



## Configuring Awareness

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**Abstract.** The concept of awareness has become of increasing importance to both social and technical research in CSCW. The concept remains however relatively unexplored, and we still have little understanding of the ways in which people produce and sustain 'awareness' in and through social interaction with others. In this paper, we focus on a particular aspect of awareness, the ways in which participants design activities to have others unobtrusively notice and discover, actions and events, which might otherwise pass unnoticed. We consider for example how participants render visible selective aspects of their activities, how they encourage others to notice features of the local milieu, and how they encourage others to become sensitive to particular events. We draw examples from different workplaces, primarily centres of coordination; organisational environments which rest upon the participants' abilities to delicately interweave a complex array of highly contingent, yet interdependent activities.

**Key words:** awareness, centres of coordination, selective aspects

### 1. Introduction

The concept of awareness is having an increasing influence on both social and technical research in CSCW. The idea of awareness, at least in CSCW, originally emerged in a number of workplace studies, which noted how collaborative activity in complex organisational environments rests on the participants' abilities to remain sensitive to each other's conduct whilst engaged in distinct activities. In turn, the growing recognition of the importance of awareness to human conduct and interaction, has begun to have an increasing bearing on system design and development in particular technologies to support collaborative work. For example, work by colleagues and ourselves on developing a media space were driven in part by a concern with supporting awareness and in particular, providing physically distributed individuals with the ability to mutually monitor each others conduct (see for example Gaver et al., 1993; Heath et al., 1997). Similarly, the work of Benford and his colleagues (cf. Benford et al., 1993, 1994) concerned with the design of collaborative virtual environments and the development of 'spatial models' has charted an innovative and sophisticated attempt to implement awareness in advanced technologies for real time collaboration. The idea of awareness in its various guises increasingly pervades system support for collaboration, whether

synchronous and asynchronous, symmetrical or asymmetrical, and has become a critical concept in research in CSCW. Despite its importance however, the character and organisation of 'awareness' in the workplace remains surprisingly unexamined and its embodiment in complex systems has remained somewhat problematic.

In this paper we wish to suggest that the difficulties in developing systems to support awareness do not simply derive from the limitations of technology, but rather from the ways in which we often characterise awareness and associated concepts such as mutual monitoring. In particular we wish to suggest that awareness is not simply a 'state of mind' or a 'cognitive ability', but rather a feature of practical action which is systematically accomplished within developing course of everyday activities. In this regard, we examine the ways in which participants design and produce actions to render features of their conduct selectively available to others, and not necessarily participants with whom they are involved in 'mutually focused interaction'. To address the systematic and emergent accomplishment of awareness we draw examples from various workplace settings including, news rooms, police operation rooms, traffic control centres, and operating theatres. These distinct domains not only illustrate the pervasive relevance of awareness to a range of workplace activities, but provide an opportunity to demonstrate how collaboration is embedded and embodied within particular features and characteristics of these settings, and the settings' work.

There is, we believe, a problem with the way in which awareness is sometimes characterised within contemporary research in CSCW and cognate disciplines such as ergonomics and HCI. It suggests that individuals develop and share common frames of reference which remain, if only temporarily, stable through time and space. These common frames of reference provide a framework for, and shape, social action and activity. For example, for those of us who are interested in control rooms, it is sometimes assumed that personnel within such domains preserve a relatively stable level or frame of awareness of other's actions. In turn this common state of awareness provides the foundation of the coordination of activities. The assumption is analogous to neuro-physiological research concerned with peripheral vision. Such research suggests that particular types of individual, for example very young children, have the physical ability to notice certain phenomena outside the direct line of their regard, and such competencies can be compared and contrasted to the abilities of other species. In contrast however, we would like to suggest that our ability to remain aware, in particular of actions and activities which are the principle focus of our involvement, is ongoingly accomplished within the developing course of conduct and interaction. The ways in which individuals accomplish awareness is inextricably embedded in the activities in which they are engaged, and the ways in which those activities necessarily entail particular practices and procedures. More crudely, what individuals need to be aware of, and how they organise their conduct so that others are aware of particular actions and events, is dependent upon the activities in which they and others are engaged. Awareness is not a state, a stable frame of reference which oversees, even structures, the organisation of

conduct, rather it is a practical accomplishment which arises in and through social action and activity. Awareness is 'ongoingly' achieved in collaboration with others.

This difficulty bears upon related issues which perhaps deserve mention. There is a tendency amongst some researchers to assume that each individual within a particular domain or sphere of (potential) mutual influence is aware of shifting field within their course of action, and that the fields of awareness of different individuals may concur or overlap. The notion of 'aura' found within certain work on virtual environments reflects perhaps this assumption or presupposition. Whilst attractive, for both social and technical reasons, the idea may be mis-founded. It preserves the idea that awareness is stable through time and space, and can lead to the assumption that as overlapping frames or sets arise, the individuals' awareness of each other is symmetrical or "mutual". It also implies that the idea or concept of awareness is predominantly spatial, like a moving beam which illuminates, in the course of action, a stable or shifting sphere of the individual's world (real, virtual physical, actions, artefacts, etc.). Such assumptions tend to draw attention away, from the ways in which individuals, ongoingly produce and preserve their awareness of each others' conduct and the immediate environment. Awareness remains an unexplicated resource in many studies, characterising rather explicating the organisation of conduct and interaction. Garfinkel (1967) raises a similar point with regard to the idea of shared agreement (or shared understanding, definition, cognition) which informs a great deal of research in the social and cognitive sciences.

"Shared Agreement" refers to various social methods for accomplishing the member's recognition that something was said according to a rule and not the demonstrable matching of substantive matters. The appropriate image of a common understanding is therefore an operation rather than a common intersection of overlapping sets. (Garfinkel, 1967, p. 30)

## 2. Awareness and centres of coordination

Whilst awareness, or whatever we come to mean by awareness, features in the practical accomplishment of presumably all human activities, within CSCW it is commonly associated with particular types of workplace. In part, this association derives from the substantive concerns of the studies which contributed to our recognition and understanding of awareness in the first place. These settings have certain characteristics which make awareness particularly pertinent. These workplaces have been usefully described by Suchman (1997) as 'centres of coordination' and include such settings as control rooms, newsrooms, trading rooms, and the like. These workplaces stand in marked contrast to the conventional environments with which ethnographic studies of work and interaction have often been concerned. Rather than organised with regard to mutually focused interaction that one might for example find in a medical consultation they have particular characteristics

which it make necessary for individuals to ongoingly monitor each others conduct whilst engaged in distinct but related activities. These characteristics include: (i) a strict division of labour in which different personnel have differing responsibilities and obligations, (ii) personal are co-located in the 'same' physical domain (though continually interact with others outside that domain), (iii) tasks which are the responsibility of particular individuals have to be coordinated with the activities of others, both in real time and 'asynchronously', (iv) the information needed to accomplish individual tasks is dispersed amongst equipment and personnel within (and outside) the domain, (v) some tools and technologies are available to facilitate the co-ordination of tasks.

There is an additional issue which needs to be raised. Many of the tasks undertaken by individuals in these domains are accomplished through the use of conventional workstations and keyboards or paper documents. These tools are primarily designed for use by individuals and in centres are normally assigned to particular personnel. To a large extent the activities that individuals undertake with conventional workstations or PCs are not accessible to others; colleagues cannot see the details of what is entered through the keyboard or read from the screen. Participants, therefore, even those sitting close by, cannot necessarily, 'at a glance', make out the activity in which a colleague is engaged at any one moment. The tools and technologies, scale and design of many workplaces, even those which involve close real time coordination, localise activities and in various ways reduce their accessibility. Personal have incongruent, restricted and shifting access to each others activities. Moreover, despite the necessity for colleagues to remain informed of each other's activities it is not always possible nor desirable to simply off-load information. For example when dealing with problems even crises in a control centre, an individual may have neither the time nor inclination to temporarily abandon the activity in which he is engaged to inform others what he or she is doing. Moreover, it is not always desirable that others are simply provided with information whenever it becomes available: (i) it may not be clear what others know or need to know, (ii) it may not be clear how they require information (in what form and when), (iii) and it may not be clear whether people are themselves too busy to receive particular information. So simply off-loading information to colleagues does not solve the problem, indeed rather than assist collaboration it would severely undermine the ability of personnel to produce and coordinate their activities.

