Chapter 3. Disposition and data

The previous chapter set out issues to be addressed within the context of interaction in CVEs. Although previous work in the field of workplace studies has briefly been discussed, the way in which these kinds of study might be used as a basis for designing CVEs to support workplace interaction, in terms of findings and methodology, was not mentioned. This chapter will introduce the key concepts used in this thesis for evaluation to inform and assess CVE support for object-focused work. Firstly, it will discuss an observational video analysis approach. The ways in which such an approach can lend itself to an understanding of the interactional organisation of human conduct, particularly with reference to distributed communication, will be outlined. Secondly, this chapter will discuss how the appraisal of ‘quasi-experimental’ data may be conducted with respect to interaction analysis. It will place the use of observational study and quasi-experimental data in context with other studies of co-operative work. Finally, it will motivate methods employed to compare, contrast, and incrementally evaluate changes made to CVE interfaces with the objective of supporting object-focused interaction.

3.1 Naturalistic analysis and quasi-experimental data

The Human-Computer Interaction (HCI) community is increasingly recognising the social impact and import of computer technologies in general, and communication systems in particular. Over recent years, HCI has seen a shift from viewing users as singular processing entities at their workstations to understanding the social situations and spaces within which work takes place. In line with this shift is a parallel movement from traditional experimental analysis to an inclusion of the naturalistic study of the technological workplace (Bannon, 2000). Within the CSCW field particularly, Workplace Studies (Luff et al., 2000) have shown the benefit of examining the production of work and the local concerns of collaboration with and through computer technologies. In particular, such studies have been highly effective
at revealing the ‘seen but unnoticed’ modes upon which collaborative work rests – intricate and fundamental practices which are often glossed over by study techniques with macroscopic concerns.

Workplace studies bear upon this thesis in a number of ways. The findings of workplace studies provide a basis from which to understand collaborative practices through CVEs. As a reference point, the local activities of work can show how the organisation of co-located collaboration might differ from work performed in distributed technologically mediated situations.

Of particular importance for this thesis is that these studies show how objects in the physical environment are critical to sustaining and organising workplace interaction. Furthermore, workplace studies describe concepts of awareness in interaction that are commonly oriented to and employed by colleagues. These concepts allow the characterisation of certain forms of interaction with which to approach analysis. For example, an investigation of object-focused work in CVEs will need to take account of the ways in which awareness of actions and activities is accomplished in the virtual environment.

Furthermore, this thesis also adopts the disposition of many workplace studies that explicate tacit practices of social interaction. This inclination has its methodological foundations in the fields of ethnomethodology and Conversation Analysis (CA)\(^{12}\), concerned with the contingent production of social order through interaction. Thus the next section will discuss this field as a starting point for such studies of work.

### 3.1.1 Naturalistic sociology

The development of a “naturalistic observation discipline which could deal with social action(s)” (Schegloff and Sacks, 1974) has been a primary thrust in the analysis of situated action outlined by Garfinkel’s ethnomethodological programme. Sacks and his colleagues developed considerable insight into both language use and

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\(^{12}\) There is some argument about the exact nature of the separations and similarities between ethnomethodology and CA. See, for example, Lynch (1993: 203 *et seq.*).
methods through which such sense might be accomplished. Sacks is thus regarded as the founder of Conversation Analysis (CA), a research field which has created rich and detailed findings of the organisation of talk. Amongst the most important of these is the local production of turns at talk (Sacks et al., 1974). Participants in a conversation routinely manage and display understandings of the sequential production of interaction. Contextual meaning is a process achieved by people in their everyday activities, step-by-step with regard to one another. In other words, the context in which utterances in conversation takes place is both ‘shaped’ by the previous turn of talk and ‘renewed’ in the light of the utterance (Heritage, 1984). Each action (where talk, as well as body movement, comportment and gesture, is regarded as action), both renews the context of the interaction, and displays an understanding of the previous action(s). This display of understanding in local interaction is, of course, necessarily available to and seen (but often unnoticed) by others in the milieu. Thus, it stands to reason that such displays are also repeatedly available to researchers whose project is the analysis of recorded data of that naturally occurring interaction. Detailed inspection of such data can render visible the participant’s own orientations and understandings of the interaction, a key alignment in the CA programme.

