communication currently missing on other social network sites. By combining the various media with a social network, a larger number of communication benefits can be realised than with the more limited features of mainstream public social network sites. The use of the variety of features Elgg provides, despite them individually not being the best available, suggests that in a professional context, it is not having a social network site such as Beehive that is most important to help with communication in projects, and more the bringing together of the different social media in one place where information can be maintained over a long period of time and constantly referred back to.

While a social network site can bring communication benefits it can't solve problems resulting from bad project management. If the project has management issues, these need to be addressed first, before attempting to install a social network site. The problems with ASP and the direction it was taking combined with a lack of understanding of the technology and their requirements meant it failed to gain any acceptance. If a project lacks a clear focus and direction knowing how best to configure a site and in which area it will be best utilised is difficult. For this reason the introduction of social network support is not advised. If the site is put into a failing project it is also unlikely to gain the number of users required as they have often lost faith in the project at this stage. Instead it is better to introduce the site early in the project, before strong opinions have been formed and problems have developed.

Despite the disappointing levels of use in ASP, the use of a social network site appears to have many potential benefits to communication in large scale projects. If used as a complementary mechanism alongside traditional approaches, including email and meetings, its use can help improve communication throughout the project. A clear understanding of what the communication needs of the project are and how the project will be structured can help develop a site that best meets these requirements. If everyone is clear how the site should be used and the potential benefits, and if key figures are seen to be actively promoting its use it should be possible for a site to quickly gain a critical mass of users. The introduction strategy taken and the configuration and evolution of the site is extremely important in determining its ongoing success. While technical and interface issues do exist with the Elgg platform this can be developed to overcome these and should not prevent benefits being derived from its use in future projects.

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Appendix A SQL Queries

Users

Get all the users in the system

```
SELECT username, email, name, last_action from elgg_users where
user_type = 'person';
```

Files

Get all the files uploaded in order of date

```
Select title, location, access, size, from_unixtime(time_uploaded) as
time_uploaded, username, originalname
From elgg_files, elgg_users
Where elgg_files.owner = elgg_users.ident
Order by time_uploaded;
```

Weblog comments

Get all comments made on blogs and when posted

```
Select post_id, postedname, from_unixtime(posted) as posted
Into outfile 'weblogcomments.csv'
From elgg_weblog_comments
Order by posted;
```

Weblog posts

Get all the posts made and by who

```
Select title, access, username, weblog, from_unixtime(posted) as
posted
From elgg_weblog_posts, elgg_users
Where elgg_weblog_posts.owner = elgg_users.ident
Order by posted;
```