The fragments discussed in this paper are drawn from various settings which are, or have, many of the characteristics of centres of coordination. We begin by discussing the ways in which participants render visible certain aspects of their own activities, including specific contributions to conversations in which they are engaged, and how these tailored vocalisations engender specific courses of action from those not directly involved in the interaction. We then consider how participants embed and embody action within the immediate environment; action which can serve to have others notice events and engage in particular activities. Finally,

we explore how seemingly unambiguous events, such as alarms, are given particular significance by virtue of the ways in which a participant may unobtrusively encourage others to perceive the event in a particular fashion.

### 3. Rendering activities selectively available

In centres of coordination personnel often find that an activity in which they are engaged becomes potentially relevant for others within the domain and yet their colleagues are seemingly involved in distinct and unrelated tasks. In such circumstances, a participant may design an activity, or at least an action within that activity, to enable others to gain particular information about some matter at hand. They selectively display an aspect of the activity in which they are engaged, and provide others with the opportunity, if they so wish to gain further information about some occurrence or event. These selective 'displays' of particular actions within an activity may be designed to reveal particular events or information, without demanding that anyone should respond or even listen.

Consider the following fragment drawn from the London editorial office of Reuters. Journalists receive news stories from the various bureaux based in countries throughout the world. The editorial office is divided into sections including money and capital, commodities, minerals, and equities. Each section consists of two or three journalists, a sub editor and an editor. Stories are coded for particular desks, so that stories received on one desk may not be received by another, even though they may be relevant to the stories that they ordinarily handle and of interest to the customers they serve. Indeed, the early morning news meetings in which journalists review the previous day's work are largely dominated by discussions of stories received by certain desks and missed by others. Stories are received on-line and edited before transmission by a particular journalist on an individual workstation. In consequence, journalists need to inform colleagues, where relevant, of stories on which they are working; stories which would otherwise remain invisible and unavailable.

Things are relatively quiet in the newsroom and as he works on a story about a fall in Israeli interest rates, Peter begins to make a joke of the text he is editing on-screen. Peter's remarks, which are produced in a mock Jewish accent, are not explicitly addressed either to colleagues on his own desk, Money and Capital, or to those on the adjoining desk, Equities. Whilst talking aloud, he continues to edit the story.





#### Fragment 1

Peter: Bank of (.) Israel interest ra(i)te drops.  
(0.3)

Peter: Down, down, down.  
(0.4)

Peter: Didn't it do this last week.  
(13.0) ((Peter continues to work on the story))

## Fragment 1: Images

			Bank of Israel er.	
			(3.2)	(0.6)
			cut its er daily (0.4) the	Yeah. Got that now.
			rate on its daily money	Thanks Peter
			tender (0.2) to	(0.6)
			<u>commercial</u> banks.	O.kay?
(13.0)	er	(1.0)		
				
	Peter:		Alex:	Peter:

Roughly thirteen seconds later, Alex who is sitting some six feet away at the Equities desk momentarily changes his orientation. He glances towards Peter and then turns back to his own monitor. Peter treats the action as relevant to the story that he voiced some moments ago. He utters 'er:::' and after pausing for a second, perhaps to relocate the relevant part of the text, tells part of the story on which he is working. In the illustrations, Peter is on the right, and Alex second from the right.

Peter's talk is now addressed specifically to Alex. He no longer makes a joke of the story, nor characterises the text on which he is working, but rather delivers a quote from the material itself. The quote provides a more precise and potentially factual report of the events. Peter's delivery sharply contrasts with the earlier version. It is not rendered as a joke or as a précis, but rather as part of the original, authentic story. The ways in which the talk is produced, coupled with the accompanying visual conduct (looking at the screen, etc.), provides Alex with the resources to find for himself the story on the system. Indeed Alex displays his use of this reading to find the story, when he says "Yeah. Got that now. Thanks Peter". So, the two renditions are produced such that Alex is able to differentiate the status of each and in particular their 'relationship' to the textual version of the story.

A few moments later Peter once again reads the story out loud and discusses it with a colleague who should receive a copy, and considers how the separate desks should co-ordinate the transmission of the story to their respective customers (mainly dealers in financial institutions in the City of London and elsewhere). What begins as a joke turns out to have serious import for news production and dissemination.

In talking aloud, Peter gives voice to the story on which he is working. Peter's remarks are tailored with regard to the location and activities of his colleagues, in

particular those working on the adjoining desk. They are modulated so that they are audible to colleagues nearby, and designed not simply to make a joke, but to provide the gist and potential relevance of the story. In talking outloud, Peter orients to what is potentially audible and of relevance to colleagues, in a sense he is sensitive to their potential interests and responsibilities and their abilities to selectively monitor events whilst they are engaged in their own activities. In so doing, he does not simply talk through the text, but provides a selective rendition that animates aspects of the story, giving it the character of a joke. The way in which the story is voiced and animated, its light hearted rendition coupled with Peter's continuing orientation to the text, does not demand that his colleagues respond, or even acknowledge, what has been said. The question, 'didn't it do this last week' is rhetorical, it elaborates the joke, and perhaps provides a framework for Peter's remarks, but does not demand, nor encourage, a response. In some sense Peter's remarks render the materials on which he is working selectively 'visible' to his colleagues within the local milieu, but through the ways in which they are accomplished, it places no one under any particular obligation to respond.

The joke displays the part of the story which may be of relevance to the responsibilities of others within the domain, since a change in national interest rates can bear upon a range of more specialised news in various markets. In selectively rendering the story visible, he orients to the work and interests of others within the domain, without interrupting the particular activities in which they are engaged. It is not simply that others 'overhear', but that particular individuals design activities so that they are selectively rendered visible and relevant to others.

In the first example therefore, a journalist designs an activity which, by rendering certain features visible (or at least audible), invites a colleague to find out more, which in turn leads to the production of a related story transmitted to a different readership or audience. The renditions of the story are selective, neither involves a full reading of the entire text of the story. The first is designed to provoke interest by giving a simple (and humorous) flavour of the story. Then once Alex displays some interest, Peter produces a more 'factual' rendition that enables him to find the full story on the system. By configuring the activity so that a colleague becomes aware of the story, the journalist is sensitive to and reflexively produces the potential significance of the material, and its relevance to a different desk and their readership. The decision to render the activity available to the other(s), and the colleague's response, orients to and invokes organisational practice and convention which inform the production and delivery of the news, at least in the Reuter's editorial office.

