



## User Requirements for Selecting Collaborative Technologies for Academics: Case Study of Loughborough University, UK

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### ABSTRACT

This study identifies a sample of academics from Loughborough University who collaborate as part of their research and teaching activities, and explores their use of technologies in supporting their collaborative activities. Seventeen academics were interviewed to capture their opinions and experiences, as relate to the aims and objectives of this study. Documentary evidence, such as spreadsheets of technology requirements, provided by the eLearning Centre at Loughborough University and archived materials, such as emails, provided by the research participants formed part of the data gathering and analysis. The findings of this study reveal that, academics at Loughborough University are involved in a variety of collaborative activities at an international level and they use a range of technologies to support those activities. In addition, this study revealed that user requirements vary across individuals and groups, based on the nature of their collaborative activities.

**Keywords:** *Collaboration, Technologies, eLearning and collocated*

### 1. INTRODUCTION

The activities of organizations are expanding beyond the four walls of offices. The physical location of organizations is no longer a barrier to cooperative activity. Some organizations have different offices located across continents carrying out related tasks. Irrespective of the location or the size of organizations, they need to align their work to avoid redundancy and repetition of tasks, and to maintain competitive advantage.

The field of Computer Supported Cooperative Work (CSCW) studies how people work together in teams or groups and how technologies can be used to support collaborative activities (Hogarth, 2008). D'Souza and Greenstein (2003) described "Groupware" as computer based systems that are designed to support people working together. Groupware is used to support people working together in a distributed way or in the same location. Examples of groupware include e-mail, group decision support systems, group scheduling software, group meeting systems, electronic bulletin boards etc. The technologies used in supporting collaborative activities vary based on the activities of collaborators, for example, synchronous-distributed collaboration can be supported by a virtual team room, video conference system and asynchronous-distributed collaboration can be supported by email, wikis and so on.

Collaborative activities have been classified in many ways, but the major starting point for all classifications

has been the 'Johansen's groupware matrix' (Penichet *et al.*, 2007). The 'Johansen's groupware matrix' has been the primary and famous matrix of classifying collaborative technologies because of the time and place benchmark used for classification as shown in Table I below.

**Table I: Classification of collaborative activities**

	Same Time	Different Time
Same place	Synchronous-collocated interaction	Asynchronous-collocated interaction
Different place	Synchronous distributed interaction	Asynchronous distributed interaction

Source: Penichet *et al.* 2007, p.239

#### 1.1 Objectives

- (1) Identify a sample of current users of collaborative technologies at Loughborough University and the range of collaborative activities they are engaged in.
- (2) Identify the methods users of collaborative technologies at Loughborough University use to capture user requirements amongst collaborators.

Explore ways in which user requirements are prioritized and negotiated by the various stakeholders involved.

## 2. LITERATURE REVIEW

### 2.1 Concept of Collaborative Technologies

Collaborative technologies are used across different fields and for different activities, this implies that users requirements for selecting a collaborative technology will vary, depending on the purpose for which the technology is been adopted for. Over the past years, studies have been conducted into users' requirements and the adoption of collaborative technologies (Mark, 2000).

Lewis *et al.* (2007) examined the barriers to the adoption and use of collaborative technologies and identified the following barriers:

- a. Organizational incentives to the use of collaborative technologies,
- b. Cost of using the technologies,
- c. Complexity of the technologies,
- d. Absence of perceived benefits; and
- e. Compatibility of the collaborative technologies with the existing system.

To ensure the successful adoption of collaborative technologies, Sanjiv and Priya (2009) suggested ways of improving the use of collaborative technologies through the provision of adequate training, technical support, enhancing employee willingness and ensuring better cultural fit.

### 2.2 Activity Awareness

The concept of awareness in collaboration is defined as the indication of what is happening or what has recently happened in collaborative activities (Neale, Carroll & Rosson, 2004). Studies have been conducted into different awareness requirements for collaborative technologies. There are lots of issues that can be categorized under the banner of awareness. To affirm that awareness issues in collaboration have different facets, Carroll *et al.* (2006) dissected awareness issues into; social awareness, action awareness, workplace awareness and situation awareness, then they summarized that;

Collaborators need to know what tools and resources their counterparts can access. They need to know what relevant information their collaborators know, and what they expect, as well as their attitudes and goals. They need to know what criteria collaborators will use to evaluate joint outcomes, the moment-to-moment focus of their attention and action during the collaborative work, and how the view of the shared plan and the work actually accomplished evolves over time. Carroll *et al.* (2006, p.2)

Neale, Carroll and Rosson (2004) also identified activity awareness as a major requirement for collaborative technologies especially the technologies that support

distributed collaboration, because participants who are distributed need some continuous support to remain aware of their counterparts, their tools/resources, their expectations, their knowledge, their goals and their present attitudes.

