DOI:
10.1177/1094428117747688

Document Version
Peer reviewed version

The Naturalistic Experiment: Video & the Interactional Organization of Workplace Activities

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Abstract

Despite its contribution to management and organization science, the experiment has been subject to wide-ranging criticism and relatively few studies now include either laboratory or field experiments as part of the research process. In this paper, we discuss a particular approach to experimentation that is becoming of increasing importance within the social sciences. The approach draws on ethnomethodology and conversation analysis to use quasi-naturalistic experiments as part of video-based case studies of social interaction in work and organization environments. We consider the ways in which experimentation can form part of a programme of naturalistic research and in particular how experiments can expose the limitations of our insights and analysis and serve to reveal organizational phenomena that might otherwise remain unnoticed. We discuss how quasi-naturalistic experiments can be office or field based and draw attention to the ways in which they increasingly form part of more applied qualitative research, in this particular case, the design and development of advanced technologies to support workplace collaboration and the assessment or evaluation of a practice or a procedure.

Keywords

Qualitative, experiment, video, social interaction

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Introduction

It is widely acknowledged that the experiment, in its various forms, has underpinned some of the highly regarded contributions to management and organization science. Consider for example Lansberger's (1958) discovery of the Hawthorne effect, Lewin's research into leadership (Lewin, Lippit & White 1939) or March and Simon's (1958) studies of bounded rationality and decision making. Indeed, it will also be recalled that Frank and Lilian Gilbreth's pioneering motion studies (Gilbreth, 1911, Gilbreth & Gilbreth 1917, Belliveau 2010), research that in some cases involved the use of film recordings, also included experiments and trials. While an experimental tradition does continue in organization research, as Scandura and Williams (2000), Grant and Wall (2009), Highhouse (2009) and others powerfully demonstrate, only a small proportion of published studies, includes either laboratory or field experiments (see Campbell and Stanley 1966).

The relative absence of experimental research within organization studies derives from the wide-ranging critique of the method(s) and the challenges that arise in using experiments to produce generalizable findings. For instance, an important motivation for undertaking experimental research is to identify robust causal explanations and yet serious questions have been raised concerning the relationship between antecedents and their effect and whether, in many cases, alternative explanations account for any co-variation (see for example Aguinis and Bradley 2014). In the case of laboratory experiments, it is argued that notwithstanding the sophistication of the experiment and the internal validity of the findings, it is difficult to generalize the findings to real world organizations and their employees, that is, to achieve external validity. On the other hand, in the case of field experiments and related interventions it is acknowledged that there can be severe methodological problems, in sampling, exercising control over key variables, drawing causal explanations, generalizing findings and even identifying an appropriate setting for the study. These and a range of other criticisms pervade the wide-ranging debate concerning experimental methods in organization research. Despite the impressive defence of the contribution of various forms of experiment to understanding conduct and cognition (see for example King et al. 2012, Grant and Wall 2009, Mellor and Mark 1998, and Huxham and Vangen 2003), laboratory, office and field experiments have largely become marginal in contemporary organizational and management research.

In this paper, we would like to discuss a distinctive form of experimental research that has become of increasing importance over the last couple of decades, experimental research that is concerned with understanding organization and organizations but is largely undertaken within disciplines not commonly associated with management studies. For want of a better phrase, we will characterize the approach as 'quasi-naturalistic', an approach that includes both in-house office or laboratory experiments, as well as field experiments. The approach

involves a close, systematic relationship between field studies, naturalistic research of organizational conduct and cognition, and experiments, and is primarily concerned with using video-recordings to explore the interactional foundations of workplace activities. In contrast to experimental research that is traditionally undertaken in management and organization studies, be it laboratory or field experiments, the approach is not primarily concerned with the assessment of theory or with identifying causal explanation. Rather, this growing corpus of quasi-naturalistic experiment addresses the social and interactional accomplishment of everyday organizational activities and the knowledge, practice and reasoning that enables the deployment of particular techniques and technologies. They are therefore primarily exploratory. They routinely form part of a broader programme of research or case study in which they are used to expose phenomena and examine particular ideas and solutions.