In some cases, we find that the production and recognition of actions by co-located personnel is oriented to a stronger sequential relationship between particular activities. For example, the occurrence of particular actions or activities may serve to engender an activity from a co-participant, such that, if the activity does not occur it is 'accountably absent', and accountable (see for example Schegloff and Sacks, 1974). Indeed, as we have suggested elsewhere (Heath and

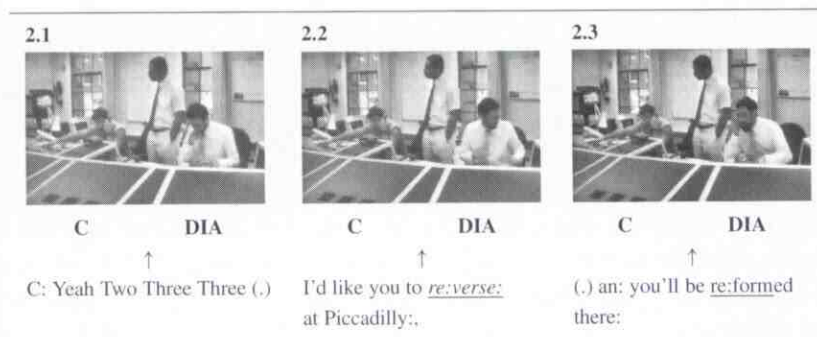
Luff, 1996, 2000), collaborative work may be organised through a body of tacit practice and procedure which informs the production of sequences or trajectories of actions and activities, contributed to by particular, but different, participants. With regard to awareness, an activity can be configured so as to engender a series of actions from a colleague; a colleague who, until that moment, might well be engaged in a distinct and unrelated activity.

Consider the following example, drawn from the control rooms of London Underground. There are difficulties on the Bakerloo Line south of Piccadilly and they have decided to 'turn trains short': have them reverse in the platform and return northbound before they have reached their destination. We join the action as the line controller calls a driver (Dr) who is approaching Piccadilly and asks him to reverse.

**Fragment 2 (simplified)**

- C: Controller↑ to South Bound Two Three Three,  
<do you receive?  
(8.2)
- Op: Two Three Three receiving pass your message (. . .) (0.3) over↑
- C: Yeah Two Three Three: (. )
- I'd like you to re:verse: at Piccadilly:; (. )
- an: you'll also be re:formed there: >  
I'll come back to you:: when you get to Piccadilly:; over.  
(1.2) ((Radio noise (0.3)))
- Op: O:kay >thankyou very much Controller: (0.2) erm: (. ) can you ma(ke)  
(0.2) er:; (. ) i(s)it er: possible to make announcement (to the people) (when  
I get there) over?  
(0.7)
- C: Yeah: the D I A: A:: will make announcements for: you, (. ) Can you confirm  
you've just left Re:gents:?
- Op: Er:: Roger (. ) no (I think) (I'm er::) (0.2) still at Ba:ker Street, Over on  
the:: (. ) on the (-) South Bound, Over?
- C: hh Yeah:: we've received driver thanks: very much, I'll tell the D I A::  
(who) will monitor you down: te Piccadilly.  
(0.3)
- DIA: Ye ah (. ) Bakerloo Line Information Two Three Three is going to reverse  
with with you:; (0.2) South to North:;  
(2.0)
- DIA: Two Three Three. He's at Baker: Street now:;  
  
((roughly 3 minutes later))
- DIA: Good morning Ladies and Gentlemen↑ (. ) Bakerloo Line Information↑  
(1.0) This train is for:; (0.4) Piccadilly Circus:↑ only.(1.2) This train (. )  
for: (. ) Piccadilly Circus↑ only.
- ((Successive announcements made at each station as the train in question arrives.))





In the following pictures the controller is on the left and the information assistant (DIA) on the right. The person standing behind is a relief controller who has helping deal with the difficulties. As the controller calls the driver, the DIA is updating his paper timetable marking up the changes are being made to the ordering of trains. As the controller speaks to the driver and produces his request he emphasises the word "re:verse:" (the word is uttered more loudly and the sound elongated).

On the production of the word 'reverse', even before the Controller has finished speaking to the driver, the DIA abandons the activity in which he is engaged. He reaches for the telephone and calls the station manager at Piccadilly to warn him all passengers will have to be leave train 233 when it arrives at his station. On completing the call, the DIA then produces a series of public announcements. Each announcement is addressed in turn to the people waiting on the stations between Baker Street and Piccadilly, warning that the train is 'for Piccadilly only'.

The word 'reverse' and the request of which it forms part, is principally addressed to the driver. It is driver who will have to deal with request, and will be responsible for 'turning the train short'. In producing the request, and emphasising the word 'reverse' the controller renders the request audible not simply to the driver over the radio but to colleagues within the control room, and in particular the DIA. The request, and the way in which it is articulated, not only serves to inform the DIA of the actions being undertaken by the Controller, but serves to engender a series of interrelated actions; firstly to warn the station manager of the upcoming events, and secondly, to inform passengers who may join the train at a number of stations prior to Piccadilly, that its destination has been changed.

The controller therefore designs his request to the driver over the radio, such that the activities which are about to take place are also available to DIA. This enables, even encourages, the DIA to produce a series of related actions which enable the driver to successfully alter the proposed route at Piccadilly. In animating the word 'reverse' the controller not only renders a section of the utterance audible and noticeable to his colleagues, but voices an action which has sequential relevance

for the DIA. That is, voicing the word 'reverse' orients to, and serves to reflexively invoke, procedures ordinarily followed in turning trains short. In producing his request to the driver, and in perhaps emphasising the word 'reverse' the controller is sensitive to the obligations and responsibilities of colleagues, both those based in the line control room and others outside. In particular, the controller produces the request with regard to the responsibilities of the DIA, and necessity of the DIA to warn colleagues and passengers of the impending changes to the service. The request provides the resources to enable the DIA to undertake the sequentially appropriate actions, and exploits his colleagues ability to overhear and discriminate the relevancies of talk in which he is not a participant.

In rendering actions within activities visible in particular ways, the controller is sensitive to the ways in which those actions properly invoke a body of organisationally relevant practice and procedure. In producing his actions, the controller is able to simultaneously transform the arrangement of traffic down the line, whilst encouraging a colleague to put in place the relevant arrangements to have the solution to the difficulties of work. The ways in which participants configure activities to enable others, who may not be involved, to retrieve relevant actions, are thoroughly embedded in the sequential organisation of the participants conduct within the particular domain; just as the ways in which the DIA monitors the activities of the controller is with regard to his responsibilities and the sequential import of particular actions undertaken by the controller. The practical accomplishment of 'awareness' is embedded in the activity at hand and practices and procedures on which individuals in organisation ordinarily rely in producing and coordinating their activities. What is rendered visible and how its discriminated emerges moment by moment with the articulation of the activities at hand.

#### **4. Embodying action in the environment**

One aspect of awareness which has begun to generate an increasing amount of interest, concerns the ways in which individuals remain sensitive to changes within the immediate environment. For those of us interested in new technologies, the local environment has particular relevance, since it often contains, amongst others things, a diverse and shifting display of different forms of information which are more or less relevant to the activities in which participants engage. It is of some analytic and practical interest, how individuals remain sensitive to such a complex array of information and the extent to which they are able to discriminate relevant phenomena and events. It might be thought, for example, that participants maintain some general state of awareness which allows them to 'filter' relevant information which is of particular significance. Such an assumption has contributed to the idea of 'cognitive overload' and the difficulties which are said to arise when individuals are faced with managing a complex array of divergent and shifting information for example in command and control.

Participants however, at least in the settings that we have studied, rarely seem to encounter difficulties in handling a diverse and rapidly changing body of information. They are highly selective in what they notice and look at, and their monitoring or awareness of the scene is firmly embedded within the practicalities of their current activities and area of responsibility. It is through their activities and the conduct of others that they come to notice and look at the things they do, and it is part of those activities that assemble the sense and significance of particular information and events. In organising their conduct and making sense of the scene, participants draw upon and use organisational practice and procedure through which they reflexively constitute relevant aspects of the scene, here and now, and produce and coordinate their conduct with each other. It is not that participants monitor the scene in general and maintain a stable level of awareness, but rather they actively and ongoingly constitute the relevant features of the setting within the course of their activities and interaction with others.