This naturalistic, observational programme has burgeoned into a comprehensive research field, comprising studies on the intricate local organisation of talk. Studies of the structures of conversation include those of turn-taking (Sacks et al., 1974), categorisation and assignment of membership (Sacks, 1966), openings of conversation (Schegloff, 1968), agreement and disagreement (Pomerantz, 1984), invitations (Drew, 1984), integrating discussions of troubles (Jefferson, 1984a) and laughter (Jefferson, 1984b). In addition to analyses looking at empirical examples of ‘pure’ talk, CA has focused on the institutions within which conversation occurs, and the ways in which people orient to their domains and ‘social structures’ (Schegloff, 1993) through features of their conversation. Amongst these contexts are studies of talk in news interviews (Heritage and Greatbatch, 1993), medical consultations (Heath, 1986, ten Have, 1993), schooling (Mehan, 1979, 1993) and offices (Boden, 1991).
These studies of talk emerged at the same time as the technology of tape-recording achieved widespread availability. This allowed the recorded conversations to be subjected to intricate and detailed scrutiny. Furthermore, within the setting of a growing body of empirical research in CA based unsurprisingly upon conversation, and the advent of affordable video technology, some researchers concerned with this study of interactional organisation began to use video as a resource for studying non-vocal aspects of human conduct. These studies encourage observational analysis of video data firmly rooted in CA, and emphasise the interdependence of visual and vocal conduct (see Heath and Luff, 1993). Examples of studies include Schegloff’s (1984) study on some gestures’ relation to talk; Heath’s (1984, 1986) work on recipiency and body movement in medical consultations; Goodwin’s (1981, 1984) discussions of gaze direction and posture; and Kendon’s (1990) related ‘context analysis’ video-based work on gaze, body movement and posture.

With regard to the study of technologies, therefore, it is now possible to map the incursion of such naturalistic studies into evaluation and analysis of computer communication and work. Well-publicised disasters with the deployment of new technologies into working settings have encouraged a reconsideration of the ways in which organisational requirements are uncovered (Heath and Luff, 2000: 1 et seq.). Furthermore, difficulties have been encountered with the use of traditional experimental work in informing the design and deployment of technologies. Experimental approaches become increasingly difficult to apply to new technologies where the rapid flux in which they are created confounds the experimental process. As Tromp et al. (1998) describe,

The prototypical nature of the applications becomes another methodological issue because it’s often not feasible to create different conditions for experiments. Therefore, the given state of the applications at the time of testing constrains the scientific enquiry process. (Tromp et al., 1998: 55)

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13 As an aside, once one begins to refer to literature which departs from CA’s view of the accomplishment of social order to the extent that Kendon does, it becomes necessary to begin to cite vast quantities of literature on non-verbal communication. This primarily technical thesis will not undertake such as task. However, it should be noted that a body of work exists on gesture, gaze and other actions related to the production of the relevance of physical objects. For some of the more closely related examples, see Argyle and Cook (1976), Birdwhistell (1952) and Scheflen (1973).
Therefore, research has increasingly turned to the naturalistic studies exemplified by ‘CA’. Research within the CSCW field has become increasingly sympathetic to naturalistic methods, to the extent that many technologists within CSCW believe such studies to be synonymous with sociology, rather than marginal disciplines. Workplace studies have repeatedly been shown to be a powerful way of understanding how people orient to and manage work and technological practices (Luff et al., 2000, Button, 1993); how features of the workplace environment (such as technologies) are constituted as interactional resources through gesture and talk (Hindmarsh, 1997, Hindmarsh and Heath, 1998, Goodwin and Goodwin, 1996). Key elements of these studies include the notion of peripheral awareness as a feature of the organisation of work; the focus and locus of interaction in working environments as being accomplished in situ; and, as mentioned in the previous chapter, the relevance of objects in the workplace as being critical to the achievement of workplace interaction.

In this way, rather than simply drawing on methodological orientations of workplace studies, it is also possible to draw on the findings of such research in understanding and designing for the nature of collaborative work. Ethnographic and conversation-analytic studies have been increasingly used to inform the design and deployment of technologies within various settings, including air traffic control (Harper and Hughes, 1993), London Underground control rooms (Heath and Luff, 1992, 1997), emergency telephone call centres (Whalen, 1995), medical consultations (Greatbatch et al., 1993) and financial trading rooms (Heath et al., 1995).