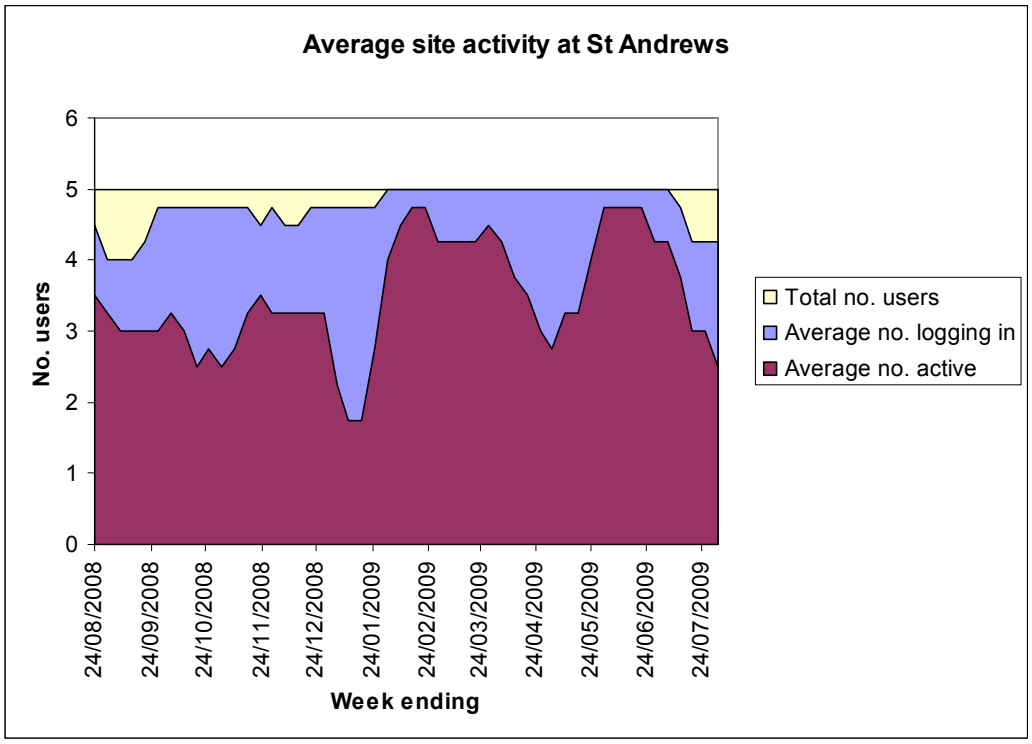
Folio

Get all the updates to the wiki

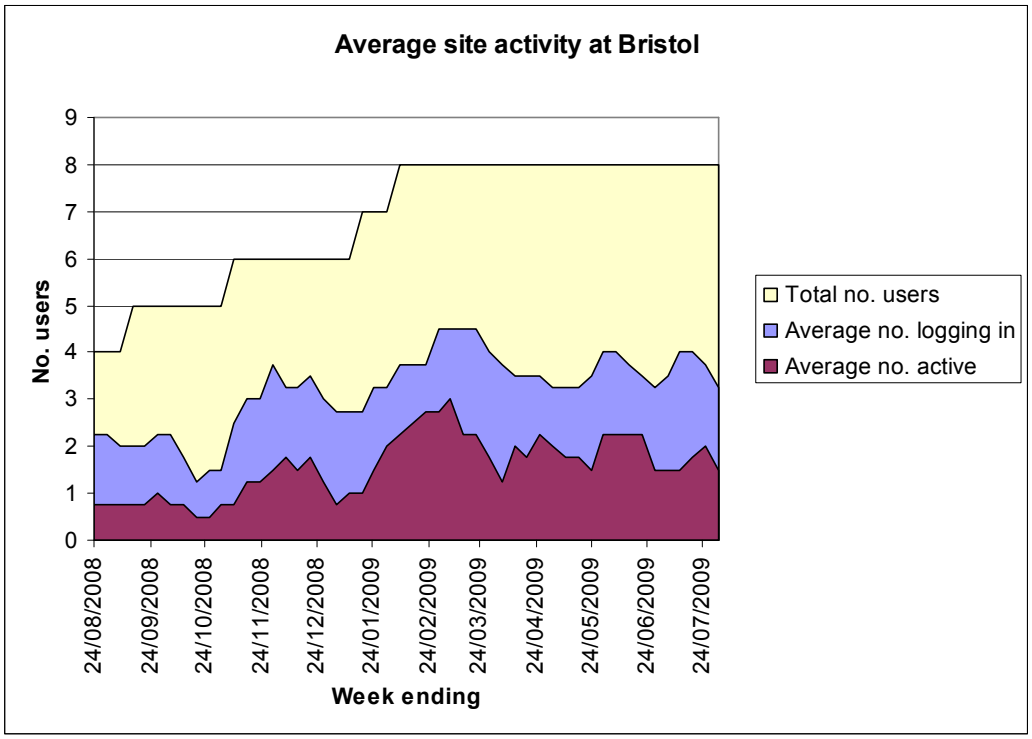
```
SELECT user_username as username, title, FROM_UNIXTIME(created) as
created
FROM elgg_folio_rss
WHERE type = 'page' OR type = 'page_comment';
```