In centres of coordination and we suspect almost all social settings, the conduct of others is critical to how you remain sensitive to your surrounding environment. In particular, participants rely upon others noticing events which might, in some way, be relevant to their own concerns and interest. In some cases, a co-participant may explicitly warn you of something which you 'should' have seen, in other cases, people simply notice others noticing things. In a sense therefore, in centres of coordination, like other social settings, you come to see and respond to the world by virtue of the conduct and action of others. Consider the following couple of fragments drawn from different domains. In both cases, rather than inform a colleague of particular problem, a participant encourages the other to notice something within the local milieu, and in having that event noticed, engenders a sequence of action through which the event is identified and managed.

The first fragment is drawn from the control centre of a provincial city police force. Two police officers sit alongside each other. They are responsible for developing a coordinated response to problems and emergencies. Each officer has a workstation which catalogues the details of incoming reports, provided mainly by the public and received and logged in the first instance by a telephone operator or officer on the desk. The officers speak to their colleagues, either on the beat or in vehicles, through the radio. Only one of the controllers has access to the radio at anyone time.

We join the action as one of the officers Paul (P), is talking on the radio, asking a Unit (A2) to provide back up to a violent incident which is occurring in the town. As he talks, Ruth his colleague (R) notices a report come up on the monitor. The report details the collapse of a woman behind a door at a local address; "Whisky off Alpha Six" is a call sign and the name of a particular unit. She tries to have him notice the new problem without interrupting the activity in which he is engaged.

**Fragment 3. Transcript 1.**

- Paul: *((is dealing with a request for back up for an incident on Wharf Lion Walk and has called Alpha Two to attend))*
- Paul: Roger received.
- A2: Thank you.  
(0.3)
- Ruth: Can you take the (. . .)
- A4: Can you (give) a Two O: Five:?
- Ruth: Mm ((Exasperated))  
(0.8)
- Paul: Yes, all units away. Whisky off Alpha Six. Alpha Six. Over
- Ruth: Yes  
(1.4)
- Paul: Whisky off Alpha Six, Alpha Six, Over?
- A6: Alpha Six, Over.
- Paul: Yers. Can you go to Grange Farm Road Number Thirty One. An old person, believed old, has collapsed behind locked doors, ambulance en route. Received Over?

As the radio call with Unit 2 comes to completion with 'thank you', Ruth attempts to interject with 'Can you take the . . .'. She has already made a couple of attempts to have Paul notice that she has noticed something come up on her screen. The utterance is cut off by an incoming request on the radio, asking Paul to give a '205', a generalised announcement to all Units. Before he replies, he turns to Ruth, and she raises her eyebrows, thrusts her hand towards her screen, points to the line of text.

He glances at her monitor. As he responds to the request with 'Yes, all Units away' he initiates a new call 'Whisky off Alpha Six'. He calls an available Unit (A6) and asks them to attend the incident at Grange Farm Road. A few minutes, Alpha Six calls to inform the controllers that an elderly woman has been found dead behind her front door.

The officer, Ruth, therefore renders a particular event 'noticeable' to a colleague. Unable to inform him of the incident and the necessity to respond with dispatch, she encourages Paul to look at and investigate an object which has arisen within the local milieu, namely on her screen. Encouraging the other to look, provides Paul not only with resources to enable him to find the location of the object in question, but to look for something which has immediate relevance for his conduct. In finding and confronting the description of the problem, Paul produces the sequentially and organisationally appropriate course of action; to have a Unit attend with dispatch. Ruth therefore has the object noticed, and notices the object herself, by virtue of its relevance for her colleagues' conduct (both those in the control centre and those outside) and Paul treats the object as engendering the organisationally relevant activity. The object is produced and noticed with regard to its organisational sequential significance.

The possibility to enable a colleague to notice an event, by virtue of rendering a feature of the local environment noticeable or accountable, is a critical aspect of co-operation in these complex work settings in which participants engage, simultaneously in multiple, interdependent activities. In a sense, the feature of the local environment, the object in question, whether it is a line of text, diagram or a video image, itself becomes, momentarily, a centre of coordination; an object which is constituted in such ways that it engenders an array of sequentially relevant and interconnected activities. In a sense it is not simply making another 'aware', where awareness has a flavour of disinterested perception, rather it is configuring an object which has a determinate sense and set of organisational relevancies.

Consider the following fragment. It is drawn from the line control rooms on London Underground. We join the action as one of the Underground staff (Vic) who is visiting the Control Room is telling the Controller (C) a story of a past Minister of Transport turning up to a function rather the worse for wear, or "pissed" (a colloquialism for 'drunk'). In the course of the story, the DIA appears to notice a potential problem emerging with the traffic (at Waterloo). He tries to bring the problem to the Controller's attention without interrupting the tale or committing himself as to whether there is indeed a problem.

#### Fragment 4

V: Carrying on the story wer (.) with the three p: (.) th:ree

V: (part most of the ɾto ner), four par:t  
 ˌ((Ding Dong))

(0.8)

V: Victoria Line at Rickmansworth, (0.6) on Mon:day

nigh:tˆ

(0.4)

V: an he:(r): like (.) The Minister of Transport

<\*Lipton

(it is) turns upˆ (0.5) at er::

(0.4)

V: Rickmansworth to see the: (0.6) the Waterloo Train,

(0.8)

V: they've finished there: >then immediately go back to

Clapham hehhhhss heh heɾh

C: ˌthey

finished on frhhom

therheh ɾhe h heh

V: ˌ(\*heh ɾheh)

C: ˌBrilliant

V: (That was)

C: Brilliant

(0.2)

- V: He really was pissed.  
(1.8)
- C: That Thirty Three at Waterloo?  
(0.6)
- DIA: Yeh.=
- C: =He's (time:) >no he's tight
- DIA: Fifteen:~
- C: Yeah

The Controller is orientated towards Vic, who is standing to the rear of the console. The DIA is facing forwards, looking at the timetable. As Vic tells his tale and the Controller listens, the door bell rings and momentarily interrupts the story ("ding dong"). The DIA looks up at the fixed line diagram, resets a CCTV monitor to Waterloo (see image i), and as the image emerges, turns to the Controller (see image ii) and then immediately back to the monitor (see image iii).

The selection of the image by the DIA, and his shift of gaze to the other and then the monitor, encourages the Controller to turn away from Vic and look at the screen (just noticeable on image iii). The DIA's actions momentarily render a particular feature of the local environment of potential significance to a co-participant; a colleague who is engaged in unrelated activity. The Controller looks at the screen for a couple of moments, and then, either because he is unable to see anything of importance, or simply due to Vic's continuing tale, he returns his gaze to the speaker.

A little later, Vic once again pauses, delaying the words 'the Waterloo train'. The DIA seems to exploit the break in the story. He once again turns to the Controller then to the CCTV monitor. The DIA's shifts in orientation once again encourage the Controller to turn from Vic and look at the screen with his colleague. The Controller decides to exit from his conversation and find out whether difficulties are emerging at Waterloo; the scene which he has been encouraged to look at on the monitor.

His response 'Brilliant Brilliant' is nicely designed to display his appreciation of the anecdote, whilst simultaneously stepping out of the conversation with the visitor. As he utters his appreciation, he turns from Vic and re-orientates bodily towards the console. As he re-orientates, he turns firstly to the CCTV monitor and then the fixed line diagram looking in the area of Waterloo and utters "That Thirty Three at Waterloo?". The query is designed to discover more about what may be happening at Waterloo and in particular which train it is which is standing in the platform.

The DIA therefore provides the Controller with resources which he can search for and identify a potential problem. The DIA's actions are designed not to interrupt the conversation between his colleagues, but to display to the Controller that a problem may be emerging with traffic on the line. The potential problem comes to the Controller's attention, by virtue of the DIA having his colleague look for, and notice, events which are arising in the operation of the service. These events are

## Fragment 4: Images i-iii

V C DIA

i



V: Victoria Line at Rickmansworth,  
(0.6)

↑

ii



V: on Mon:day nigh:t↑

↑

iii



V: (0.4) an he:(r): like (.)

