Using Live Virtual Technologies to Support Communities of Practice: the Impact of Extended Events

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Abstract. Physically dispersed Technology-Enhanced Learning (TEL) communities often require support for collaboration over extended periods of time, in what are effectively very long meetings. While there are a wide range of support systems for foreground interactions, such as phone calls and short meetings, and a similar range of tools for 'background' interactions, such as email and instant messaging. This paper presents data from a virtual ethnographic study of a working TEL community using the FlashMeeting videoconferencing application and the Hexagon ambient video awareness system, over month of active at-a-distance project planning. The study is a naturalistic insight into the use of online synchronous communication to support extended synchronous interaction between a working community of practice. Over an extended working period it seems that a complex mix of planned and opportunistic interactions require a new set of working tools, managing the trade-off between awareness and disruption. Switching between foreground and background 'meeting activity' remains a very big challenge.

Keywords: TEL communities of practice, extended meeting, ambient video awareness, videoconferencing, foreground channel, backchannel, synchronous communication

1 Introduction

A wide variety of live communication tools are used by Technology-Enhanced Learning (TEL) communities of practice in order to meet and work virtually. These technologies generally provide a whole range of features, such as presence, availability and awareness, instant messaging, videoconferencing, ambient video awareness, collaborative tagging, social networking etc. Presence is an indispensable social software function, stimulating group awareness [1], [2] and the building of collective knowledge in online communities. Presence has evolved from just being 'online' or 'offline' to a range of preferences such as availability or geolocation. In instant messaging systems, a set of presence attributes may include time, context, availability, location, activity, state of mind and identity. Presence is currently plotted to geographical maps with tools, such as TwitterVision or Google maps, representing the individuals' presence with icons on maps. Geo-location can also be integrated in virtual learning environments and indicate presence and availability of contacts according to the courses a user may be enrolled on (http://labspace.open.ac.uk/).

Along with presence, a great variety of tools supporting group interaction and location based social software applications make use of presence data for a wide variety of purposes, e.g. providing awareness of friends being in the vicinity or providing awareness of who is visiting online community sites, or recommending users with similar interests etc. Other social software features may involve activity awareness, indicating individual users' thoughts to a community, such as in Twitter, describing a current activity, a goal, or an achievement etc. Video presence is another feature increasingly found in desktop applications and can be integrated in ambient awareness tools, forming collaborative media spaces, or used in videoconferencing applications. It can be argued that collaborative spaces can be considered as a collective product and can be transformed through the use of technology [3].

Interestingly, TEL communities of practice are usually supported by a range of tools providing ambient awareness for community building, instant messaging for quick opportunistic interactions and videoconferencing for pre-arranged meetings of an hour or so. However, these communities are often required to meet for days, in 'hot' collaborative phases. TEL community members can be engaged in *'extended'* events, which can last many hours / days or even weeks or so and can include users 'dropping in' and 'out' of the workflow at many points. Most users may be involved in short, opportunistic interactions via text or video chat with other community members and may run applications on the background for community awareness for the rest of the time. A few other users may drop in the event for a short while to communicate with a specific person and then get back to their work. Extended events have an end when there was a communicative goal which was achieved.

There is still little research into tools supporting extended communicative events. A set of challenging research questions derives from the choice of systems for online video communication, focusing on how different tools support interaction patterns in different communities and how we select the appropriate tools to communicate. What are the parameters influencing the selection of the suitable application for extended meetings? Or, is the selection random, or opportunistic? It seems that we use different tools, depending on the person, context and nature of interaction. This paper discusses results from virtual ethnographic studies of two live online tools, FlashMeeting for videoconferencing and Hexagon, initially designed for ambient video awareness, but evidently used successfully in a variety of contexts for extended meetings. In the extended meeting use, the FlashMeeting and Hexagon participants all share the same project goals for a number of days, with a very specific outcome beyond any 'ambient' usage. We provide insights into the tools usage in one extended event and report on qualitative user feedback from questionnaires and interviews. The choice of the tool for extended meetings depends on a range of factors, such as event temporal duration, purpose and interaction patterns.