The shift from an experimental to a ‘naturalistic’ focus presents a paradox for understanding and informing the design of novel communication technologies such as CVEs. As noted above, the data often used to investigate such technological settings requires applications to be deployed and used within naturalistic settings such as the workplace. Yet the relative incipiency of such advanced communication systems design means that this kind of data is difficult to obtain in a constantly evolving climate.
This difficulty is reflected in the limited numbers of previous naturalistic studies of CVE interaction. Such studies that have been undertaken have circumvented this paradox in a number of different ways. Designers of CVE systems are the only user group which interact within such systems on a regular basis within the frame of a constant change in technology. Bowers et al. (1996a, 1996b) took advantage of this situation by collecting and analysing naturalistic data of designers themselves interacting through an early CVE system, MASSIVE-1 (Greenhalgh and Benford, 1995). The data featured the analysts as direct participants in the interaction as part of the design team. Büscher et al. (2001) collected data of a game-based CVE in a temporary experimental art installation, but limit analysis to real-world interaction between co-located participants using the same CVE system. The notable ethnography of multi-user virtual environments in use is the work of Schroeder (1996, 1997) who discusses social participation within Alphaworlds, an Internet-based CVE system. However, as with most Internet CVEs, Alphaworlds reduces bandwidth requirements by using textual communication instead of full auditory connections between users. The lack of audio within the communicative media provided by such CVEs reduces their interest as available naturalistic data sources in considering conversational interaction, creating different conventions to those employed in talk. Yet the few CVEs that currently support ‘real-time’ spatialised audio are research prototypes. Therefore, given the demands of rapid prototyping and re-design of these precursory technologies, it becomes necessary to obtain data involving collaboration in situations other than naturally occurring CVE interaction. In order to obtain ‘naturalistic’ data through such systems, the situation of use must be, in some senses, ‘manufactured’ in order to obtain data relevant to understanding interaction through the technology. However, this may be done in such a way that the usual orientations of the participants are not undermined by imposition of analysts’ commonsense notions of social categories or social structures.

3.1.2 Quasi-experimental data

The practice of obtaining naturalistic data within an unnatural or ‘manufactured’ setting has been employed to analyse day-to-day, workplace and distributed
interaction within the fields of ethnomethodology, CA and CSCW. The following sections outline an example of each in turn to describe what might be meant by such ‘experiments’, and to motivate the use of these data as the methodological and procedural emphasis of this thesis. The following section begins this process by examining the analysis and data used by Garfinkel in his ‘experimental’ observations of day-to-day interaction.

3.1.2.1 Quasi-experimental data in day-to-day interaction

In his series of studies commonly entitled the ‘breaching experiments’, Harold Garfinkel, the founder of the ethnomethodological programme, explicated the underlying stable features of familiar social settings, by asking

… what can be done to make trouble. The operations that one would have to perform in order to multiply the senseless features of perceived environments; to produce and sustain bewilderment, consternation and confusion; to produce socially structured effects of anxiety, shame, guilt, and indignation; and to produce disorganized interaction should tell us something about how the structures of everyday activities are ordinarily and routinely produced and maintained. (Garfinkel, 1967:37-38)

Garfinkel showed how members treat constitutive expectancies as moral and ‘account-able’ materials by asking his students to record disruptions of those expectancies in interaction with subjects. Probably the most well known of these experiments were those in which students were instructed to insist on clarification of everyday remarks whilst talking to a friend or acquaintance (Garfinkel, 1963: 221-222). A typical case is given below

Case 1

The subject was telling the experimenter, a member of the subject’s car pool, about having had a flat tire while going to work the previous day

Subject: I had a flat tire.

Experimenter: What do you mean, you had a flat tire?
She [the subject] appeared momentarily stunned. Then she answered in a hostile way: “What do you mean, ‘What do you mean?’ A flat tire is a flat tire. That is what I meant. Nothing special. What a crazy question!”

The experimenter disrupted the expectancies of the subject. In fact, the student had ‘breached’ what the subject regarded as ‘what everybody knows’. In order to make sense of each other’s talk, people assume an inordinate amount of background knowledge and unstated intricacies which give recognisable sense to the conversation. Garfinkel (1963: 221) states that “much that is being talked about is not mentioned, although each [party in conversation] expects that the adequate sense of the matter being talked about is settled”.

The breaching experiments showed that participants in interaction are held accountable to each other to maintain a local ‘perceived normality’ and implied the presence of sense-making procedures through which interaction holds. However, the experiments also have methodological implications, two of which are mentioned here.