↑

rendered noticeable through the ways in which the DIA encourages the Controller to look at a particular monitor; a monitor which provides access to a scene (the platforms at Waterloo) where the difficulties are arising. The DIA's actions encourage the Controller to undertake a 'motivated' search, to inspect a particular monitor within the local environment, in order to determine whether, there is something that might need to be dealt with.

For the DIA, and the Controller therefore, features of the local environment provide resources through which they can make objects or events 'noticeable' to each other, without necessarily interrupting the activity in which the other may be simultaneously engaged. The DIA systematically designs particular actions, in particular his own looking, to make those actions potentially visible and relevant

to a particular co-participant. The timing and exaggerated character of the looks, coupled with the ways in which they prefaced by glances at the Controller, are ongoingly tailored with regard to the conduct, location and orientation of the potential recipient, namely the Controller, they are sensitive to what he may potentially be 'aware' of and successfully draw his attention without disrupting the flow the conversation. The local environment therefore provides resources through which a colleague can attempt to make sense of, or determine why, the other may have brought some object or event to his attention. Like earlier instances, the DIA's actions are designed to render a particular object or event noticeable, whilst not directly informing the other of the 'issue in question'. It exploits and accomplishes 'awareness', and serves, in this like other instances, to form the first moves into more focused interaction and collaboration.

The very possibility that looking at a scene on a monitor can serve to have a co-participant initiate inquiries and subsequently a course of action to deal with the difficulties, derives in part from the indigenous work practices and conventions found in the line control rooms. The Controller's responsibility is to deal with problems and difficulties which arise in the operation of the service. The DIA's actions, are treated, sequentially, by the Controller as pointing to a particular section of the line, and raising an issue concerning which train (is that the 223) is where. In having the other notice, a noticing, the DIA orients to, the potential responsibilities of the Controller, and in particular his colleague's responsibility to notice and deal with traffic problems. For the participants, the very discovery of a potential problem with the service, generates in the first instance for the Controller, a sequentially ordered trajectory of action: determining the character of the problem and putting in place one of various alternative solutions. In a sense therefore, particular events within the line control room, have as part of being both noticed and resolved, relevant course of action for particular participants such as the Controller. Thus the Controller is not simply 'aware' of any occurrence within the immediate domain, but rather of specific events which are embedded in routine ways of handling those events. The Controller's awareness of the scene is highly selective, and in having his colleague look at, and inspect something within the local environment, the DIA orients to, and exploits, just the objects or events with which Controllers routinely deal. The environment 'comes alive' by virtue of these sequentially organised courses of action which are tied to, and embedded in, particular events and their management.

In both these examples, an individual encourages a colleague to look at and notice a particular feature of the local milieu, and in having the other see the object in a particular way, they produce organisationally relevant conduct. The interaction between the participants is not simply 'mediated' through the environment, rather the environment is constituted, momentarily, in a particular way, and serves to render an event noticeable and accountable. In many centres of coordination, in particular those concerned with 'command and control', a critical aspect of the



responsibility of personnel is to oversee and manage events and activities which occur outside the immediate domain.

Technologies such as CCTV which are specifically designed to support monitoring and surveillance, can be used to configure the 'awareness' of, and to engender actions from, individuals who are the subject of the surveillance. On London Underground for example, CCTV technologies coupled with Public Address systems are the principle resources through which staff provide passengers with information concerning trains, their destinations, problems emerging with the service and so on. The CCTV equipment for example provides staff in the station operations centres with the ability to inspect platforms, identify trains, assess the build up of passengers, and thereby provide timely and relevant information. In one sense therefore CCTV and surveillance equipment, provides staff with the ability to remain aware of a range of actions and events which arise in a variety of locales throughout a station; the perception and monitoring of multiple monitors relying upon, and reflexively constituting various organisational practices and relevancies. More interesting however, CCTV equipment provides resources to inform, unobtrusively, how passengers perceive events and go about their business. So for example, staff in the operations room will deliver announcements to the public informing them of the whereabouts of the next train, the destination of the vehicle entering the platform, the difficulties arising on other lines, and so forth and so on.

These announcements are carefully designed and timed with regard to such considerations as the number of passengers on the platform, their current conduct, the arrival of trains, and so forth. They provide information which not only allows passengers to recognise particular objects or events, for example the train for Watford, or a non-stopper due to vandalism, but in so doing serve to engender particular courses of action. So for example hearing that this train is for Watford rather than Paddington, certain passengers will stand back whilst others crowd around the doors, or for example, knowing that traffic on the line is suspended, some people will sit and wait whilst others will run quickly to find taxis. The tools and technologies therefore not only provide resources for 'monitoring' the scene, but critically, for configuring the awareness of others; of how people in particular locations see and respond to particular events. So whereas in the control room itself, staff can delicately have others notice and respond to things which they might not otherwise notice, that is encourage colleagues to become aware of particular events, on stations we find staff shaping how people might see and respond to aspects of the world at some particular moment in time; that is, exploiting and configuring the awareness of people. This is done in relatively unobtrusive and delicate ways, and is accomplished, at least in part through the staff's abilities to know when and where it might be appropriate to shape passengers perception and conduct.

Awareness is systematically accomplished by participants within the course of their everyday practical activities. In settings such as control centres and news rooms where people are engaged in concurrent independent activities which require

real time coordination at particular moments, we find personnel using various practices and procedures through which they render particular actions 'visible' to others in relatively unobtrusive and non demanding ways. In the course of the production of their activities, personnel encourage particular forms of potential participation from others, participation which more often than not engenders specific actions and trajectories of conduct. The immediate environment provides an important resource in making others aware of particular actions or events. Co-participants engaged in other, often unrelated activities, can be encouraged to look at and notice an action or event, and independently respond in occasioned and organisationally relevant ways. These complex environments provides resources for making others momentarily aware, and for making sense of the activities in which they are engaged, both before they are made to notice and in deciding whether they are dealing with the difficulty or problem at hand. Moreover, actions are produced and recognised with regard to the (mutually) available details of the local environment.

### **5. Figuring the significance of events**

In the examples we have discussed so far, we find one participant delicately encouraging another to take notice of a particular activity and event which may be of particular relevance to their concerns and responsibilities. So for example the DIA has the Controller notice an event that he, the Controller should respond to, or, in Reuters we find one journalist providing a colleague with story which is relevant to his colleague's domain of interest. In some cases, however, a participant may require the cooperation of a colleague to enable a particular activity to be successfully accomplished. Once again it may inappropriate to simply ask the other for their consideration or assistance, but rather you might wish to have them notice something that would enable you to undertake a particular activity. In one sense therefore, we can begin to consider how awareness does not simply render activities and events selectivity visible, which may be of relevance to them, but also encourages others, to undertake actions which are critical to the successful accomplishment of your own activities. Given the interdependence of activities within these centres of coordination one can begin to recognise the importance of having others remain aware of, and sensitive to, your own activities and concerns. On occasions it may become necessary to draw their attention to the necessity to remain aware of activities in which your are engaged and which are critical to successful accomplishment of the business at hand.

Alarms are interesting in this regard. Firstly one might assume that an alarm is an unambiguous warning of particular event or problem which itself sets in motion a procedure to deal with the matter indicated by the alarm. Secondly, in many complex work situations, particular alarms, are in the first instance the responsibility of a particular participant, and can be ignored by others, unless the matter is dealt with relatively rapidly. The issue then becomes how can you have

others notice that an alarm, that is principally your responsibility, is significant, and if necessary how can you do this in ways which do not necessarily disrupt the activities of others.