2 Synchronous Tools to Support Extended Events

A variety of synchronous and asynchronous tools may support online communities of practice. Email is currently the most popular computer-mediated communication form, running on the background, addressed to one or multiple receivers. Forums are

another form of asynchronous communication intended for virtual communities. Synchronous communication involves the exchange of text chat messages, which can be done in parallel with other tasks [8], and ambient shared spaces, running in the background. Telephone and live videoconferencing are synchronous and considered as foreground communication channels (for a summary account of such online communication tools, see [12]). All these tools can be used to support different kinds of concrete communicative events. However, none of these tools has been created with the view to support extended events. Communities of practice not only have formal meetings, but also work ambiently, or via a combination of both. At the moment, not many applications can provide both formal and informal communication in virtual communities or assist in the switching between them. In this paper, we discuss the use of videoconferencing and ambient video awareness over a detailed period of time by one TEL community.

2.1 Video Meeting

Videoconferencing has been introduced with the first videophone by AT&T in the 60's and is now a well-established video-enhanced technology [4], with distinct echo-friendly benefits across various organisations, also saving traveling time and cost. Videoconferencing attendees usually participate in *'limited'* events of a specific duration, with pre-agreed start and end times and a precise communicative goal, e.g. a teachers' meeting on students' progress reports.

FlashMeeting (http://flashmeeting.open.ac.uk/) has been developed since June 2003 as a one-click web video conferencing tool by the UK Open University. FlashMeeting runs with the Adobe Flash player on the web-browser, requiring no additional software installation. A FlashMeeting can last up to six hours and can include up to 25 attendees. The system generates a URL which can be clicked to gain access to the videoconference. The application provides a 'push-to-talk' audio system, allowing only one person to broadcast at any one time, while those who wish to talk, raise a symbolic hand and queue, waiting for their turn to come, or, alternatively, they can break in to a broadcast by using the 'interrupt' button. FlashMeeting events can be recorded and syndicated. The FlashMeeting system is currently used by over 40 EU projects, several international school networks, and student and tutor communities worldwide. It initially aimed at producing a useful 'in house' communication and research tool but rapidly increased in usage throughout the world. Over 5,000 discrete events have been recorded in three years of experimental research.

2.2 Ambient Video Awareness

Ambient video awareness is a concept introduced in the 70's with NYNEX Portholes [10], supporting group awareness in distributed workers [5], but there has been no major deployments of the technology that appear to have survived long-term [11]. Issues of privacy, surveillance, reciprocity and gaze have been reported in previous literature as inhibiting factors regarding the use of the technology [10], while image filtering techniques have been previously used to alleviate privacy concerns [6].

Group awareness and availability checking is considered to be the major benefit in ambient video technologies [1], [2].

Hexagon is a simple applet running in a web page with the Adobe Flash™ browser plug-in, requiring no additional software installation. Hexagon users share live, personal webcam images, updated every 20 seconds on a grid of hexagons. Communication channels include group and private text chat and 'push-to-talk' audio. When two members are exchanging text messages, an animated envelope flies between the text chatting members. Hexagon provides a 'room-based' view of connected users. A webcam image appears as a hexagon, which can be moved around on the grid, and can be zoomed in and out. Users without a camera appear as a grey hexagon, while availability can also be expressed with individual status indicators. A range of communities have used the Hexagon technology at work or in learning and collaborative contexts for over three years. Workers situated in the same location use ambient cues to interact more effectively, e.g. to check their colleagues' availability. Students can interact with other students or tutors using the video for opportunistic learning interactions. The system was offered to various multinational enterprises, European research projects, UK-based organisations and educational institutes. The Hexagon server has hosted over 20 rooms since its launch. Most groups only meet in the context of specific events, with concrete communicative goals, after their initial trials. The tool is used on a daily basis by at least two of these communities for daily video presence and social networking and to enhance the sense of community for workers from remote locations, who interact with co-workers. The other communities may present some minor activity, such as summer school events and collaborative document authoring.