Conversation Analysis has subsequently shown conversational organisation to be structured by turn-taking procedures, and that through this organisation, “a context of publicly displayed and continuously up-dated intersubjective understandings is systematically sustained” (Heritage, 1984). In mundane conversation, “the issue of ‘understanding’ per se is only rarely topicalized at conversational ‘surface’” (ibid.) Yet anomalous interactions whether engendered, as in the breaching experiments, or ‘naturally occurring’, render the display and attempted resolution of mutual understanding visible, both to the participants, and to researchers observing or recording. In other words, anomaly in interaction can make explicitly visible to social research the practices through which participants understand and manage collaboration. Given the problematic design of distributed communication systems, one can postulate that studies of turn-by-turn interaction through such technologies may produce frequent anomalous interaction. Thus a sociological researcher can further venture two key likelihoods. Firstly, there is significant scope for studies of
interaction in virtual environments which breach the conventional kinds of practice in co-located collaboration in ways that would not be possible in real environments, thus causing participants to resolve and display orientation to such real-world practices. This is an issue to which I shall return later in the thesis. Secondly, the probability exists that such studies might provide rich data regarding the ways in which people orient to interaction through often problematic technologies, such as CVEs, and thus produce information with regard to designing those technologies.

The second methodological implication of the breaching experiments is the use of quasi-experimental data for naturalistic study. Whilst Garfinkel soon departed from the use of such experiments in favour of more ethnographic techniques, he also acknowledged that experiments can be useful for preliminary investigations into virgin territory.

Despite their procedural emphasis, my studies are not properly speaking experimental. They are demonstrations designed ... as “aids to a sluggish imagination.” (Garfinkel, 1967: 38)

The quasi-experimental data used by Garfinkel are considered to be an important maturation in the early development of the programme of ethnomethodology. For very simple procedures, Garfinkel causes many of the experiments to yield incredible depth in his findings and conclusions. Granted the incipient level of investigation in CVE interaction, the use of quasi-experimental data in the light of the breaching experiments would seem a viable proposition. However, the question remains how such data might be collected with respect to interaction in the workplace and through technologies. The next section motivates the use of these kinds of data within studies of the workplace through a discussion of the ‘uncontrolled’ experimentation in an early instance of workplace studies undertaken by Lucy Suchman.

3.1.2.2 Quasi-experimental data in workplace interaction

A main task of designers of workplace technologies is to anticipate the contingencies of use of the technology in advance. The interface of a technology must be constructed so as to provide support for and to understand, the local actions of users
of that technology. Lucy Suchman’s seminal doctoral dissertation, Plans and Situated
Actions (Suchman, 1987), is widely regarded as a foundational work in the CSCW
field, and critical to an increased prominence of naturalistic study within the HCI
community. Suchman’s ethnomethodological critique of the cognitive plan-based
approach to the problem of human-machine communication was explicated through
an analysis of a photocopier’s ‘expert’ help system in collaborative use.

The expert system included sensors within the photocopier which dictated the
changes caused by users, and a program that controls the behaviour of the copier with
respect to the ‘state’ it appeared to be in given those changes. The user was
‘questioned’ by the copier as to the kinds of documents used and copies required. The
information from these questions was then used to determine a step-wise plan by the
machine to be presented to the user – the “designer assumes that the plan matches the
user’s intent, and that in following the procedural instructions, the user is effectively
engaged in carrying out the plan” (Suchman, 1987: 121). By the changes in state
registered by the machine, it was assumed that the “designer can effectively specify
how the user’s actions are to be recognised by the system, and how the system is to
respond” (ibid.) by providing help and instruction during the process. The following
sequence is an example of how problems emerge for users ‘C’ and ‘D’.

*Sequence XXIV* (taken from Suchman, 1987: 164)

C: “Instructions. Slide the document cover to the right.”

D: (Noting output) Okay, it gave us one copy here.

C: Okay, “Slide the document cover right to remove the original.”

D: We’re supposed to have five copies and we only got one.

C: (Looks to output) Oh. (Looks to display) We only got one?

D: Yea. (long pause)

C: What do we do then?
The problem facing participants within this sequence is that the prior state of the photocopying machine is different from what the users believe it to be. The system ‘sees’ no problem, as the single copying action is consistent with producing a different type of copy to that which the users expect (the system expects a preliminary run in advance of producing five two-sided copies). The users, however, do see a problem: the provision of a next instruction by the display implies to the users that the correct action has been completed, yet the output of the machine conflicts with the users’ expectancies, and indicates that the operation was performed incorrectly. Yet the system offers no remedial course for the users, because it ‘believes’ a different operation to be taking place, one where the output confirms the correct performance of the operation, leaving the users with no recourse to effect repair. The plans of the local actions of users which the system designer formulated *a priori*, incorrectly provide support for those actions as though the plan were always followed in all its supposed eventualities at all points.

Suchman’s approach to analysis was to engender collaboration with the technology. The sequence above was taken from a number of situations in which two people were asked to use the photocopier in order to obtain audio-video data of the resulting interaction.