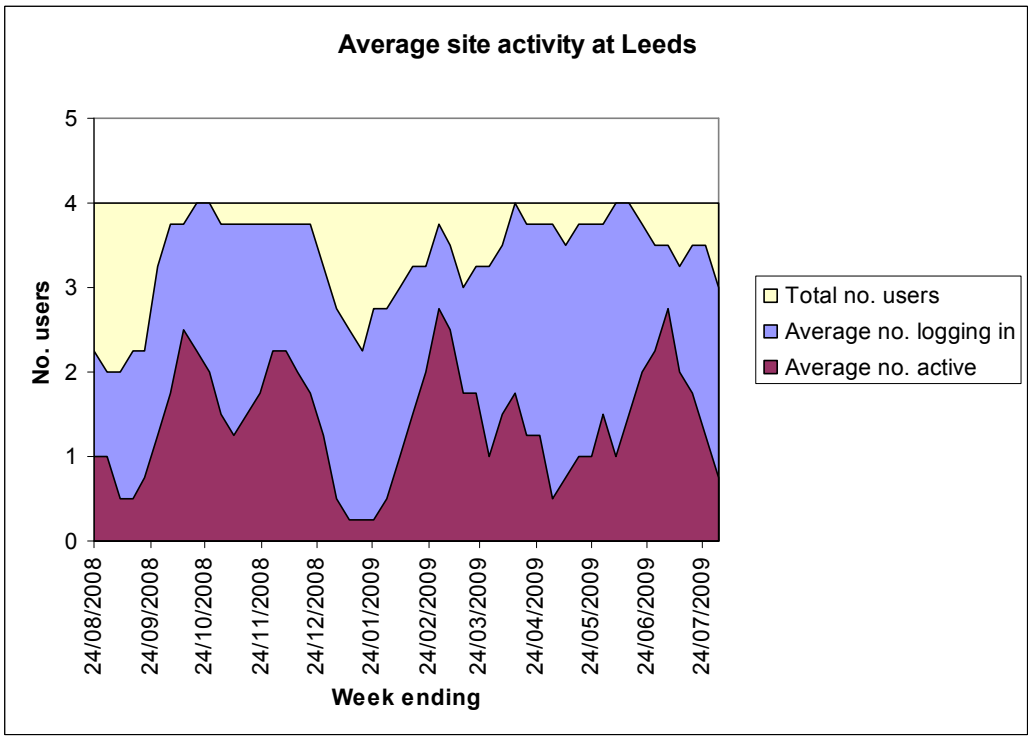
Appendix B Usage at LSCITS universities

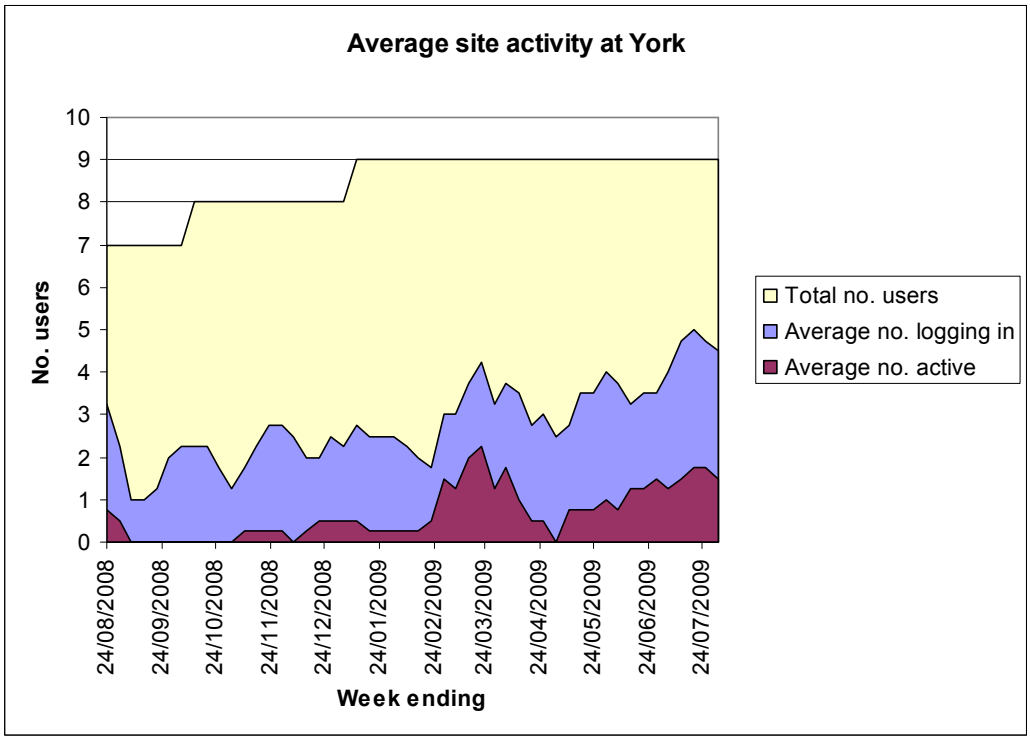
The graphs below show the average number of users logging in to the LSCITS site from each of the universities involved and the number who have been actively contributing over the 12 month period of use. The first graph shows the very high levels of active use at St Andrews due to this being the pilot university and its use being actively promoted.