Consider the following fragment drawn from an operating theatre in a London teaching hospital. The anaesthetist, the surgeon and the nurses are involved in an operation which focuses on an aperture in the patient's windpipe (trachea). The patient has had a tracheostomy (the surgical construction of an opening in the trachea for the insertion of a tube to facilitate breathing) and the aim of the current operation (termed 'dilatation') is to enhance the patient's breathing capabilities by enlarging the ventilation tube implanted in the throat.

It is a fairly straightforward operation, but it is complicated by the fact that both the anaesthetist and the surgeon need the access to the patient's trachea at the same time. The aperture provides the surgeon with convenient access to look inside the trachea with a microscope and to undertake the relevant surgical procedure. The anaesthetist, on the other hand, needs access to the trachea in order to ventilate and control the paralysed patient's breathing system.

Oxygen is provided to the patient through a small ventilation tube that needs to be inserted into the trachea so that gas can be pumped into the lungs. The gas is manually pumped into the patient's lungs when the anaesthetist squeezes a reservoir bag. Regular ventilation is critical and the anaesthetist continually monitors and regulates for the patient's blood pressure, oxygen levels and levels of carbon dioxide. The anaesthetist has at hand an anaesthetic machine that automatically displays the patient's body functions and alerts the anaesthetist to significant changes. For example, an alarm is activated when the ventilation tube is out of the trachea for more than 20 seconds. Ordinarily this alarm warns the anaesthetist that there is a problem with ventilation. In this operation, however, the ventilation tube is regularly removed to allow the surgeon access to the trachea. Therefore, the alarm is routinely ignored whilst the surgeon acts. Once the surgeon pauses the operation, however, the ventilation tube must be replaced in order to pump oxygen to the patient's lungs.

In the following fragment, we can begin to see the ways in which the anaesthetist is sensitive to the conduct of the surgeon, and in the course of the procedure, delicately encourages him to replace the ventilation tube during a pause in the operation.

We join the action as the surgeon, Sean, is examining the patient's throat through a microscope. He is engaged in a discussion with a fellow surgeon who is watching the operation. The anaesthetist Michael, is positioned at the opposite end of the operating table; the anaesthetic machine is on his left. Michael occasionally glances at the surgeon's activity to find opportunities to ventilate the patient. For convenience, in this particular type of operation the surgeon normally reinserts the ventilation tube when there is a pause in the procedure.

## Fragment 5: Transcript 1 (images i-iii)

Jerry Sean Peter Michael



Sean: But I think it probably=



Sean: =best just (dilating)=

↑  
# #

((Alarm indication 1))

Peter: =Yeah ( )

Sean: I know what you mean  
(0.5)Sean: I think that's blocked  
(1.0)Sean: It's blocked (1.0)  
(Thanks \_\_\_\_\_)

↑  
# #

((Alarm indication 2))

Mary: ( ) I'll  
give you another one)  
(0.4)

The images show that the anaesthetist turns away from the patient's body to look at the anaesthetic monitor behind him. Sean produces an answer to a question asked by Peter standing next to him (i) and as he is finishing his utterance the anaesthetic machine activates the alarm (two quick sound bursts) (ii). A few moments later, Sean sits up, refuses a tool displayed to him by the scrub nurse (Jerry) suggesting it (the tool) is "blocked". Just as Sean is about to insert the ventilation tube, shortly

## Fragment 5: Transcript 2 (images iv–vii)



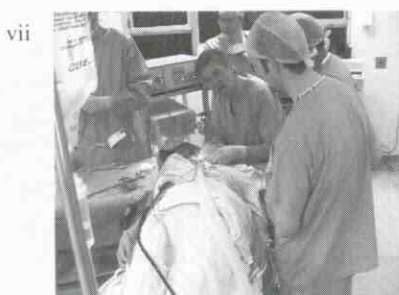
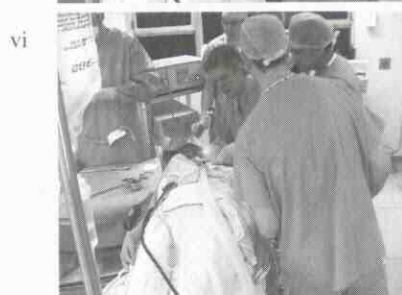
Michael: Yeah::: [(\_\_\_\_)]

↑

Sean: [very thin  
(0.2) very thin will  
you



← (Alarm indication 3)



followed by another re-indication of the alarm, his attention shifts once again towards the scrub nurses as Mary (not visible in the video images) informs him that another tool will be provided soon. Sean grabs the microscope and puts the ventilation tube back on the bed without inserting it (iii).

The alarm warns of a potentially critical problem – the lack of oxygen being received by the patient and the amount of carbon dioxide remaining in the patient's lungs. Whilst the alarm only provides restricted and often indefinite information of the 'actual' condition being detected, the alarm has very different relevancies for the participants. It is largely ignored by the scrub nurses and more importantly perhaps appears disregarded by the surgeon; indeed he leaves the tube on the bed and does not hurry his discussion with the colleague and his involvement with the scrub nurses. It is interesting to note that at this stage the anaesthetist does little to have his colleagues treat the alarm as if it were serious; that it is to be dealt with urgently, involving some sort of break from activities in which they are engaged.

In this particular occasion, it appears that the blood pressure reading normally indicated on the monitors, for some reason, does not become available for the anaesthetist during the entire operation. The blood pressure reading, combined with other indicators, normally provide confirmations and warnings for the anaesthetist about the need to ventilate the patient. At this stage, perhaps the anaesthetist has not yet received any confident confirmation that a potentially critical problem demands his immediate intervention. The anaesthetist glances momentarily at the scene of action but does not render his noticing, noticeable; it is delicately accomplished as a passing glance, it neither displays nor seeks to display that some matter needs to be addressed and addressed with dispatch.

Approximately fifteen seconds later the anaesthetist turns towards the surgeon to find that the ventilation tube has not been reinserted even though the surgeon is not apparently in the course of the procedure. Rather than simply turn away, the anaesthetist moves bodily towards the surgeon and precisely at the moment at which the alarm sounds, he moves the ventilation bag towards the field of view of the surgeon (v).

Firstly, the anaesthetist produces a quiet utterance when turning towards the surgeon. At the same moment the surgeon makes a request to the scrub nurse ('very thin will you') and does not directly face the scene of action. This makes it very hard to hear what the anaesthetist says and to whom the utterance is addressed. Not only is it hard for an analyst to hear the anaesthetist's utterance, it also seems that the surgeon does not hear it, as he does not respond immediately. Interestingly, the anaesthetist's bodily conduct, including his manipulation of the reservoir bag, is perhaps invoked as a response to the lack of the surgeon's response to place the ventilation tube in the trachea.

The anaesthetist renders the placement of the ventilation tube 'noticeable' and accountable to the surgeon. Moreover, in looking at the patient's throat whilst simultaneously revealing the reservoir bag, the anaesthetist displays the problem at hand and its resolution. His actions display the need to place the tube back in the trachea to enable the patient's lungs to be filled with oxygen. His actions do not demand response from the surgeon, nor do they interrupt the activities in which he is engaged, rather they encourage the surgeon to notice, and take into account, the ventilation of the patient.