This study proceeded, therefore, in a setting where video technology could be used in a sort of uncontrolled experimentation. On the one hand, the situation was constructed so as to make certain issues observable … On the other hand, once given those tasks, the subjects were left entirely on their own. (Suchman, 1987: 114)

Suchman approached this problem through the constructed collection of video-based ‘quasi-experimental’ data. The investigator instigated the circumstances in which the video was collected, yet the “issues observable” in that interaction developed through the contingent situation which users of the technology themselves collaboratively produced. Analysis was presented through observed sequences within these interactions rather than using statistical or categorised methodologies:
… predetermined coding schemes and controlled experiments presuppose a characterization of the phenomenon studied, varying only certain parameters to test the characterization. Application of that methodology to the problem of human-machine communication would be at the least premature. The point of departure for the study was the assumption that we lack a description of the structure of situated action. And because the hunch is that the structure lies in a relation between action and its circumstances that we have yet to uncover, we do not want to presuppose what are the relevant conditions, or their relationship to the structure of the action. We need to begin, therefore, at the beginning, with observations that capture as much of the phenomenon, and presuppose as little as possible. (ibid.)

This (lengthy) quote accurately describes some reasons behind the use of naturalistic data in the study of collaborative work. When addressing workplace practices, Suchman’s approach to data collection is consistent with her analysis. Just as the use of plans may cause anomalies in the collaborative understanding of a machine’s situation and ‘action’, so an analytic method planned a priori would invoke background expectancies and gloss on the situated phenomena in question.

This section has shown how quasi-experimental data might be used in the study of situated workplace interaction – interaction which frequently requires the use of technologies and collaboration around them. However, when that interaction occurs in a geographically distributed manner: when participants communicate with and through the technology rather than with and around it, a modified approach to data collection may be required. The next section looks at an example of quasi-experimental data in analysis of such distributed collaboration, in order to more closely approximate how analysis of CVEs might address such an approach.

3.1.2.3 Quasi-experimental data in distributed interaction

The contingent features of interaction studies in Suchman’s dissertation were revealed through the quasi-experimental collection of audio-video as data for analysis. Unlike the kinds of technology considered within this thesis, however, users must usually be co-located, with both a photocopier and each other, in order to discuss and employ it as a resource. However, quasi-experimental data has also been used as a way of uncovering the resources relied upon in distributed communication; where interacting
participants are in geographically separated physical environments, yet have one or more media connecting and allowing communication between them. As a case in point, the use of quasi-experiments with ‘mediaspaces’ will be considered – communication tools allowing distributed users to interact through a combination of audio and video media. This example of distributed communication is particularly interesting in that audio-video is not simply a tool for analysis, but the very medium through which that communication takes place.

Mediaspace conventionally provides ‘head-and-shoulders’ views of participants, restricting the access each has to the milieu occupied by and available to the other. (e.g. RAVE, Gaver et al, 1992). As noted in chapter 2, Gaver, Heath, Luff, and Sellen developed MTV II, an experimental mediaspace at Rank Xerox Europarc, Cambridge as a means of investigating the potential for supporting collaborative work with documents and other artefacts through such technologies. Rather than simply providing a view of the other’s upper body, MTV II extended remote participants various views of each other and their respective domains on three separate monitors. These included the usual ‘head-and-shoulders’ view, but to provide increased access to artefacts within the other’s environment, an ‘in-context’ view (showing the overall setting), and a ‘desktop’ view (allowing access to documents and other objects) were shown. A quasi-experimental study was carried out through MTV II in which participants were asked to undertake a simple task that necessitated reference to objects in, and features of, each others’ respective environment – that of agreeing upon the design of a model of a room containing miniature furniture. Thus, as with the co-located domain of interaction in Suchman’s (1987) study, participants were given a task (a task designed to make certain issues observable) and then ‘left to it’. The naturalistic video data concerning the ways in which that task was accomplished was then subjected to observational analyses of the production of talk and bodily conduct through the mediaspace. The results of these analyses are described in a number of publications (e.g. Gaver et al., 1995, Heath and Luff, 2000, Hindmarsh, 1997). Despite providing participants with visual access to the relevant features of each others’ domains through different video views, in MTV II participants encountered difficulties in completing the task. In general, individuals could not
determine what a co-participant was referring to; where they were looking; what was
being pointed to. This problem derived from participants’ difficulties in
(re)connecting an image of the other with the image of the object to which they were
referring. The fragmentation of images – the person from the object and relevant
features of the environment – undermined the participants’ ability to assemble the
coherence of the scene. This impaired collaboration through the ‘mutually available’
objects, because in fact those objects were often difficult to show or invoke for others.

