

# Ambient Video Awareness: “It’s Great, but I Still Don’t Want It”

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**Abstract.** Video instant messaging tools are not as widely used as we would have predicted and have so far failed to fulfill their promise to become an indispensable tool of social presence, interacting within the workgroup environment and creating a sense of community. Whilst users are becoming comfortable with videoconferencing and software video meetings, the use of video in “awareness” is still very uncommon. Over a 2-year period, we have run 8 discrete Hexagon room studies on naturalistic “ambient video awareness”. Only one of these studies can be considered to be a (limited) success. This paper discusses some of the factors inhibiting the use of such tools in e-learning environments, based on users’ feedback on issues, such as the tool promotion, user interface, size of community and visibility concerns.

**Keywords:** video ambient awareness, collaborative media, group awareness

## 1 Introduction

The “potential of awareness information” using video cues has excited researchers since the very early days of remote video meetings [1]. A range of video, audio and text-based instant messaging tools offer awareness features that can be used for office or learning ‘group awareness’. Studies on the impact of these community tools have been very positive. In early systems, such as the XEROX and NYNEX Portholes [1], [2], a shared awareness was viewed as helping to build a sense of community using video broadcasting technology. Awareness in terms of video and text instant messaging tools can be achieved by denoting social presence with live images transmitted via networked computers and by exchanging text or voice instant messages. In social presence theory, the role of media is to provide valuable ‘cues’ about the presence of others: including facial expression, tone of voice and other key aspects of presence, such as clothing or hairstyle [3]. It is argued that face-to-face communication is rich because it includes deictic elements and objects, which are visible to both participants of the communication [4] and that this is critical to participants. Computer mediated communication for workgroup awareness was viewed in the past as a direct replacement of this aspect of face-to-face communication. Video technology can be used effectively in physically distributed workgroups around the world, saving travel costs and minimizing the time taken to complete a group task [5]. Video instant messaging tools can enhance computer-supported group-based learning, which is an important part of contemporary

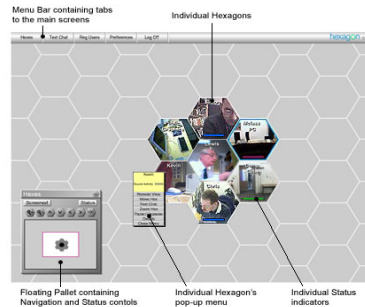
education, focusing on concepts such as ‘cooperative’ and ‘collaborative’ learning, motivated by learning environments similar to original working processes [6]. However, where video is involved, issues of surveillance, invasion of privacy and concerns about being on view to the community are common. The evidence of the last ten years is that video instant messaging and awareness tools have failed to become an indispensable tool of the everyday communication in e-learning and workgroup environments, despite advances in the technology that made it genuinely usable outside of the research lab.

This paper focuses on the video awareness tool Hexagon. Despite deployments into over 8 different target communities and some very positive feedback, the tool has failed on the one single measure of an effective piece of software: does it continue to be used once the initial novelty factor and research enthusiasm have worn off? This is a very high standard for much experimental work, and on this measure only 1 community of the 8 can be considered to be a limited success.

## 2 Hexagon Video Presence Technology

Hexagon is part of a research programme on telepresence, which focuses on issues such as ambient presence awareness and working and learning in public. It is a simple applet designed to run in a web page, using Adobe Flash™, a pervasive and cross-platform browser plug-in, which typically requires no additional software installation. Hexagon users share regularly updated, live, personal webcam images, laid out on a grid of hexagons. Features such as a text chat facility and a voice communication mode, allow large groups to interact with each other.