In this paper, we discuss the methodological and analytic considerations that arise in undertaking quasi-naturalistic experiments and the ways in which they can contribute to videobased field or case studies of work and collaboration in more conventional organizational environments. The motivating example is the design and development of prototype technologies to support remote collaboration in the workplace and the ways in which we can support real-time interaction with and around material and digital documents and artefacts. Alongside the more applied aspect of the research, we seek to show how quasi-naturalistic experiments can serve to expose organizational phenomena and the taken for granted, tacit practices and reasoning that informs the concerted accomplishment of routine actions and activities. To begin, however it is perhaps helpful to provide a little background to these methodological initiatives.

Background

In recent years we have witnessed the emergence of a substantial corpus of video-based field studies that examine how tools and technologies, ranging from material documents through to complex multimedia systems, feature in work and organization. This corpus has come to be known as ‘workplace studies’ and includes research into a broad range of organizational environments including control rooms, operating theatres, architectural practices, law firms, health centres, offices and call centres (see for example Suchman 2007, Heath and Luff 2000, Engestrom and Middleton 1996, Llewellyn and Hindmarsh 2010, Luff et al. 2000, Streeck et al. 2011, Szymanski and Whalen 2011 and for a general discussion Barley & Kunda 2001).

Drawing on analytic developments within sociology, namely ethnomethodology and conversation analysis, these studies address the interactional foundations of organizational activity and the ways in which workplace activities are accomplished through talk, visible

conduct and the use various tools and technologies. Videorecording, augmented by field studies, has proved critical in this regard, providing the resources through which the routine accomplishment of work and collaboration can be subject to detailed scrutiny and analysis.

These naturalistic, video-based studies of work and organization have been accompanied by a substantial corpus of quasi-experimental research in which particular practices, techniques and technologies have been subject to detailed exploration and investigation. These experiments routinely form part of broader programme of naturalistic research, video-based field-studies of particular organizational activities and arrangements. They have made an important contribution to our understanding of workplace interaction and the resources and practices that inform the accomplishment of particular actions and activities. Perhaps the most familiar example of how these developments came together is Suchman's (1987) pioneering analysis of plans and situated action.

Suchman's study is a wide-ranging critique of the key assumptions that underpin Artificial Intelligence and cognate developments within HCI (Human Computer Interaction). Drawing on ethnomethodology and conversation analysis, the critique points to the limitations of plan-based, cognitive models of human conduct, and draws attention to 'situated' character of practical action and contingent reasoning that enables 'users', in concert and collaboration with others, to use tools and technologies to perform particular tasks. Suchman's research was undertaken at Xerox and had an increasing impact on the design and development of advanced systems as well as the emergence of workplace studies; studies that in many cases were concerned with exploring the tacit knowledge and practice that enables personnel to accomplish complex tasks using a range of tools and technologies. And yet Suchman's (1987) original analysis that served to expose the importance of the situated and the contingent, derived from her analysis of an experiment in which personnel used a prototype, 'intelligent' photocopier. The experiment consisted of pairs of participants who were required to undertake a series of tasks using the machine; their interaction and attempts to use the system was videorecorded and subjected to detailed analysis. Despite the seeming idiosyncracy of the experiment, Suchman's (1987) analysis served to generate some highly influential and significant findings (Seeley Brown 1991) – findings that both bore upon the shortcomings of a particular technology and more importantly, exposed the socially organised skills and competencies on which participants relied in attempting to use a new technology. Her insights into the 'situated' character of human computer interaction had an important impact on the emergence of workplace studies and facilitated the use and development of experimental, qualitative approaches for studying and assessing the use of novel technologies (Suchman and Trigg, 1991, Lazar et al. 2010).

There is a second element to the emergence of quasi-naturalistic experiments that in one sense is both more methodological and more theoretical, but closely resonates, with Suchman's (1987) analysis. Building on Schutz (1962), Garfinkel (1963, 1967) develops a highly distinctive approach to the analysis of social action, an approach that is articulated in part through a series of 'breaching experiments'.