This study has much bearing on the course of this thesis for two reasons. Firstly, the
task itself and the reasons for the experiments are critical to the work described in this
thesis. These issues, however, will be taken up in more detail in the next chapter.
Secondly, the quasi-experiments and data collection methods within the MTV II
studies are the most closely relevant of the three examples that have been discussed in
this chapter. The use of video as an analytic tool of distributed communication
presents some rather particular technical problems, which were addressed in MTV II,
and which are adopted in this thesis. The very fact that participants are not co-located
means that information needs to be gathered from at least two different places and
‘synchronised’. The most relevant feature of this separation is the delay experienced
by data being transmitted across a computer network. Even though, in an
experimental situation, participants can be located on a fast, local network, in
proximal areas, it is essential that data be collected from all parties so that the exact
timing of events can be subsequently observed in the data. The data in the MTV
experiments was obtained by capturing video for three views – over the shoulder, face
on and over the desktop. Additionally, these views were synchronised and captured
using picture-in-picture devices to see these video views simultaneously during
analysis. This and other specific data collection problems issues will be raised in the
next chapter.

It is interesting to note the limitations in distributed communication which different
technologies provide. When discussing the adequacy of audio tape-recorded
materials, for example, Sacks notes that “other things, to be sure, happened, but at
least what was on the tape had happened” (Sacks, 1984). Sacks and his colleagues
often used telephone conversations as data, because “the nice thing about telephone conversations is that they provide an opportunity for people to make sense of each other’s talk without recourse to visual cues” (Silverman, 1997). The ‘impoverished’ resources of telephonically mediated communication allowed research to focus on the ways in which participants themselves organised their talk. Thus the study of interaction through new visual technologies in some ways returns us to the ‘roots’ of conversation analysis. Just as Sacks and Schegloff found the limits of non-visual technologically-mediated communication useful, studying interaction through visual communication technologies such as CVEs, idiosyncrasies, limitations and anomalous interactions included, may provide resources with which to understand simplistic, yet foundational, aspects of bodily conduct in interaction.

3.2 Video data in real and virtual environments

Just as Sacks utilised the telephone as a medium for conversational analysis, it has been suggested that distributed visual communication technologies might be employed for obtaining data concerning fundamental ways in which members conduct their social interaction – and for conducting it with respect to the idiosyncrasies of the technology.

The following sections look at some issues concerning the use of video data, in order to inspect how we might use existing techniques as a basis for video analysis of CVE interaction.

Firstly, when collecting data from ‘the real world’, a researcher must decide where, when and how (e.g. in which direction; with which lens angle) to film. This may call into doubt the objectivity of the data as a record of ‘what actually happened’. For instance, consider the trend in producing ‘docu-soaps’ (documentary soap-operas) for television. The film is often (although not always) recorded as the story unfolds, as opposed to in retrospect for a ‘television-friendly’ version of events. Yet camera techniques, post-production and editing can put that story, the characters, or even details such as the spatial arrangement of a setting, in an entirely different light.
Secondly one might argue that, in a physical setting, the camera and researcher themselves are part of the local milieu. People may orient to the camera or the researcher (for example when they are changing to a new blank tape) during filmed interaction. Thus it may be argued that data as a record of naturally occurring interaction is affected by the presence of the recording activity itself.

Thirdly, video as a medium and resource is incomplete in a number of ways. The resolution of the recording may be inappropriate in some fragments for the detail required in analysis of the conduct of the participants. The camera takes a certain view on the scene being recorded, and thus the researcher may be unable to see possible details (e.g. gaze direction, occlusion of participants or relevant environmental features), critical to an understanding of the orientation and perspective of the interactors.

There are, of course, some differences in studying video data of interaction within physical and video-based environments and virtual (3D graphical) computer-based environments. As with methods of video data collection in real environments, we might consider placing a virtual ‘camera’ within the virtual environment to record the overall interaction as it occurs\textsuperscript{14}. However, when considering such video as data, this approach may not take advantage of some of the idiosyncrasies of participation in CVEs. Notably, users act as their own ‘camera-person’ by steering their view of the virtual world. In other words, the gaze direction, speech, and actions of the user are controlled and distributed directly through technologies, and thus a researcher has an opportunity to capture video material from each user’s point of view. Indeed, when considering multi-party interaction, such data lends a researcher potential posthumous access to a view of interaction from any individual’s perspective. Of course, this does not take into account, or consider, the activity occurring ‘outside’ of the technology in the user’s real environment, action which can manifest within the virtual world\textsuperscript{15}. However, this thesis does not consider interactions \textit{with} CVEs, but \textit{in} and \textit{through} them. The users themselves have no recourse to the other’s real environment, and