Hexagon provides a ‘room-based’ view of connected participants to specific ‘room instances’. Some Hexagon rooms allow guest access, whereby users can enter without registration and can typically remain for a time-limited period with limited functions. Registered ‘room users’ can send instant text messages to other users individually, or as a group, can have an audio chat with individuals and can look at the “room history” of user attendance. A user’s webcam image appears as a hexagon, in a grid of other user hexagons. Users can move the hexagons around on this grid, and can zoom in and out on them, and users without a camera appear as grey in the grid. The images are very low refresh Adobe Flash™ movies, and update independently with a new frame every 20-30 seconds. The most recent ‘image refresh rate’ allows the applet to update without overly taxing a client’s personal computer and network. Simple graphical effects are used to indicate to the present community that users interact with each other, e.g. text chat sent from one user to another, is animated by a small spinning ‘envelope’ graphic moving between the two relevant hexagons. The applet has been tested with 50 simultaneous webcam connections in a single room, and is theoretically capable of supporting many more. However, no ‘real’ room uses in this study have exceeded that number of video connections. Fig. 1 shows an annotated view of the main ‘hexes’ screen, including the views of 7 different webcams, involving users or specific locations. Individual status indicators can be set showing whether the users are ‘busy’ - as in many other instant messaging tools.



**Fig. 1.** A view of the (*hexagon*) screen showing (7 participants).

The Hexagon technology was designed to support ambient awareness in a coherent community. In a working office context, we envisaged that remote workers would get an increased sense of community by seeing co-workers and office locations; and that they would use ambient cues to interact more effectively, e.g. to quickly gauge availability, engagement in work on the phone or meetings from video cues. In learning contexts, we envisaged that groups of tutors and students could mingle in such a space to make use of the video for convenient opportunistic learning interactions. The technology supports a number of work and learning models, from ‘student drop-in centre’ or ‘public helpdesk’, to acting as a ‘jumping off point’ for video meetings or other interactions, to a full ‘virtual learning space’.

### 3 Evaluation

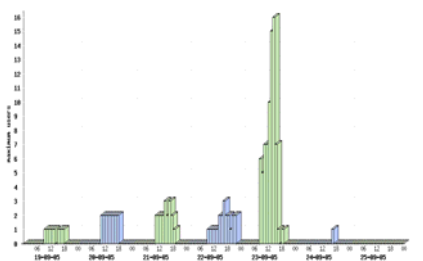
Over the last three years, the Hexagon system was provided freely to a range of companies, research projects and organizations. All but one of these groups have taken enthusiastically to the technology, but failed to convert their interest into a stable, long-term working model for video presence in their community. Most of the workgroups have deployed the system to a small number of enthusiasts, who have used the technology for only a few weeks. Once the novelty factor has worn off, the working models that remain have been insufficiently compelling to bring users back to the system. This section includes an analysis of Hexagon’s failure to become an indispensable tool for social presence and interactivity in different workgroups.

The Hexagon applet was prototyped in the summer of 2003 and tested with a range of user communities through to 2004 under various models. The current studies started in April 2004, with detailed recording of activity in each room. The most heavily used ‘room’ (the Knowledge Media Institute’s own lab room) has recorded around 19,000 logged-in connections. However, in addition to this one successful room, 17 further user-communities were offered access to the technologies to deploy in a naturalistic setting. None of these studies have come close to the success of this initial context. This list includes a number of large ‘corporate-level’ organizations, specifically the e-learning and training departments of: a multinational telecoms

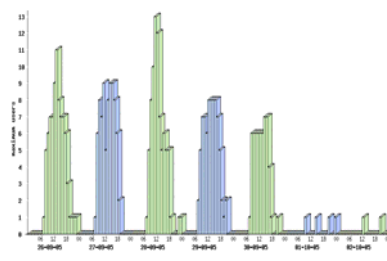
company, a multinational energy company, a multinational computing networks company, a large UK-based broadcasting organization, and a UK-based government supported civic organization, communications department. Also, by more ‘local level’ organizations: a small USA-based independent music teaching company, a local UK-based innovations organization to support small enterprises, and a UK-based schools-networking organization. It has been trialed by 3 organizations within the Open University, and by University groups in South America, North America and Central Europe and has been used with “project-based” highly distributed groups in 3 pan-EU projects. The typical pattern of use in our studies is illustrated below. Almost all of these trials exhibited a similar pattern to the illustration, which appears to be a form of “adherence failure” in which the technology evidently fails to ‘stick’ with a given community. In all cases, users appear to like the technology and to report minimal technological problems, but still do not continue to use it after the initial trials.