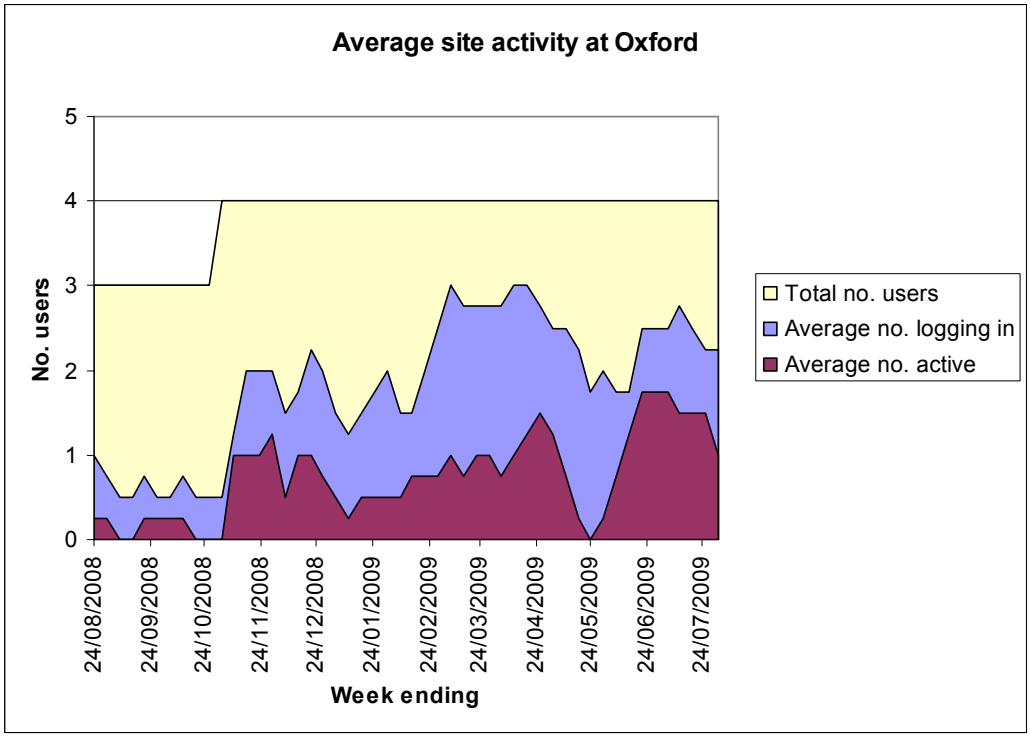


The other graphs show very different activity patterns however similar peaks in the number of active users can be seen when examined more closely. This would suggest particularly busy times for the project or particularly interesting discussions. An increase in the number of active users can also be seen after the introduction of the monthly progress reports.