2.3 The Study

This study involves quantitative data logged on the Hexagon and FlashMeeting servers, indicating the number and duration of user connections during one extended event. A questionnaire was circulated in September 2006 and completed by 20 members of the Prolearn community, which is a network focused on innovative aspects of technology enhanced professional learning, with researchers from different European institutes, who have used Hexagon for at least 5 times and FlashMeeting many more. This questionnaire was supported by a set of 9 interviews. The interview data is used here to provide insights into issues regarding communication patterns and tools used in extended events. All respondents indicated that they used a rich mix of tools and technologies in support of their work and community engagement, such as email for asynchronous communication and file exchange, telephone for informal conversations, FlashMeeting for formal meetings and Hexagon for ambient awareness. For the purposes of this analysis, we will focus on the use of just these two tools as representing a primarily foreground communication channel and background channel respectively.

2.4 Anatomy of a Sample Extended Event

Members of the Prolearn community have formed sub-communities of (relatively) short duration for specific events. Here we consider one 'natural' extended event of such a sub-community in some detail. The event included 10 main participants from different European countries and lasted nearly a month with main goal the writing of a proposal for a European research funding. The extended event started with a series of emails and an opening formal meeting held via FlashMeeting on 25th February 2005 with 10 videoconferencing attendees users and ended on the 23rd March with 2 simultaneous user connections in the Prolearn Hexagon room.

This sub-community of members arranged a series of 6 FlashMeeting events (Fig. 1) with an overall duration of 550 minutes (over 9 hours), while the mean average time of these events is nearly 1.5 hours. The first event was conducted at the start of this extended period 14:30 GMT on the 16th at which the use of the Hexagon system for a longer-period interaction was discussed. The first 3 FlashMeetings lasted more than 2 hours (the longest one was 179 minutes), as the participants had, at that point, many issues to resolve, such as delivery of tasks. The fourth of these events was the shortest FlashMeeting of 13-minute duration and included 3 participants. While all other events were called 'meetings', the shortest one was called 'instantFM', denoting its limited duration and informal context. The small number of participants indicates that a subgroup selected to communicate via multi-party videoconference, which is faster than typing group text messages and not feasible in Hexagon, which can host only pairs of users for audio conferencing. The final formal meeting was held on Friday, 18th March, and lasted only 38 minutes, possibly because most issues were resolved by that time. The first and last events included the same 10 attendees, who were actually the main 10 participants involved in the extended event.

Although the use of FlashMeeting, and consequently the formal events stopped on the 18th March, users continued to communicate via Hexagon as the workflow required the 'bid document' to be finally 'tweaked' and finalised. Fig. 2 shows the maximum number of connected Hexagon users in this scenario from 14th-27th March 2005.

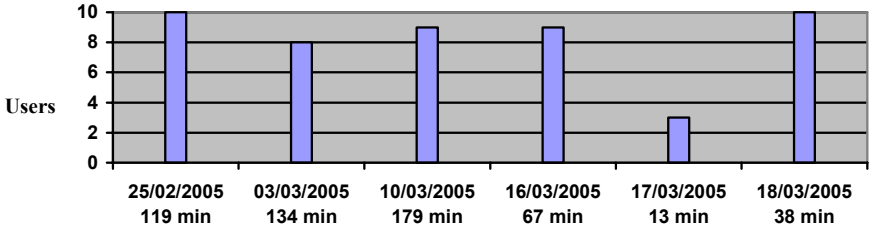

Fig. 1. Videoconferencing formal meetings arranged during the course of the extended event