> An alternative procedure would appear to be more economical: to start with a system with stable features and ask what can be done to make for trouble. The operations that one would have to perform in order to produce and sustain anomic features of perceived environments and disorganized interaction should tell us something about how social structures are ordinarily and routinely maintained.
>
> (Garfinkel 1963: 187)

Garfinkel's (1963, 1967) breaching experiments included for example having subjects clarify the sense of commonplace remarks during conversations with acquaintances, to have students return home and act as if they were lodgers, to bargain for fixed-priced merchandise, to erase the first move in the game of tic-tac-toe, and so forth. In various ways the experiments served to expose the taken for granted, the 'background expectancies' that underpin and enable routine action and to reveal ways in which participants attempt to normalize discrepancies, to preserve a reciprocity of perspective, and re-establish trust that is 'compliance with the expectancies of the attitude of daily life as a morality' (1967:50). Garfinkel suggests, coining Speigelberg's phrase, that breaching experiments are 'aids to sluggish imagination'; they 'produce reflections through which the strangeness of an obstinately familiar world can be detected' (Garfinkel 1967:52?). As Crabtree (2004) suggests, while breaching experiments may serve to engender 'bewilderment, consternation, and confusion' they provide an important technique with which to examine how participants themselves respond to, manage and repair infractions. In turn, they serve to expose and enlighten our understanding of the tacit resources, practices and reasoning on which people rely in the routine, taken for granted accomplishment of everyday actions and activities.

In different ways, Garfinkel's initiatives coupled with Suchman's critique of goal-oriented, plan or rule based models of human conduct, have informed the emergence of a qualitative, quasi-experimental tradition within studies of work and organization. These include both office or laboratory-based experiments as well as naturalistic interventions in everyday activities and encompass a broad range of small-scale 'trials' in which particular practices, technologies, systems, ecological arrangements, task structures, and the like, are subject to detailed exploration and in some cases assessment. These experiments include the

assessment of specialised skills and communication practices areas that include health care, education, and public speaking (see for example Sarangi and Roberts 1999, Antaki 2011). They also include a substantial corpus of research concerned with the analysis of how people respond to and use new technologies, both alone, but more generally, in and through interaction with others (Hsieh et al, 2006, Andre et al. 2011, Hollan et al. 2000). The aim of these experiments is not solely concerned with the assessment of a particular technique or technology, but rather with exposing the unknown or unexpected aspects of a social organization that informs and enables the concerted accomplishment of particular actions and activities. These experiments routinely arise in the light of prior extensive and detailed analysis of particular activities and aim to resonate with those practices. In this way it they serve as vehicles to explore the robustness of the original analysis, to expose the limitations and shortcomings of our understanding and to reveal phenomena that might otherwise pass unnoticed (see for example O' Hara et al. 2014, Johnson et al. 2011)**.**

Both within workplace studies and this associated experimental research, it is increasingly realised that videorecordings, augmented by field-work, observation and interviews, provide unprecedented resources with which examine the fine details of organizational activities and interaction. They provide access to talk, visible conduct and the use of tools and technologies and the ability to subject sequences of action and interaction to fine grained and repeated scrutiny using slow-motion facilities and the like. Videorecordings also provide the opportunity of build a data corpus that can be subject to various analytic interests and concerns and where relevant, to identify and assemble numerous instances of particular phenomena from different situations. Videorecordings also provide the opportunity to present and discuss data and fragments not only with fellow researchers but also with participants themselves, to elicit their insights, observations and comments, a resource that can prove invaluable when for example analyzing highly complex sequences of action say in control rooms, operating theatres or even experiments. And, audio-visual recordings, both of naturally occurring events as well laboratory experiments and real-world interventions, can prove invaluable in engaging practitioners, be they clinicians, engineers or designers, enabling for example discussion and debate concerning recommendations and interventions (see Broth et al 2014; Streeck and Mehus 2005, Heath et al. 2010).