### 3.1 The ‘Prolearn’ Hexagon

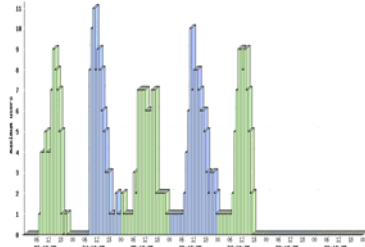
On 23<sup>rd</sup> September 2005, an EU funded network of excellence in Professional Learning (see: <http://prolearn.tv/>) conducted a webcast using the “Prolearn” Hexagon room as an ‘audience presence space’. Those ‘tuning in’ to the broadcast event were invited to join the Prolearn Hexagon study to see the remote audience and to interact with other attendees and the speaker. The event served to excite a small community with the potential of ‘ambient presence’ technologies, bringing webcam users into the room for a short while. The event was ‘attended’ by 16 Hexagon clients from all over this European community (although this figure includes some ‘contextual cameras’ in the presentation itself) (Fig. 2). Overall, the room in this week had 501 chat messages between 34 unique IPs of participants. The webcast audience included attendees from the computer science department of the Katholieke Universiteit Leuven, Belgium. This group of enthusiastic students and researchers returned, bringing more webcams to this Hexagon room the following week (requesting full accounts that would enable them to remain in the room past the ‘guest allocation time out’) and remained for four further weeks. Figures 3 through 7 illustrate the use of the room over five weeks, with peaks through to the early afternoons (Monday to Friday). Fig. 3 shows some minor activity over a weekend, but most activity was clearly in the working week.



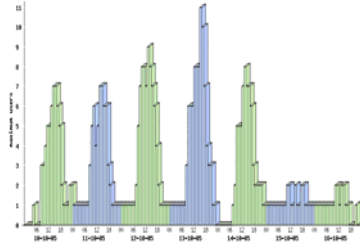
**Fig. 2.** (Prolearn Hexagon) Room Week View (19-25 Sept 2005)



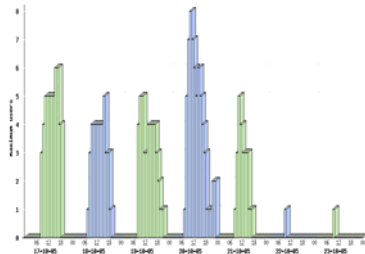
**Fig. 3.** (26 Sept-02 Oct 2005); 1069 Chat Messages, 49 IPs



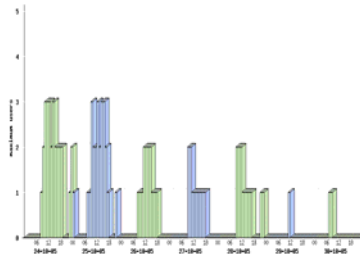
**Fig. 4.** (03-09 Oct 2005); 424 Chat Messages, 29 IPs



**Fig. 5.** (10-16 Oct 2005); 456 Chat Messages; 25 IPs



**Fig. 6.** (17-23 Oct 2005); 87 Chat Messages, 16 IPs



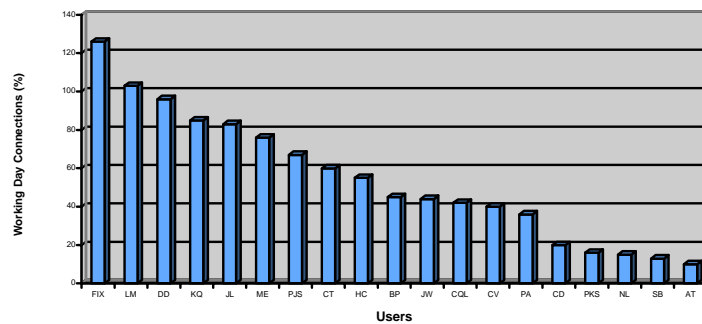
**Fig. 7.** (24-30 Oct 2005); 3 Chat Messages, 15 IPs

Overall, there was significant room activity with over 2000 text chat messages generated in this short time. Little use was made of person-to-person audio in this time (only 5 audio chats in the first week and then 5 over the remaining 5 weeks). However, as can be readily gauged from the sequence, the level of presence in the room gradually fell to a core of 4-5 users (the most active of the KUL students and researchers). In the latter of these weeks, whilst 15 unique IPs came and went from the room, a maximum of only 3 were co-present at any one time. Evidently, this was below the threshold for this community and signals the end of this phase of its use. The room remains open, to date, and since this October activity has hosted 3-4 users on infrequent and irregular occasions. Whilst all 8 trials have been different with respect to their initiation, most have followed this general pattern, with users reporting a continued enthusiasm for the technology, but ‘measurably’ NOT using it.