Synchronous distributed technologies are computer applications that allow people to concurrently work together at the same time and from different locations (Moore *et al.*, 2008). There have been significant developments in the design of synchronous distributed technologies as the internet infrastructure which supports these technologies advances and organizations are shifting their activities and services towards mobile and cloud computing. This has attracted a lot of research interests on the importance of activity awareness of collaborators when using collaborative technologies.

### 2.3 Social Interaction

Social interaction is the relationship that exists when two or more people associate with each other as a result of working together or communication. Face-to-face meeting saves time and is more thrilling when compared to the use of groupware which is time consuming, laborious, and require more concentration (Lipponen, 2002).

It has been asserted that, using technologies for distributed sessions of collaboration tend to lack social interaction because it is rare to have interactions that are not related to the task and focus is only on the immediate task (Mark, 2000).

In spite of the limitations of groupware or distributed collaborative technologies they are used for distributed collaboration although, there is little or no social interaction using groupware, because face to face sessions tend to have deeper reflection on issues and richer interaction as opposed to distributed sessions. There is threshold between the loss of social interaction, group awareness and saving costs of bringing people to one physical location.

From example, in a study conducted by Thomas, (1996) for a distance learning using web conferencing technology that was introduced to a taught postgraduate course in University of London to reduce the cost of students coming down to the University two evenings in every week for two years. Investigation of the participants opinion on the technology revealed that they missed the social cues obtained in face to face interactions, there was no awareness of other participants, the pace of the conversation failed to match the learning process, and participants felt there was lack of focus in the discussion.

## 3. METHODOLOGY

Purposive sampling was adopted for this study because the documentary evidence obtained from e-Learning

Center contains the list of departments and users that are conversant with collaborative technologies.

Loughborough University has three faculties and the profile of all the lecturers and researchers are available on the University website. The contacts of the sampled participants were obtained from Loughborough University website. After collating the list of departments that are currently using collaborative technologies from the documents obtained from e-Learning Center.

It was necessary to balance the active and passive users of collaborative technologies in order to achieve a balanced sample. Loughborough University website was surfed to get the list of those who use collaborative technologies for project, lecturing and research purpose.

Request for interview was sent out to potential participants via electronic mail. Twenty eight (28) participants were invited to participate in the interview. Five (5) participants declined the invitation, seventeen (17) participants were interviewed and six (6) participants did not respond to the invitation. A follow up email was

sent out to the participants that did not respond to the first invitation. The interviewees were labeled by alphabet.

#### 4. FINDINGS OF THE STUDY

The findings of this study have been discussed under two major headings which are:

- a. Type of Collaborative Technologies used by Academics
- b. User Requirements when Selecting Collaborative Technologies

##### 4.1 Type of Collaborative Technologies used by Academics

Table II, below shows the collaborative technologies used by the interviewees, the features of the technologies and the collaborative mode these technologies are used. The features of the collaborative technologies used by the participant of this research has been categorised under the following headings:

**Table II: Characteristics of collaborative technologies used by interviewees**

Collaborative technologies	Features of collaborative technologies							
	Visibility	Audibility	Co-temporality	Reversibility	Asynchronous-collocated	Asynchronous-distributed	Synchronous-collocated	Synchronous-distributed
Google calendar			X	X	X	X		
Email			X	X	X	X		
Base camp	X	X	X	X	X	X		X
Illuminate LIVE	X	X	X	X				X
Skype	X	X	X	X				X
Telephone		X	X					X
Wimba	X	X	X	X				X
Adobe connect	X	X	X	X				X
JAMwiki			X	X	X	X		
Window shared server			X	X	X	X		
Wikispace			X	X	X	X		
Scholar 1			X	X	X	X		
AT & T	X	X	X	X				X
Google wave	X	X	X	X	X	X		X
e/pop	X	X	X	X	X			X
Dim dim	X	X	X	X				X
Pbworks			X	X	X	X		
Yammer			X	X	X	X		
Twiki			X	X	X	X		

- Visibility: participants are visible to each other
- Audibility: participants can speak to one another

- Co-temporality: any message sent is received immediately
- Revisability: a participant can revise messages before they are sent
- Asynchronous- collocated: the technology supports different time but the same place collaboration
- Asynchronous- distributed: the technology supports different time and different place collaboration
- Synchronous- collocated: the technology supports the same time and the same place collaboration
- Synchronous- distributed: the technology supports the same time but different place collaboration

All the interviewees use at least one collaborative technology in order to save time, save cost, share knowledge or information and ease decision making. Interviewees have certain requirements for collaborative technologies. The next section presents user requirements consider when selecting collaborative technologies.