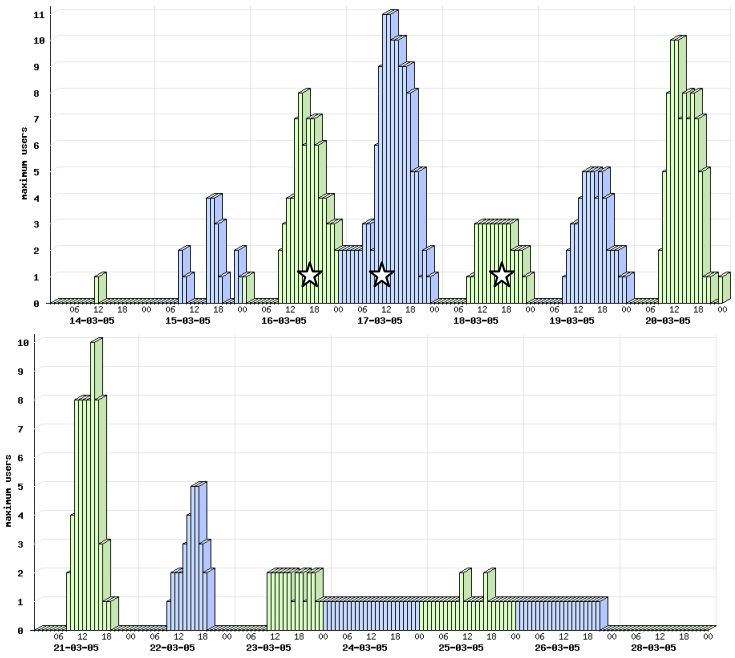

Fig. 2. Hexagon connected users (peak) during sample (*14th-27th March 2005 shown)*

As shown in the figure, the 8-day working period from 16th-23rd March 2005, was effectively a single extended event for this community which peaked on 17th March with 11 simultaneous working connections. The event was initiated with an uninterrupted 40-hour room activity starting on Wednesday (16th March) of that week. On the first 3 days of Hexagon use, 3 foreground FlashMeetings took place, one informal amongst 3 individuals and the other two including the main participants (the "stars" in Fig. 3 represent the FlashMeetings running in parallel with the Hexagon usage). It should be noted that the times in the figure are listed as the server time (GMT), while participants situated in different parts of Europe were in GMT +1 or +2.

Hexagon has been used for extended meetings in multiple contexts at the same or different physical location. The community interrogated for this study used the system for a variety of working awareness reasons: displaying activity in sending text messages, and a few audio chats. The tool has been proved especially useful for building working communities in intensive phases of writing proposals with partners situated in different countries, offering alternative ways of communication and enhancing the sense of community.

> *"... people were sitting all over Europe, were logged into Hexagon and were working intensively with each other ... it was very convenient to be in a Hexagon room and checking who's sitting in front of his desk*

and sort of ask him a question without needing to phone somebody up or sending him an e-mail" (MH, female)

After this intensive 2-day (40 hours long) engagement - the next day (Friday) represented some minor activity with people dropping in and out and a maximum number of 3 users connected at the same time. Interestingly, during the next two days - Saturday and Sunday, from 8.00-24.00, many more users connected to the room, reaching 10 simultaneous users on Sunday, indicating intensive weekend activity for this extended event. On Monday and Tuesday the room was 'empty' after 18.00. The last day of the proposal work, 5 different users entered the room, with a maximum of 2 users connected simultaneously. Approximately 100 hours of overall room activity has been recorded during that period, including at least one connection. During that week, 12 different individuals were entering the room at different times, while 2 of them were in the room for a limited time and for a specific purpose, e.g. to help with part of the proposal or to provide technical facilitation.

In Fig. 3, a Hexagon room screenshot during this period, shows 8 participants at work in this community, communicating synchronously via private or group text chat, and audio chat, whilst participating in the concerted writing of the project proposal. The communication channels provided in Hexagon are used in different ways. While the video channel, which is continuously open, is used for group awareness, a piece of information relating to the overall proposal can be communicated via group chat, visible by everyone, and pairs of two can collaborate via audio chat. The Hexagon view displays two audio chats taking place at this time, one including users labeled Bernd and Ambjörn and the other one labeled Marc and Peter (with Marc's hexagon highlighted, indicating that he is speaking using audio at that moment).

Fig. 3. A *(Hexagon)* grid of *(8 participants)*

The chat area shows 7 group messages related to participants' tasks for the proposal writing. Hexagon was used in a rich mix, which certainly included other technologies such as email and telephone interaction, and one interesting aspect of the 'extended event' awareness was to help coordinate these other channels most effectively over this time. The work undertaken is seen by all respondents as very valuable, and a positive experience.