Like other forms of qualitative research (consider for example Walsh et al. 2015, Silverman 2016) including those that utilise visual media - photographs, video and the like, for the study of work and organisation (Jewitt 2014, Knoblauch et al. 2006, Ray and Smith 2012) there is no formulaic approach to the design of these quasi-naturalistic experiments and we find some diversity in the ways in which they are organized and subject to analysis. The design and operation of naturalistic experiments pose a series of questions and considerations

that are largely resolved with regard to the aims of the experiment, the practicalities and circumstances of its operation, and the overall project, the case study of which it forms part. Rather than attempt to formalise how quasi-naturalistic experiments should be undertaken, in this paper, we would like discuss two exemplars, or case studies, in which this kind of experiment can serve as part of a programme of research. In the first, a series of experiments were undertaken with sophisticated, prototype technologies that were aimed at supporting workplace collaboration. By carrying these out in settings that could be configured it was possible to focus on very particular aspects of collaboration and suggest ways in which further studies of organizational phenomena could be undertaken. In the second, the experiments concerned making subtle changes in current workplace practices. These experiments took place in the field. In both these exemplars, videorecordings provide a critical resource, not only in enabling access to the fine details of talk and action within the experimental data, but also in providing the opportunity to compare and contrast the organization of particular actions and sequences of action across diverse sets of data, both experimental and naturalistic. In using these programmes of research as exemplarx, we explore the concerns and considerations that arise at successive stages of undertaking naturalistic experiments, both in the design and analysis of the data.

Developing prototype workspaces: creating ecologies for collaboration

There has been a long-standing interest in developing technologies to support real-time collaboration amongst participants who are based in different physical locations. These developments resonate with the emergence of the new forms organizational arrangement that began to emerge in the 1980s and with globalization and the growing emphasis on disaggregation, flexible specialization, and dynamic networks. Video telephony and video conferencing systems were the precursors to these developments and more recently, publically available solutions such as Skype and Google Hangouts, are increasingly used to support remote collaboration. It is widely recognised however that these systems place severe constraints on the type of work and task that can be undertaken by remote participants and for some years substantial resources have been directed towards the development of technologies, so-called ‘media spaces, that enable more sophisticated forms of remote collaboration across organisational environments (see for example Harrison, 2009 , Galegher et al 1990). One programme of work in which we have been closely involved, was initially undertaken with Xerox Research Laboratories and more recently has involved close collaboration with research teams in Japan, in particular with partners based at NTT Communication Research Laboratories and the Universities of Tsukuba and Saitama (e.g. Luff et al, 2006, Luff et al.

2013). Quasi-naturalistic experiments coupled with studies of work have been critical within this programme both in exposing aspects of interactional organization that would otherwise pass unnoticed as well as informing the progressive design of systems to support remote collaboration. In this section, we would like to focus on one series of experiments, their design, analysis and subsequent implications for studies of work and organization.

The problem and its questions

These experiments emerged in the light of two interconnected 'problems', one concerned, in part, with the seeming shortcomings of a particular technology; the other, with our lack of understanding of certain aspects of organizational interaction. It is worthwhile briefly clarifying the character of these two problems.

Traditionally, media spaces consisted of audio-visual infrastructures designed to facilitate communication and collaboration amongst personnel located within different physical spaces within organisational environments – in some cases within the same building in others based in offices in different regions or countries. Studies of how people used these systems as part of their daily work identified a number of issues and problems that derived in part from the model of communication that informed their development. Not unlike more contemporary 'solutions' such as Skype, media spaces were primarily concerned with supporting face-to-face interaction and largely disregarded the material and digital resources that enable (many forms of) work and collaboration within everyday organizational environments. On the other hand, whereas studies of work and interaction were becoming increasingly concerned with how objects and artefacts, tools and technologies featured in organizational activities, the ways in which participants made reference to, annotated, and made sense of resources such as documents or displays within the course of their interaction, remained relatively disregarded and unknown. Though seemingly trivial, our own studies, and those of others demonstrate how complex organisational activities co-produced in and through interaction with material and digital resources (see for example Goodwin and Goodwin 1996, Heath and Luff 2000, Hindmarsh & Heath, 2000).