Average site activity at Bristol
No. users
0
1
2
3
4
5
6
7
8
9
24/08/2008
24/09/2008
24/10/2008
24/11/2008
24/12/2008
24/01/2009
24/02/2009
24/03/2009
24/04/2009
24/05/2009
24/06/2009
24/07/2009
Week ending
Total no. users
Average no. logging in
Average no. active


Average site activity at Leeds
No. users
0
1
2
3
4
5
24/08/2008
24/09/2008
24/10/2008
24/11/2008
24/12/2008
24/01/2009
24/02/2009
24/03/2009
24/04/2009
24/05/2009
24/06/2009
24/07/2009
Week ending
Total no. users
Average no. logging in
Average no. active


Average site activity at York
No. users
10
9
8
7
6
5
4
3
2
1
0
24/08/2008
24/09/2008
24/10/2008
24/11/2008
24/12/2008
24/01/2009
24/02/2009
24/03/2009
24/04/2009
24/05/2009
24/06/2009
24/07/2009
Week ending
Total no. users
Average no. logging in
Average no. active


Average site activity at Oxford
No. users
5
4
3
2
1
0
24/08/2008
24/09/2008
24/10/2008
24/11/2008
24/12/2008
24/01/2009
24/02/2009
24/03/2009
24/04/2009
24/05/2009
24/06/2009
24/07/2009
Week ending
Total no. users
Average no. logging in
Average no. active

Appendix C Getting started with Elgg

Filling in your profile

1. Select 'Your Profile' from the main menu options at the top of the screen
2. Next select 'Edit this profile'
3. Fill in the profile fields. Blank fields will not show on your profile page
4. Enter a 'Brief Description' to appear in your sidebar profile
5. Give each file an access level to determine who can see it
6. Upload a picture to be displayed with your profile
7. When finished click 'Save your profile'

When entering research interests remember to only enter words or phrases separated by commas as these will become tags.

Account settings

Friendship moderation: allows you to decide if others can add you as a friend

- No moderation: anyone can make you their friend
- Moderation: you will be notified when someone wants to make you their friend and be given the option to accept or decline
- Private: no one can add you as a friend

Public comments: allows visitors to the site to make comments even if not logged in

Receive email message: sends you an email notification of comments made on your blog posts and any discussions you have marked as interesting

Email notifications: sends you an email notification if someone adds you as a friend or joins a community you created

Your site picture: an icon to represent you in the system**. Not to be confused with your profile picture which is what is displayed when people view your profile.** Once you have uploaded the picture select it as the default icon for it to be displayed. Even if you select it as default when uploaded you must click save on the next page for it to be used.

Keywords

- Also known as 'tags' and are used for searching Elgg.
- **They are case insensitive and separated by commas so can be phrases as well as individual words**.
- Once a keyword has been used more than once in Elgg it becomes a link. Clicking this returns search results for every other object in the system tagged with that keyword.
- **Some examples of keywords have been uploaded if you search for user Natalie and enter the file repository. These can also be seen in the tag cloud.**

The tag cloud

The tag cloud displays all the key words used in the system with the size representing how often they have been used. Selecting one of these will search the network for any reference to that key word.

When adding or editing a blog post you can view the tag cloud and select keywords from the list. Clicking on them will add them to the keywords. This option is also available for community blogs. It is not however an option when uploading new files. If you wish to use the tag cloud for this, upload the file and then click edit. This will then give you the option to select keywords from the cloud.

Your Blog

- From here you can post new entries to your blog. These have a title, body and associated keywords. They can also be given an access level to restrict who can see it.
- The friends blog allows you to see all the blog posts made by people you have selected as friends.
- When viewing a blog post you can keep track of comments made on it by marking the post as interesting. Any updates will then appear in the interesting posts section.