\textsuperscript{14} For a discussion of virtual environment camera techniques see Greenhalgh et al. (1999).
therefore investigating members’ own orientations to their interaction within the virtual environment might require less access to this data. However, collection of this data does provide certain benefits. A significant one is to establish a more complete understanding of the setting, before inspecting the information users themselves had recourse to. With this in mind, the data used in this thesis were collected under ‘semi-regulated’ conditions. Users were sat in separate, adjacent rooms, otherwise empty of people, where distractions from the users’ real environment were avoided – and thus a method of data collection from each user’s on-screen perspective becomes advantageous. The likelihood becomes that the on-screen information and the user’s actual view are closely related in the examples discussed. That said, data was collected for this thesis using video cameras recording real-world actions of users at their terminals, to identify if this synonymy holds for particular cases.\textsuperscript{16}

### 3.3 Targeted evaluation

Previous sections have described some of the ways in which communication technologies breach normative expectations of users. Designers attempt to avoid this – yet as Suchman (1987) shows, predicting the local interactions of users is difficult and problematic in every contingency. One way of addressing the kinds of ‘technology breach’ caused by distributed communication technologies is to empirically investigate such problems in partnership with design. Whilst this approach still relies on a designer’s plans, it provides that designer with more relevant, empirically grounded, resources with which to construct those plans. For example, many of the findings from early CSCW studies such as those by Suchman (1987) on ‘plans’ and Heath and Luff (1992) on ‘awareness’ have gone on to be applied in constructing technologies that support more locally adaptable issues and themes (a small subset of which includes Bellotti and Sellen, 1993, Bannon and Bødker, 1997, Turner and Turner, 1997). Studies of the situated action(s) of users can undoubtedly uncover some of the more problematic issues with technology design.

\textsuperscript{15} Studies which do consider real-world interaction with CVE technologies include Bowers et al. (1996b) and Büscher et al. (2001).

\textsuperscript{16} Data collection methods will be further discussed in chapter 7.
This thesis pursues this course of design in two ways. Firstly, by designing CVE interfaces which draw on findings from studies of workplace and mediaspace interaction as comparative ‘measures’, a reasoned approach can be employed, adapting to meet the potential needs of collaborative work within virtual worlds. Secondly, however, the key issue in this thesis is the presentation of an initial investigation into the very technology being designed. Specific CVE issues are uncovered in an exploratory analysis conducted with a system which is re-prototyped to take into account the local problems of interacting users within that system.

Thus, this thesis describes two evaluations, which were conducted, and are broadly presented, in the manner described in this chapter. Both employ an observational approach to the analysis of audio-video data collected under quasi-experimental conditions. Both sets of experimental data are obtained through users conducting the same task within the same virtual world. However, the two analyses differ in one important respect. The first analysis is exploratory, intended to uncover issues critical and specific to object-focused work in CVEs. The exploratory analysis evaluates the ways in which such collaborations occur within the virtual world, and through the CVE interface. This exploratory analysis is intended to inform the design of a system supporting the user with respect to these issues. The second analysis evaluates not just the ways in which interaction occurs through the new CVE system design, but also, in the light of the exploratory analysis, that design itself. This evaluative analysis is approached with some sense of categories based upon the first analysis and the category choices will become clearer with the explication of the exploratory evaluation contained in the following chapter. Therefore, the first evaluation informs not only the new system design but also the evaluation of that design – what this thesis will term a targeted evaluation.

Initial analysis of the practices recurrent during use of a technology gives a greater understanding of relevance when discussing and addressing issues in interaction with that technology. Once those issues have been determined, a more relevant re-design may be produced in supporting the user with respect to those issues. In turn, a more focused evaluation of these issues is possible, and thus we can more comprehensively
understand the effects of that re-design. A targeted evaluation allows a direct comparison of systems – it becomes possible to inspect the benefit of the re-design based upon changes in orientations of interacting participants through initial and new systems.

Targeted evaluation takes the form of a framework of issues with which to inspect the evaluative analysis. This simply means that, where particular problematic conduct arises in the exploratory analysis, the proposed ‘design solution’ to alleviate those difficulties will be investigated through participant’s orientations to it in the evaluative analysis. It is perhaps worth clarifying the relationship between CA as described in this chapter, and the evaluative analysis undertaken later in the thesis in order to clarify some issues with respect to the way in which it is targeted.