It was necessary to address two interrelated concerns: (i) to develop and assess a prototype system designed to facilitate object focussed collaborative work between remote participants, and (ii) create a situation in which participants are required to establish and sustain mutual reference and orientation to objects and artefacts and resolve difficulties that might arise. An experiment provides the resources with which to address these concerns. This would prove problematic in a conventional working environment. In the first place, it provides an opportunity to test potentially problematic and unreliable systems and solutions. In the case, considered here the experiment concerned a technology called Agora, developed by engineers and computer scientists at the Universities of Tsukuba and Saitama. Secondly,

an experiment enables the creation of tasks that maximises the occurrence of particular forms of action and interaction and allows the researcher, in principle at least, to rapidly generate numerous instances of certain phenomena. Thirdly, an office or laboratory based experiment, enables the collection of high quality data, video-recordings using multiple cameras that enable access to the details of action and interaction that prove problematic to gather in many conventional workplaces (see Heath et al. 2010). Given our limited understanding of the interactional sequences in which we were interested, and relatively crude ideas concerning a technical infrastructure that might resolve the shortcomings of conventional media spaces, there was little point in seeking to develop hypotheses or assuming that we might know in advance what we could be found let alone proved.

The design of the experiments: identifying a motivating case

The experiment therefore had to satisfy two sets of requirements, one technical, the second, social interactional. On the technical side, we were concerned with developing a system that enabled remote participants to be able to talk and have visible access to each other and to have access to various material and digital resources including material documents and displays. It was also critical not only to allow participants to see each other in relation to those resources, for example to seeing the other looking at a document or display, but also to enable the participants to refer to and annotate a document. With regard to the activities that were required for the experiment, it was necessary to encourage different forms of participation and co-production and enabling participants to undertake variable forms of collaboration using varied digital and material resources. Specifically, it was important to see and identify the problems and issues that arose in how the remote participants used the system and its resources and resolved difficulties that arose, particularly with regard to mutual reference to aspects of documents and displays.

The design of the experiment therefore was informed by studies of communication and collaboration in the workplace. They informed both the design of system and tasks that we invited subjects to undertake. In particular, the *motivating case* that informed the experiment derived from a study of an architectural practice in which personnel would routinely meet to discuss a particular design and make appropriate modifications to drawings and plans. These meetings would routinely involve the use of both paper and digital resources and would include making annotations to documents. These activities would routinely occur around a desk at which participants either sat or stood to discuss and make modifications to the drawings both material and digital. Aside from the intense forms of collaboration with and around documents required in the design and modification of plans, architecture as the motivating case was particularly pertinent since it was field in which there was an increasing demand for systems to support remote collaboration.

Figure 2: A frame from a video fragment that was used to inform the design of a quasi-naturalistic experiment. In this fragment in a discussion with the architect on the right, the architect on the left juxtaposes a feature on the screen with one drawn on a paper plan.

With other instances taken from office work, the motivating example suggested that rather than focus just on a face-to-face view, other viewpoints might be required, and that these should show objects within the local environment. More importantly, it suggested that these viewpoints should be configured so that movements towards or away from an object should appear in a similar way in a remote domain. So, if a participant turned away from one object and towards another, their remote image would reflect that turn. This led to a configuration that in some way reflected work around a desk (see Figure 3), so that, when for example one party turned towards the shared screen in their own domain, the co-participant would see the shift in orientation on the life-sized image of the co-participant as towards the shared screen in theirs. It was envisaged that these resources would be straightforward to use, requiring few changes in how participants might act if they were sharing the same environment. Hence, they would require little instruction in the use of the technology.

Figure 3. *The configuration of the Agora system for the experiment. Details of objects can be referred to in different ways through the different spaces. The image on the left shows the different spaces of Agora. A large life sized image provides access to the remote participant. A working area projects a general view of the remote desktop. Details can be discussed when documents are placed in a 'document space'. When a remote participant gestures over the document space of shared screen their conduct is projected over the 'real' physical object in the local domain. On the right is detail showing how a remote participant's projected hand appear to the local participant.*