Your Files

Uploading a file:

1. Click on add a file or folder.
2. Click 'Browse' to locate the file you want to upload
3. Select an access restriction and enter some keywords
4. **Check the box verifying you understand you are sharing the file with others and have the legal right to the file and click upload.**
   If you don't check the box it won't upload the file

Creating a folder:

To get you started a public and private folder has been created for each user but a more detailed file structure can be created.

1. Click on add a file or folder and type the name of the folder in.
2. There are two folder types. The default just displays files and folders as icons; the photo gallery shows thumbnails of the photos in it.
3. Choose access controls for your folder and add any keywords
4. Click create

Access controls applied to a folder do not then apply to the files within it, these have to be set individually.

If you delete a folder its contents will be moved to its parent.

Your Network

This is where you can manage your connections to other people.

Communities: all the communities you are a member of

Owned Communities: all the communities you own. Allows you to create communities

Friends: displays the friends you have linked to

Friend of: displays all the people who have linked to you as a friend

Friendship requests: used if you have chosen to moderate friendships

Communities

- Each community has its own URL, profile, file repository and blog.
- Communities are created using the owned communities section of 'Your Network'.
- **Membership can be moderated if you select this option when editing the community details.**

Access Controls

Default access controls:

- Public: anyone can see it
- Logged in users: only logged in members can see it
- Private: only you can see it

Custom access controls

1. Click on 'Your Network' and then 'access controls'.
2. Enter a name for your group and click 'create'.
3. Now you have to populate the group. There are two lists; those on the left are those who aren't in the access control group and those on the right are the group members. Select the members and click add to selected group.

You will now be able to restrict access to this group.

Members can be removed from a group in a similar way.

Only those who you are friends with can be added to an access group.

RSS

- Each user has an RSS feed for all of their activity
- Each tag has an RSS feed
- User file repositories have an RSS feed
- User blogs also have a feed
- Each community has an RSS feed for files, blog posts, tags and the community as a whole
- RSS feeds are produced when you search on a particular topic

The RSS feed for user activity is accessed by clicking the RSS icon next to the username. This feed is the one recommended for keeping up to date with blog posts and file uploads as it shows all behaviour. Some RSS feeds will only notify you of changes that are made public.

Tag based RSS feed:

After searching on a topic, clicking a keyword provides you with a link allowing you to view its RSS feed. You can then subscribe to this using its URL.

An RSS aggregator is provided in the form of Your Resources however I would advise against using this as it will still require you to log in to Elgg to check it.

The RSS icon  can be clicked anywhere it appears to view the feed associated with that item.

Your Calendar

- From here you can view your own personal calendar, any events related to any communities you are a member of, and any events related to your friends.
- Events can be added to your calendar with a start and end time and a location.
- Access to this information can also be restricted.

The comment wall

Each user has a comment wall which allows you to post comments that will be displayed at the bottom of their profile.

Searching Elgg

Using the search bar you can search the whole network, people or communities. Choosing to browse shows you all the members and communities in the network.

This is not a full text search so will only search the keywords items have been tagged with.

Appendix D Ideas for How to use Elgg in LSCITS

Elgg has a variety of features which can be used in many different ways. This document just provides some suggestions to get you started.

Your Blog

Your blog is a place you can post information for others to read and comment on.

- It can be used to post information that you would like feedback on. It keeps all the comments together and anyone (or a restricted group) can read what others have said. This can avoid situations where multiple emails are sent to mailing lists in an attempt to collate ideas. These can often get lost in your inbox and be difficult to find at a later date and it can be difficult to follow the back and forth of ideas.
- The blog allows you to keep a record of what has been said about a subject and by marking a post as interesting you can keep up to date on what the latest comments are.
- Blogs are also easy to search and the use of keywords can help you easily find all posts on a particular topic.
- The blog can be used to post progress reports on what you are working on to keep people up to date and aware of what is happening. These can then be commented on allowing you to see where clarification may be necessary.
- Comments may also be used to suggest new directions that you had not considered and allow you to see things from different perspectives.
- Questions can be posted that might prompt you on things you had not considered.
- Brief updates and general news can be posted avoiding the sending of regular short emails.
- As a reader of a blog you can look at anything you may find interesting and follow those posts. You can be selective in what you read rather than receiving all emails to a mailing list when only some are relevant to you.
- You can choose when you read the blog and it is easy to find when you do. If you don't read an email when you receive it and you receive lots it can be difficult to find it later.