## 4.2 User Requirements when Selecting Collaborative Technologies

This section describes the interviewees' requirements when selecting collaborative technologies. This section further presents how interviewees prioritize their requirements, what are interviewees' current and future requirements and the factors that determine the interviewees' choice of collaborative technologies. The following are the user requirements identified by this study:

### 4.2.1 Task

This study showed that some interviewees adopt collaborative technologies that are only relevant to their tasks. Interviewee A collects users' requirements, compare the requirements and select the technology that best suit their tasks.

Interviewees A and K argued that collaborative technologies should be purchased based on their relevance to task. Additional job role of Interviewee B is to provide support to some staff that use *LEARN* and she stated that; "collaborative technologies should not be packed with lot of functionalities that are not useful instead collaborative technologies should be purposeful."

Interviewee M uses email, interviewee F uses a wiki and interviewee J uses google wave and all of them said: they are not active users of collaborative technology but they are willing to use any type of technology relevant to their jobs.

Interviewee Q is very experienced with collaborative technologies and is involved in different collaborative activities stated that: "his choice of technology depends on the kind of task at hand".

### 4.2.2 Security and Confidentiality

This study revealed that some interviewees are always security conscious when they are collaborating with someone for the first time. Interviewee A affirmed that extra security features are included in technologies used by the department when collaborating with external participants that are not Loughborough University staff. Interviewee A described *Base Camp* as a technology that allows locking of users to a particular group for discussion and setting permission that enhances the security of collaborative activities.

Interviewees C, L, O and P shared similar opinion about confidentiality and they asserted that, security is a factor they consider when collaborating with people they are yet to build trust with.

### 4.2.3 Cost and License Agreements

Cost was a general factor all the interviewees do consider when selecting collaborative technologies. The interviewees explained that, on many occasions they have made the decision to use a collaborative technology, because the technology is free or requires them to pay little amount of money.

Interviewee B, E and G are regular users of different types of wikis (*twiki*, *pbworks* etc) for free and they are satisfied with the set of technologies they use. Interviewee L is satisfied with *AT & T* because *AT & T* offers an excellent license agreement. Interviewee C often selects collaborative technologies that are *open source* because the technologies are cost effective. Interviewee Q described the Loughborough university *LEARN* system as a good example of open source.

### 4.2.4 Awareness

Interviewees are concerned about knowing who they are collaborating with, collaborators personalities, background and resources. Interviewee B likes *pbworks* because it notifies users of incoming mails.

On the contrary, interviewee M is happy with the email he uses for collaboration despite that email does not provide the awareness of the partner. Though, interviewee K is concerned about the success of his collaborative activity not the visibility of collaborator.

Interviewee C shared similar opinion with interview K, and explained that, when an author submits an article for

publication he is not supposed to know who will edit his journal and the editor is not supposed to know who is the author of the article he/she is editing so that it does not affect the level of scrutiny.

#### 4.2.5 Ease of use of Technologies

The interviewees that are less familiar with technologies are particular about ease of use of the collaborative technologies they use. Interviewee A described Base Camp to be intuitive and easy to learn. Interviewee M describes the use of basic email like *yahoo*, *msn* and *google* for collaboration as a natural process because it is easy for him to learn how to use any email account compare to other technologies.

Interviewees B and E described how they stopped using twiki because twiki was complex and require some syntax. Interviewee F is satisfied with the telephone she uses for teleconferencing because it is easy for her to setup up conference phone call and it does not require any technical knowledge.

#### 4.2.6 Version Control

Interviewee A, B, E, F and O are concerned about archiving their conversation because they sometime refer to their previous discussion to get some works done. According to Interviewee A, *Base Camp* allows “version control”, ease of uploading documents and tracking of conversations.

With *Base Camp*, conversations can be archived and zipped as a folder at the end of a project or conversation. Interviewees B and E are interested in technologies that allow tracking of conversation because their work involves a lot of mails exchange and they need to keep track of their mails.

#### 4.2.7 Customizability

Ability to customize a technology that has already been designed for general use to perform a specific task was a requirement identified by interviewee C and Q. Interviewee C uses *scholar 1* which was designed for all journals published by Reuters but *scholar 1* is insufficiently customized for his tasks. Interviewee C said, if he is to select another technology he will prefer a flexible system, that do not assume it knows how journal is been made and he suggested that the publisher should have collate their requirements before designing *scholar 1* because the system is complex and not customizable.

#### 4.2.8 Work-Around

It is rare to have a technology that does everything, so some experienced users improvise to get their work done

with the collaborative technologies. Interviewee C explained that *scholar 1* is not flexible in terms of organizing journal issues, so he perform some tasks manually

Interviewee F and L shared the same view of working around technologies as interviewee C does. Interviewee F is satisfied with the use of telephone for conference but it does not allow her to share documents so she uses email document attachment to compliment the telephone conference.

#### 4.2.9 Scalability

Ability to expand current collaborative technology (scalability) was a feature highlighted by technology champions like Interviewee A, E, F L and Q. The collaborative technology champions described the reluctance people show when they have to learn different type of collaborative technologies several times. Interviewee Q explicated that, it is always difficult to get people who are not experienced with using technologies to learn different collaborative technologies for different project.