The anaesthetist's actions do not pass unnoticed by the surgeon. He immediately turns round and places the tube rapidly in the trachea (vi). Right at the moment at which the surgeon inserts the final end of the tube in the trachea, the anaesthetist squeezes the ventilation bag; the rapidity with which the anaesthetist squeezes the bag follows the tube's insertion and perhaps reflects the eagerness with which he takes the opportunity that has been provided. Indeed, the surgeon also displays the import and urgency of ventilation through his quick movement to place the tube in the trachea. Moreover, he subsequently inspects the anaesthetic monitor, possibly to assess the period of ventilation required before the operating procedure may resume or, more likely, if any 'signs' of a potential problem are

available on the monitors. Surgeons, however, are rarely able to, or interested in, assessing the meaning of these complicated indicators. The potential relevance of the event which the alarm sometimes redundantly indicates becomes significant in and through the co-participant's conduct.

The delicacy with which the anaesthetist encourages the surgeon to notice and deal with the placement of the ventilation tube, might appear to derive from the differential status of the participants; the anaesthetist a senior registrar, the surgeon a more senior consultant. It might also be thought that the activities of the anaesthetist, and the nurses for that matter, whilst highly specialised and technical, are principally concerned with supporting the surgeon. However it may have at least as much to do with the interactional situation at hand. The character of the work in which the participants are engaged involves delicate collaboration between multiple individuals. At the moment the anaesthetist quietly asks the surgeon to replace the ventilation tube, the surgeon simultaneously produces an utterance for the scrub nurse. Rather than interrupting that activity, the anaesthetist's movement of his body and the reservoir bag delicately highlight concern, that whilst not 'critical', is of some immediate relevance. He presents himself and a relevant tool (the reservoir bag) visibly before the surgeon thus re-directing the surgeon to the misplaced ventilation tube.

Therefore, in the case at hand, the anaesthetists' seeming deference to the surgeon may be more concerned with not interrupting his conversation with the scrub nurse regarding the character of tools required to complete the surgical procedure. The surgeon's apparent disregard of the alarm and the ventilation of the patient, may themselves be sensitive to the anaesthetist's conduct, and in particular his seeming lack of concern in the scene of action.

The previous fragment begins to reveal how coordination and collaboration within the operating theatre entails a sensitivity both to the tasks and responsibilities of others and the ability of others, ongoingly, to undertake their activities. In the case at hand, we can see how the anaesthetist delicately encourages the surgeon to notice and act on the placement of the ventilation tube and the surgeon orients to and displays his sensitivity to the emerging demands faced by the anaesthetist.

Interestingly once sensitised to the demands of ventilating the patient, the next fragment reveals how the surgeon can be seen to have a heightened concern for the ventilation alarm. The fragment follows on from the section discussed above. With the reinsertion of the ventilation tube, the surgeon becomes momentarily involved in a conversation with the scrub nurse, Jerry, concerning the tool earlier handed to him (viii). Jerry displays a tool which the surgeon will use to force a larger opening within the throat and the surgeon responds with 'good (.) thanks very much' (ix).

As the surgeon does not shift his attention towards the tool that the scrub nurse is attempting to hand to him and by turning towards the ventilation tube the surgeon renders his disengagement from the scrub nurse and his attention to the anaesthetist's task and potential concern, visible to others within the immediate milieu (ix). This perhaps becomes relatively marked by the utterance 'Good (.)





direction of gaze towards the anaesthetist but remains in the same position, which earlier defined their joint collaborative effort (xi). When the anaesthetist turns back he positions himself further away from the surgeon, not directly facing the surgeon, and orientates his gaze down on the patient's lower half of the body. The surgeon appears to treat this shift of attention and form of participation in the scene, a moment later, as a disengagement from the arrangements that earlier exhibited an 'awareness' of each other's concerns and responsibilities. In the absence of the realignment of mutual involvement the surgeon observes the anaesthetist's re-orientation, lowers his gaze back to the surgical area and then smoothly extracts the ventilation tube from the throat.

The surgeon's conduct begins to throw light upon a further aspects of the ways in which 'awareness' is accomplished by participants themselves within the developing course of their activities. The ways in which he stalls the progression of a particular activity whilst orienting to the potential area of difficulty serves to display to others within the immediate setting, in particular the anaesthetist, that he is, and remains sensitive to, events which arise in the setting which may be relevant for the conduct of others. His conduct not only temporarily serves to delay the activity in which he is engaged but simultaneously invites the co-participants, principally the anaesthetist to deal with a problem which may have emerged.

This seems to be done, however, in the light of the seeming difficulties in making sense of the potential problem indicated by the alarm and other resources the anaesthetist use. For the surgeon, who may not be very familiar with the world of alarms and the nature of the problems the anaesthetist may face, his apparent disregard of the ventilation of the patient and the alarm, at particular moments, may be due to the ways in which the surgeon relies on the encouragement from the anaesthetist and the ways in which he experiences the potential problem through the anaesthetist's conduct. His, and indeed the anaesthetist's, sensitivity to the alarm varies moment by moment, with regard to different stages in the surgical procedure and to emerging concerns and potential problems. In other words, rather than thinking of 'awareness' as presupposed by participants in the environment, we can begin to consider how participants experience and remain sensitive to the conduct of others so that an event or action, which may have some passing significance, can be displayed to each other without it necessarily gaining interactional or sequential import.

## Discussion

Whilst the concept of awareness remains relatively unexplicated, it has directed analytic attention towards a range of phenomena that are largely disregarded in the social sciences. The burgeoning body of research concerned with interpersonal communication, talk, discourse, and the like, has primarily investigated social interaction which features two or more parties in focused encounters, occasions in which people 'gather closely together and openly sustain a single focus of attention,

typically by taking turns at talking' (Goffman, 1963). It has also largely disregarded the materials and ecological aspects of human conduct and interaction. Occasions and settings in which people engage in more flexible and fragmented forms of interaction, and where objects, artefacts, tools and technologies, are critical to the practical accomplishment of social activities and interaction, have received less attention. Indeed, an important contribution of workplace studies in CSCW over the past decade has been to open this phenomenal domain and reveal the broad variety of organisational environments in which the conventional model of human interaction accounts for a small part of the daily activities of participants. Control rooms, operating theatres and the like are particularly interesting in this regard, since they demand simultaneous engagement in multiple activities in which co-located personnel are more or less participating and rely in various ways on resources embedded in the material environment.

Unfortunately however, rather than serve to encourage investigation of a disregarded range of phenomena, the concept awareness has been used to gloss, rather than explicate, a range of organisational activities. This is perhaps not surprising; conceptual distinctions within ethnographic research often serve to recast field observations within the same genre, perhaps the most startlingly example would be the extraordinary conceptual framework developed by Hughes (1958) and his colleagues. However, the difficulty within CSCW, is that the concept is not so much illuminated by the ethnographic research but rather serves as a way of legitimising considerations for design, as if once again finding awareness, awareness should be embodied in the system. It is perhaps important to separate, at least in this regard, the ethnographic observations from their subsequent transformation into design considerations and thereby begin to focus in more detail on the organisation of awareness and more interestingly on the range of activity and practice which allows participants to configure their conduct so as to enable real time collaboration from those with whom they are co-located. The aim of this essay, is to provide a sense of how we can to unpack awareness in human, socially organised, practice. In turn, and after extensive empirical work, we might then be able to reflect more securely upon the design of systems to support and enhance collaboration.