- Blogs can be used as an informal form of communication and reduce the number of emails being sent.
- As they provide a record of what has happened on different topics they can be useful for telling new people to the project what you have been working on or for allowing part time people to keep up to date.

Your Calendar

The calendar allows you to add events with details such as when and where and an optional description.

- The calendar can be used for recording meetings or events once the details have been confirmed
- The description field of the event can include a URL to link to the agenda for a meeting which can be uploaded to the file repository. External URLs can also be included for example to maps, places to stay, restaurant menus.
- By making events public or viewable to logged in users, others who are not attending can see when meetings are happening in different parts of the project.
- It can also be used to provide a record of past meetings that have occurred.
- It can serve as a helpful reminder of meetings coming up and as a useful place to go to check details.

Communities

Although you may wish to share everything with everyone as one big community it can be useful to have a place to discuss things as group or to share things with the people you work with closest.

- Communities allow you to have a shared file repository in which you can upload files you want to share.
- The community blog can be used for discussing particular topics with all community members being able to both post and comment on items.
- Using a community allows you to keep everything together related to a particular project, working group or part of a project.

- Although it may not seem obvious now, after working together and using Elgg it may later become clear that creating a community may be useful if you find yourselves working with some people more closely.
- Non community members may not wish to read the detail of discussions you are having and prefer to just see the outcomes and this can be achieved through the use of the access restrictions.
- The community calendar can be used for recording when meetings will occur for a particular group and again provide a useful place to check details, helping to avoid confusion.

Your files

Elgg provides each user and community with a file repository.

- The repository can be organised with your own choice of file structure or just used as a place to deposit files without the use of folders.
- Using the file repository makes it easy to find files related to the project unlike those sent as attachments to emails which are hard to find at a later date. It also avoids saving all these files to your workspace so you have them for future reference.
- It is easy to search for files using keywords which help describe their content.
- Descriptions can also be added to the files so you know a little about them before opening them.
- Files made public have a URL which can be used to link to them from other websites.
- If you have a paper or document you would like feedback on you can upload it to your file repository or that of the community it is related to and people can post comments. This keeps all feedback in one place with a record of who said what.

Access restrictions

Although you may think that you would want everyone who has access to Elgg to have access to all of its content there may be occasions where this is undesirable.

- The community access restriction can be useful if the community is discussing something in detail which others who are not members do not need to know.

- An access group or community could be used for content that is confidential and only viewable by selected members e.g. a management committee.
- Access groups are useful if you want to discuss something in a group smaller than the community before making the outcome available to others.
- The ability to change access restrictions allows you to restrict access to files uploaded and make them public at a later date.

Appendix E User Guidelines for ASP

Your profile

Your profile contains a brief description of your role in the project team, as well as your contact details and any personal or background information you wish to provide. Supplying key words for your areas of interest will enable searches by other project team members.

Your picture

Your site picture is the thumbnail image which is used across the site. Your profile picture is larger and only features on 'Your profile'. These images do not have to be the same, if you wish to use another depiction on your personal profile.

Each ASP user is a member of the Project Team Community.

Discussion pages

Discussion pages are designed to enable threaded discussions, which can involve everyone across the project team and avoid the potential for confusion which can arise when there are multiple versions of an email or document circulating. To begin such a discussion, you should make a post to the community discussion page.

Community Files

The community file facility is intended to allow storage and discussion of documents. Users should make a post on the discussion page, inviting comments on the stored document. After feedback has been received the document may be edited and uploaded again and a link to the completed document placed in the original discussion post.

Keywords

Discussion page posts should be tagged with relevant keywords.