### 3.2 The ‘KMi’ Hexagon

The Knowledge Media Institute (KMi) occupies a single floor in one building in Milton Keynes in the UK. It has a large open plan central area where some researchers and graduate students work in ‘cubicle’ spaces, surrounded by 1 and 2-person enclosed offices. The enclosed offices all have full glass panel doors, to allow visitors an unrestricted view inside. Workers often have multiple computers, and webcams are freely available. The ‘KMi’ Hexagon room has been in use every single day since this work began. We can consider this to be a relatively naturalistic study,

because whilst KMi lab members have been encouraged to join this room, through occasional emails (4/5 over 3 years), no management pressure or negative sanctions have been used to oblige participation. We examined the detailed log for a complete calendar year: Aug 2005 to Jul 2006 inclusive. This showed that some of 52 possible accounts for this room, 33 “registered users” used Hexagon somewhat during that period. There were a total of 7,500 connections by those registered users in that time, with a further 360 accesses by ‘guest’ users. Fig. 8 shows the most active 19 registered users with over 10% connections to the KMi Hexagon room during a weekday in this calendar year (Monday to Friday). Some 14 active users with less than 10% connections on weekdays have been excluded from this chart.



**Fig. 8.** Connected weekdays to KMi Hexagon Room, 1 Aug 2005 to 31 Jul 2006

The chart measures (at least) one connection by the user to the room on a day in that year (excluding weekends, but not taking into account any other holiday or exclusion periods). Ergo is a percentage of the maximum possible working days the user could be connected. Some anomalies with the figure should be noted. The ‘most active’ user FIX is over-represented, as this is a generic account for fixed cameras in the laboratory, which are automatically on and overlooking public spaces when relevant computers boot up. Ergo, one or other of these are logged into Hexagon for 90% of the year, being 126% of possible working days. In the same way, users PJS and PA are workers in the lab who leave Hexagon switched on permanently. Their connections do not show up sufficiently in these daily connection statistics as their machines remain on and do not ‘log’ many daily connections, unless restarting their computers. One other issue is that users CQL and AT joined the lab during the sample period and so their % attendance in the Hexagon room actually corresponds to a proportional >90% of their possible use of their membership of this community. These caveats mean that 11 working individuals connected on at least half of the weekdays, (that they possibly could have done), in this calendar year. Interestingly, 7/18 individuals in Fig. 8 have single offices, whilst the remainder have a double office, and a few also work in an open plan context. The Hexagon applet does not automatically launch and must be opened and maintained in an open browser window. It is likely that 1 or 2 users may have set it as a browser default page, or have scripted its automatic opening, but most users go to some real trouble to ‘make the

application' work. Although the Hexagon room concept seems to work well for a proportion of KMi denizens, the majority of lab workers do not use it.

#### 4 Why Do Non-Users NOT Use Ambient Video Awareness

It is notoriously hard to reach non-users of any technology or system, and even harder to motivate them to explain why they do not use it. It may have been badly explained to them, or not explained at all. It may not make sense to them, or fit in with their working or learning style. They may simply not like it. The Knowledge Media Institute is a large and busy research laboratory. Where Fig. 8 shows active users of the system, there are 19 registered users not shown whose use is less than 10% of possible working days and a further 14 members of the lab who have never requested an account. In July 2006, we sent a questionnaire to these 33 non-users. Eighteen researchers, male and female, provided their feedback on 15 question topics. More than half of the researchers, who answered the questionnaire, have worked for more than a year in KMi, with 8/18 being employed more than two years. Just under half of the respondents (8/18) were very-low-users (under 10% in our 2005-6 sample) and the remainder were non-users. All of them use other instant messaging tools for regular communication, but said that they liked the Hexagon interface.