Interviewee L explained that, it is save cost to use one technology that can easily be expanded when the need arises rather than buying separate technology for different purpose. In addition, Interviewee E affirmed that it will be better if collaborative technology providers design systems that are scalable. So that users can easily update features they need and pay for it.

#### 4.2.10 Compatibility

Interviewees are keen about having compatible collaborative technologies that fit into existing systems. Interviewee N, O and P stated that, it is difficult for them to have collaborative technologies that work for three of them because Interviewee N uses Mac OS and Interviewee N and O use Windows.

In the same vein, Interviewee L has a lengthy experience with *AT & T* which is cost effective and satisfactory but *AT & T* is not compatible with the university LEARN, so, it was not adopted by E-Learning during the selection of video conference system for Loughborough University.

Interviewee Q stated that some projects he manages requires him to select technologies that are compatible with the computers and devices (for example, ipad, blackberry and so on) of those he was collaborating with. Another issue related to compatibility of systems, was the installation of “codec” and “plug-in”. Interviewee D, E, H, I, K, L and P have experienced the trouble of pre-installing another application before they could use a technology.

Interviewee H gave an example of *Dim-dim*, and described how she had to install some plug in before she was able to participate in an online conference. According to interviewee I, “it is easier for a professional to click and click and get the technologies to work but for some one that is not good with computers it’s frustrating and he has once discarded a collaborative technology because of the trouble of installing plug-in”.

#### 4.2.11 Bandwidth

Those who collaborate with people based in Africa and some Asian countries complained that most video conference system need a high bandwidth connection to work properly. Interviewee A, F, L, H and Q described their experiences of using technologies to collaborative in regions where internet bandwidth is low.

Interviewee A stated that collaborators they work with from Africa always go to UNICEF central offices, where there is decent bandwidth for them to use the web conferencing system. Interviewee A stated that, the usages of collaborative technologies are limited to places with decent bandwidth connection.

Interviewee L also affirmed that when collaborating with regions where bandwidth is low he do comprise the video transmission of the system his using for clear audio. Interviewee H said it will be good to have collaborative technologies that can transmit audio and video on a very low internet bandwidth.

#### 4.2.12 Functionalities of Collaborative Technologies

Some interviewees suggested that collaborative technologies should have all functionalities built in one system, to avoid repetitive learning of different technologies which will save cost and time. However, interviewees B and Q reiterated that, collaborative technologies should not be packed with lot of functions.

Whereas, Interviewee C prefers collaborative technology that is multi functional for example *google wave* which incorporates instant messaging, video conference, file sharing etc. Interviewee E hopes for a collaborative technology that is “*super tool*” like google wave because people do not like learning different type of technologies.

In summary, interviewee A, E, C, J, L, O and Q who are collaborative technology champions suggested that collaborative technology for an institution like Loughborough University should be secure, easy to use, cost effective, compatible with existing system and scalable.

Interviewee C and E stated that, if Loughborough University will adopt a collaborative technology it should be open source, ability to integrate into the existing systems (like; *LEARN, Student Portal, Library System*), the objectives of the technologies should be made clear and the collaborative technology should be flexible for future improvement.

## 5. DISCUSSION

The findings from this study revealed various user requirements that need to be taken into consideration when selecting collaborative technologies. Findings of this study identified; the nature of task, security and confidentiality, cost and license agreements, awareness of other collaborators, ease of use of technologies, version control, customizability, work arounds, the features of the collaborative technologies, scalability, compatibility and bandwidth are user requirements when selecting collaborative technologies.

The above findings corroborated the user requirements identified by Lewis *et al.* (2007) and Mohammed and Shervin (2007), which were; cost, relevance, compatibility and complexity. Neale, Carroll and Rosson, (2004), Carroll *et al.* (2006) and Moore, *et al.*, (2008) all emphasized the importance of awareness of collaborators. Mark (2000) identified the richness of a piece of collaborative technology, security and privacy of collaborative technologies as important factors to consider when selecting collaborative technologies.

Findings of this study further affirmed the heuristic evaluation approach (Swindler, Randall and Beisner, 2006) that advocates for the involvement of users when designing or selecting technologies and further argues that users will try to customize technology or work around the technology to get things done when they are not involved in selecting a technology. Indeed, customizability and work arounds were requirements that were suggested by participants that were not involved the selection process. For example, the participant who uses scholar1 wished the system was easier to customize and work around.

This study has revealed that, champions of collaborative technologies often select technologies that are intuitive to use when they are collaborating with users that are less experienced with collaborative technologies. For example, a group of participants stopped using a *twiki* because it was too complex and the technology champion explained that he has to work with the lowest common denominator of technology.

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