Four key points have been noted with regard to CA. Firstly, that CA is interested in actions (including talk) that people organise and order; and that this is done in orderly, and observably orderly ways. Secondly, that this kind of investigation into social interaction often focuses on the ways in which people display understandings of prior actions through their own actions. Furthermore, CA uses ‘natural’ data, in order to address the turn-by-turn local production of actions without presupposing their relationship to the setting. Finally, CA investigates these turn-taking naturalistic data in incredible detail, in order to uncover the ‘seen but unnoticed’ practices upon which people rely in everyday social interaction.

These points are pursued and adopted in undertaking the evaluative analysis. However, this analysis is in some ways constrained by the very orientation adopted towards development and design. In order to incrementally assess designs for CVE systems, there must be some notion in which designs can be said to be ‘better’ or ‘improvements’ on previous attempts. These questions become difficult for, or even unanswerable by, CA (and certainly by ethnomethodology) due to the very fact that it is indifferent to “all judgements of … adequacy, value, importance, necessity, practicality, success, or consequentiality” (Garfinkel and Sacks, 1970). Thus, it should be noted that the evaluative analysis is, in some senses, constructed \textit{a priori}.\footnote{\textit{A priori} refers to knowledge or opinions that are independent of experience or empirical evidence.}
Nonetheless, this is not to say that incremental versions of designs themselves (or, indeed, ‘rules’ of acting) are compared. Rather, it means that the data collected is approached with an interest in certain sequences in mind (e.g. those in which reference to objects takes place or those which notably employ the newly designed resources in some manner). This is the sense in which the evaluation in chapter six is ‘targeted’.

### 3.4 Clarification of contributions

To conclude this methodological chapter, it should be made clear what this thesis aims to contribute in terms of findings for the understanding of social practices within a broader sociological context.

This chapter has already described how communication technologies are adept at producing anomalous interactions, and the parallel relevance of such interactions for ‘bringing to the surface’ the ways that users display and repair their work such that a researcher might uncover the practices on which participants rely. Additionally, the ways in which these practices might be relevant for understanding the development of collaborative practices in real environments have been described. However, the ways CVEs can be used for such studies is not the chief concern of this work. Ethnomethodology and Conversation Analysis have a deep, intricate and defined methodological history and, whilst orienting to the findings and methods of these fields, this thesis does not aim to primarily contribute towards a further understanding of social praxis. As mentioned in the previous section, to claim that this thesis is ‘doing CA’ or other ethnomethodological study would be both wrong and to miss the point. The orientation used for analysis of CVE interaction herein draws on these writings as a resource: through the use of detailed consideration of action and interaction; previous work in the area of qualitative video analysis for this purpose; and the consideration of language (action) as a situated, socially-organised accomplishment. Yet this thesis is not indifferent to “judgements of … necessity” (Garfinkel and Sacks, 1970). The principal findings of this work, instead, are intended to be technical: to answer the central questions “what kinds of support do CVEs offer
for workplace interaction?”, “what can be done to improve that support?”; in other words, how can communication through technology allow the researcher to discern paths to design improvement.

3.5 Discussion

This chapter has described the methodological orientation which the analyses in this thesis adopt. It has described observational studies of interaction as a method of investigating collaborative practices within CVEs, and discussed how this approach will be employed. It has discussed a methodological orientation that will enable an exploratory analysis using methods and findings from workplace and video-based studies of communicative praxis. It has also outlined how a comparative, targeted analysis employing this orientation might point to a second evaluation analysis of a system re-design.

The use of quasi-experimental data has been motivated by an examination of some issues surrounding the naturalistic analysis of interaction. Studies that have used quasi-experimental data as an introductory and exploratory policy for investigating social interaction in relatively uncharted areas have been described. The first of these was Garfinkel’s breaching experiments, an exploratory look at the expectancies of unsuspecting participants in everyday interaction. The second was Lucy Suchman’s empirical video-based ethnomethodological critique of cognitive modelling exemplified by the use of ‘expert systems’ in determining a priori help for user’s local concerns. The third use of quasi-experiments described was the study of access to detached artefacts and domains through the MTV II mediaspace, using video data to analyse, as well as to enable, remote interaction. The use of audio-video recordings as analytic data within such experimental exercises was discussed, emerging from an increasing interest in naturalistic social research in the CSCW field.

These ways of studying interaction have been proposed as a method through which an initial understanding of how interaction ‘within’ CVEs and with virtual artefacts might manifest itself, and as a method through which certain problematic aspects of
CVE interaction analysis and evaluation might be overcome. The next chapter will put these methods into practice by describing the first of the CVE experiments undertaken, and presenting the video-based analysis of the ways in which participants dealt with an exploratory CVE design.