> *"We used it to write collaboratively a proposal, we discussed the documents we were working on, told each other when to expect the new versions of the portfolios, which meant that we didn't have to send things around, as much as we would have to do with e-mail" (AN, male)*

While some participants are involved in one-to-one chats, others just used Hexagon as background awareness, not exchanging messages, but still able to read others' messages and have a view of their working community. In this way, the community was able to handle the intensive workflow of the proposal writing and discussion around it in an effective public forum, and manage their other work in the context of this community effort.

> *"… it helped just to know who was there in these final days of working hard to get it finished on time, it was really helpful to see who was there, say how is it going, do you need any help, are you OK with what's in this document etc. … when it comes to the final stage when time is getting short and we have to interact in a very short time basis and synchronously sometimes, then it is really valuable" (AN, male)*

3 Discussion

Live synchronous tools have proved useful to enhance the sense of community in working groups of short life for extended events. Videoconferencing is a foreground communication channel and has been mainly used for formal meetings of more than an hour including 8-10 participants. The ambient video environment can be used in the foreground for communication, via video and audio, but usually runs ambiently in the background. It was mostly used for short informal one-to-one audio interactions or group messages and to enhance community awareness in phases of intensive group activity. While video meetings were considered more formal in the extended event, participants selected the ambient environment for informal interactions, which allowed at the same time to be concentrated at their work and be able to communicate with peers for a short while, to ask or answer to questions related to work.

However, background interactions can dynamically change the workflow when they become foreground and disrupt the user's attention. The selection of a communication tool relates also to the privacy concerns arising from its usage, such as being in control of what is being transmitted and minimise interruptions triggered by the 'main-channel' interactions. As there is a trade off between awareness and

privacy, and between awareness and disturbance [7], managing disruption in the 'backchannels' is quite challenging [9].

> *For me it is too intrusive, that's why I stopped using it after the starting try out, I don't really like to be captured on video without me being in control of what is being transmitted or not. (MW, male)*
> *... that has to do with somebody's vision of how people are supposed to work. I have often the impression that as soon as you see someone looking not really busy, sitting at their desk, it looks like they're not working actually, so that might be one of the reasons why people would not feel comfortable if they are permanently on camera. (MH, female)*

It seems that users have different privacy issues when it comes to video enhanced communication tools. These may relate to the temporal length of the event and to the communicative goal, expected to be achieved by the event. Events with an end and start and with a specific topic to be discussed, are less likely to make participants think for self presentation issues, as they are engaged in the social event.

> *If you use hexagon, you need a specific topic and a specific sort of time frame where you work intensively with each other... If you don't have anything specific to discuss, then you would rather send an e-mail or you would sort of use the phone (MH, female)*

The interviewees' feedback indicates that an ambient video awareness environment, providing instant messaging and audio chatting, works well for extended meetings with a specific purpose and temporal duration, and when the communicative model is made obvious to the users beforehand.

> *We really told them Tuesday evening at 8 you will be online with this tool, with this passport and we will chat synchronously about this and this topic. This worked because they had a clear goal. (MC, male)*

Sub-communities may originate from wider TEL communities of practice, requiring tools to support the diversity of virtual events they may hold, be it short or extended meetings, opportunistic textual interactions or data exchange. The selection of tools may depend on parameters such as the event temporal duration, and the communicative goals expected to be fulfilled during its course. During an extended event, a range of trade-offs may take place, including formal and informal, explicit or ambient interactions in no specific order. There is a lack in appropriate tools to support such unusual patterns, avoiding at the same time the disruption of the workflow, by leveraging the use of foreground and background channels.

Finally, this study clearly indicates a need for a better model of how to effectively combine communication channels, such as multi-party videoconferencing, video presence, instant messaging and audio chat may form the appropriate collaborative virtual space for community members, managing the challenging switch between background and foreground communication.

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