It appears that the main factor for not using Hexagon, according to more than half of the respondents, is that they do not like being visible to the community all the time;

*"I don't like the idea of me being on video camera all the time. I don't mind being on camera when I 'want' to be on camera ( in a video conference) but I don't like the idea of constant surveillance". (MG, Open Plan non-user, Male).*

*"I don't like the idea of being on-camera all the time. It feels like an infringement of my privacy." (CD, Open Plan non-user, Male).*

Visibility concerns have been observed in the past in other live image broadcasting tools for office awareness. Negative statements, such as "feelings of instant dislike for strangers" are described regarding the AT&T Picturephone, one of the first video teleconferencing systems [5]. Negative user reactions to the camera, such as camera shyness, threat of surveillance and loss of control over privacy were also spotted in the use of NYNEX Portholes [2]. In the case of Hexagon, these feelings were most common amongst 'open plan' office inhabitants who were already very visible to the lab community. This might initially make their concerns seem rather odd. However, it may represent a 'resistance' factor – in that they could perhaps not close their door to the community (not having one) but could at least leave their webcam off! Other users noted that, even if they did not find the awareness concept intrusive, they found the applet to be too dominant, eg. they did not want the intrusion of seeing all the others:

*"I want the instant messaging applications to be silent and noticed only when I need them or when I am being messaged." (AS, Open plan non-user, Female).*

Or worse, that it was more interesting than their work:

*"It diverted my attention from work, when I had a hard problem to solve I started to watch hexagon instead." (MS, Double office non-user, Female).*

Another issue is that Hexagon video awareness competes with a range of other technologies that provide awareness and communications functions. Users reported

that there were at least 8 different systems that they used on a regular basis and that provided some competing functions. They also reported that the working context seemed largely irrelevant in such a context:

*“... because everybody I work with is always in the office, the functionality of Hexagon was a bit redundant.” (MS, Double office non-user, Female).*

*“Since all the users are situated within KMi I always found it more convenient to visit the person myself”. (AN, Open plan non-user, Male).*

Others noted a preference for other, more traditional technologies:

*“...by phone sometimes it is easier”. (AO, Open plan non-user, Female).*

Another reason why Hexagon is not as widely used as predicted by its designers is that it was not promoted enough so that potential users can realize the functions related to the sense of community and take advantage of it in terms of social presence and interaction within the same work environment or whilst working remotely. The context of using video instant messaging also matters; five occasional users noted that it was useful to see whether a person in a different physical location was present, but their team members are already visible, working in the same lab area.

We should note that no software is embedded in a community out of context. The roles of individuals, champions and enthusiasts can make a very big difference to the uptake of a technology. The KMi Hexagon succeeds because it has contained evangelists for ‘ambient presence’ since it began! All the other studies have not made the ‘critical mass’ to make the Hexagon room aspect of their community robust, such that it could survive the inevitable temporary loss of key members. Ambient video presence is indeed as exciting as Dourish and Bly [1] hoped, over ten years ago, but we still have not quite learned enough about how to make it realize that potential.

## References

1. Dourish P. and Bly S.: Portholes: Supporting Awareness in a Distributed Work Group. ACM (1992)
2. Girgensohn A., Lee A., Turner T.: Being in Public and Reciprocity: Design for Portholes and User Preference. Human Computer Interaction (1999)
3. Short, J., Williams, E., & Christie, B.: The Social Psychology of Telecommunications. London: Wiley (1976)
4. Nardi B.: Beyond Bandwidth: Dimensions of Connection in Interpersonal Communication. Computer Supported Cooperative Work (2005) 14:91-130
5. Edigo C.: Videoconferencing as a Technology to Support Group Work: A Review of its Failure. Proceedings of the ACM conf. on Computer-Supported Cooperative Work (1988)
6. Strijbos J.W., Martens R.L., Jochems W.M.G.: Designing for Interaction: Six Steps to Computer-Supported Group-Based Learning. Computers and Education May (2003)

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