The materials discussed in this paper, we believe, point to some interesting issues with respect to awareness and suggest ways in which we can begin to explicate the concept. They suggest that awareness rests not simply on the ability of one participant to remain 'discriminatory' sensitive to the actions of another, but rather that awareness rests upon the ability to build activities to enable others to retrieve certain features or implications of those actions. In some cases we find for example, actions designed for one, principle recipient, being simultaneously shaped to have particular import for another who may happen to be co-located; encouraging but not demanding that he undertake a relevant course of action. In other cases, we find a participant encouraging another, in the course of, and without interrupting, what they are doing, to see, detect and notice something within the local milieu, an 'object' which by virtue of it being noticed is an object which may

have to be dealt with. This form of 'mediated conduct' powerfully reveals the ways in which action can be entailed in 'objects' within the immediate environment' the recipient responding to something one has now noticed and found rather than purely the action of the co-participant (see Heath and Hindmarsh, 2000). In the final couple of fragments, we can for example not only see how the sequential import of 'same object' can be unobtrusively transformed by virtue of the activity of one participant, but also how personnel themselves may 'display' their sensitivity to particular events, events for which others are principally responsible. In these very different cases, there is a critical underlying issue; that is, participants are shaping conduct which delicately and unobtrusively preserves the concurrent commitments of a colleague to the activity in which he is engaged, whilst simultaneously having him notice, and if he so wishes respond to an action or event which is arising elsewhere. To use the old adage of Hughes (1958), in having others notice that there is an action or event which may be of some relevance to their own conduct, the participant delicately preserves the integrity of, and ability to accomplish, the activity in which the other is currently engaged. Indeed, we find a delicate and well meaning etiquette in the moment by moment accomplishment and coordination of these workplace activities. There is a 'lightness of being' to awareness; an organisation which is sensitive to the commitments of others, whilst simultaneously giving a particular sense or feeling for an activity in which a colleague may be engaged.

Goffman suggests that any activity is dependant upon a particular production format which establishes, or attempts to establish, the ways in which 'those within the perceptual range of the event' will participate within the activity. He states:

Participation framework. When a word is spoken, all those who happen to be in perceptual range of the even will have some sort of participation status relative to it. The codification of these various positions and the normative specification of appropriate conduct within each provide an essential background for interaction analysis- whether I presume in our own society or any other. (Goffman, 1981, p. 3)

In the examples at hand, we can begin to discern how the design of particular activities may be simultaneously sensitive to the potential demands of different 'recipients' both within and beyond the local milieu. So, for example, whilst speaking to a signalman on the telephone to ask whether he has corrected the running order of a couple of 'out of turn' trains, the Controller may not only articulate certain segments of his talk with respect to his conversation with the signalman, but shape particular words or phrases so that they are overheard by, and implicate certain actions for, the DIA. Indeed, even a single utterance may be designed to engender different actions by different colleagues who may be positioned at different locations within the organisation. The production format of many activities within the Line Control Room is subject to multiple demands and implicates different forms of co-participation from various personnel. The same

activity can be systematically designed for different forms of co-participation, and can even momentarily merge different ecologies within the organisational milieu.

Therefore, to unpack awareness we initially need to consider how actions are shaped with regard to the participation of others, and how particular activities implicate different forms of participation from those within 'perceptual range of event'. A critical resource in beginning to understand awareness, both for the analyst and the participants, is the sequential character of social action and activities, and in particular the ways in which conduct (is designed to) engender, encourage, facilitate, and in a host of other ways to implicate action from others. Whilst awareness takes us beyond the narrow and ambiguous limits of focused interaction, the sequential organisation of human conduct remains critical provides and a framework with which to explicate how particular sorts of activities can engender a complex array of actions; actions which may occur in immediate juxtaposition, others which may arise at some subsequent moment within the developing course of activities and events. It is interesting to note however (and this itself raises a methodological problem) that conduct which derives almost as a by-product of the actions of others, often remains unmarked, and is specifically produced to avoid appearing as a response; the actions or activities are produced as if independent of conduct which occasioned its production. By producing actions as if devoid of a sequential tie to the prior, an individual can avoid producing an action that generating subsequently demands an action from the co-participant. It avoids, where necessary, movement towards fully-fledged focused interaction.

The sequential and interactional relations which inform the production of 'awareness', do not stand independently of the organisational settings and arrangements in which they arise. For example, participants do not simply monitor the actions of others within a domain, but rather are sensitive to actions and activities which might, in various ways, have implications for their own conduct, and in particular serve to render relevant specific activities. It is not that the participants are overwhelmed by the complexity of the action and the domain, somehow 'filtering' where possible what might or might not be of interest or relevant. Rather, they orient to others conduct within the framework of their organisational responsibilities, and in particular with respect to the ways in which the actions of others implicate particular activities. As we see for example in the Line Control Rooms of London Underground, an individual's sense of the scene, his 'awareness' of the conduct of others, is embedded in the sequential relations and interdependencies which provide for ordered and accountable conduct within the local domain. *Mutatis mutandi*, the very production of actions and activities, rendering certain features visible in particular ways, its sensitive to the complex array of sequential relations in and through which the participants coordinate their work in a routine and orderly fashion. Sequence does not simply inform the production, intelligibility and co-ordination of conversational actions and activities, but is a fundamental resource in the co-ordination of action in complex organisational environments. The practical production of awareness is embedded in

and inseparable from organisational routine and practice. In unpacking awareness therefore we are unpacking indigenous organisational arrangements.

In beginning to address the problem of awareness and examine how it might be supported through innovative technologies, we confront an important shortcoming of research in the social and cognitive sciences. Studies of social interaction, system use, discourse, and like provide strangely disembodied characterisations of human conduct. Communication for example involves talk and visual conduct and yet appears to arise independently of the physical circumstances in which it occurs. In attempting to build electronic environments which support collaboration amongst distributed individuals, we confront, in spectacular form, our lack of understanding as to how objects and the environment feature in the production and intelligibility of conduct. As we have tried to show, not only do individuals produce actions with, and with regard to materials aspects of the local environment, thereby giving such materiality its occasioned sense or meaning, but that the environment provides a fundamental resource in making sense of the actions and activities of others. Once we rip action from its environment, even when we attempt to provide resources for its re-assembly, we challenge some critical social organisational features of human conduct. Awareness, and our attempts to support awareness in CSCW, not only reveal our poor technical achievements, but dramatically displays the shortcomings of our human sciences.

This paper has almost exclusively focused on the ways in which awareness is systematically accomplished within conventional work settings, primarily centres of coordination. As suggested however, awareness, in one way or another, has informed a range of 'technical' research in which we have been engaged. For example in media space, in collaborative virtual environments, and more recently with *GestureMan* the like (Heath et al., 1997; Hindmarsh et al., 1998; Kuzuoka et al., 2000; Heath et al., 2001). Attempting to support awareness in synchronous collaborative electronic environments proves a difficult and intractable problem. In particular, the more we provide participants with flexible access to each other's conduct and the environments in which that conduct is produced, the more we threaten the participants abilities to establish and maintain a common frame of reference, a reciprocity of perspectives. However, when one considers the varying demands of particular activities, one can also see that solutions which attempt to specify the width and focus of awareness *a priori* are unlikely to support even the most simple forms of collaborative activity.

Other CSCW systems that attempt to support 'awareness' often *automatically* reveal information about the location, action or activity of remote colleagues. However it may be more relevant to consider how we can provide participants themselves with tools through which they can flexibly monitor and display their sensitivity to the activities of others, tools which allow people to selectively, subtly and ongoingly render actions and activities visible to others in particular ways in the course of their production. In attempting to develop system support, it may well be the case that we need to abandon the concept of awareness, at least in the ways

in which it is sometimes conceived and applied CSCW. Given the ways in which awareness has increasingly become a rubric with which gather a disparate collection of activities and practices, it is hardly surprising that technical research has followed suit, and in many cases provided participants with prescribed and stable access to information, action and the environment. Awareness reveals a phenomenal domain largely unexplored by the social sciences, a domain which directs our attention to a complex body of socially organised practice and reasoning. As we begin to unpack awareness and take this domain seriously, then we may well be a position to offer more sensible, empirically grounded recommendations and consideration to those involved in the design and development of complex systems, recommendations which place the contingent and emergent character of collaboration at the heart of the agenda. In attempting to realign the agenda for awareness for social science research, we may well be in a much stronger position to provide more sensible support for the development of tools and technologies.

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