The general requirements and motivating case also provided the resources to design a task that would place significant demands on the use of the system as well as maximise particular forms of collaboration and co-production. A task therefore required subjects, or better, participants, to consider redesigning an area of a familiar environment, or an area that both participants knew (in this case a region of Tokyo). They were asked to first identify problems with the area, and then propose to address these problems and then provide arguments for their proposal. They were given a set of documents, such as photographs, plans and maps as well as paper on which to draw and write. Some of these objects the participants each had, others were only in the other's domain. The task was simple enough so that it did not require lengthy explicit instructions, but also complex enough to require participants to refer to a range of objects in either the local or remote domain, identify features on different documents for others and also was expected to involve a variety of ways of talking about the objects they had. So, for example in order to accomplish the task the participants would need to refer to specific features in both the local and the remote domains, juxtapose locations related to different objects and discuss relationships between what was visible and what was envisaged. It was also designed to reflect the ways designers worked, so that concrete matters, such as problems, were discussed first, then more exploratory activities were performed – such as those involving sketching and annotating the existing documents – and finally, some synthesis of the foregoing activity was attempted.

The operation of the experiment

We designed the task so it could be undertaken in half an hour or so and found that the system and the activity required no more than five or ten minutes of introduction before participants were able to begin. Given that the task did require some familiarity with the region that would be redesigned, extensive discussion and complex forms of reference, we chose participants and arranged pairs that had a high level of competence in the same language (natural language speakers). Given our interests in the use of the system, reference practices and collaboration, there was no need for strict selection criteria of types of participant, concerning age or gender, for example, or for pairing up participants in specific ways. We identified 26 pairs of participants: 16 Japanese and 10 English speaking. The participants ranged in age from 21 to 55 and there were roughly equal numbers of men and women. Following the sessions, we held a brief (15 minute) discussion with the participants that focused primarily on their thoughts and ideas concerning the system and whether they found any feature of the task particular challenging or remarkable.

For those with an interest in fine-grained studies of work and interaction as well as the use of innovate systems and technologies, naturalistic experiments do provide an important analytic resource. Unlike field studies where complex recording arrangements can prove

obtrusive and in many cases impossible, they provide the opportunity to record multiple views of particular activities and thereby gain access to certain aspects of action and interaction that might ordinarily be inaccessible. In the case at hand for example, we recorded data from the cameras used in the Agora system as well supplementing these views with wide-angle in situ recordings of the participants – in part so we could determine their actions more clearly with regard to their immediate environment. Together, six cameras collected recordings during each session and the different views provided an unprecedented opportunity to examine, in detail, the participants' action and interaction within the production of reference to and annotation of documents, including such features as the design of particular gestures and use and manipulation of pencils and the like. Wide-ranging access to the activities, also provided an opportunity to examine the problems and issues that arose with the use of the system and in particular how the appearance of particular actions on certain displays could momentarily threaten the mutual orientation of the participants. During the operation of the experiment itself, real-time access to the data from cameras, also provided an initial opportunity to identify phenomena and issues, prior to a detailed review of the materials themselves, that be might worthwhile subjecting to more detailed, systematic investigation following the event.

Analysis of the experimental data

The preliminary review of video data, in particular for those with an interest in the social and interactional organisation of workplace activities, poses significant challenges. The richness of the data, coupled with the slight and fleeting character of phenomena, many of which will be unknown in advance of data collection, can result in an initial time consuming review and cataloguing of materials that frequently proves inadequate once analysis begins. It is only through detailed transcription that insightful and systematic observation begins to emerge and yet with video-recorded data, that necessitates the transcription of both talk and visible conduct, it is neither practical nor worthwhile transcribe the complete data corpus. With quasi-experimental data, these difficulties are resolved at least initially, by virtue of the aims of the experiment and principal phenomena it is designed to engender. In the case at hand therefore we initially reviewed a selection of recordings that included different participants undertaking the task and at different stages of its development to identify instances of particular actions, sequences, and events, including examples of problems and difficulties, that participants had in using the system to undertake the task. These actions and sequences included occasions where one participant made reference to a particular feature of a display or document either in their own domain or the domain of the other, where participants pointed to or attempted to show objects, gestures that were designed to illustrate or animate particular features of a drawing, document or display, and occasions where some problem or issue

appeared to arise in determining in what was being looked at or referred to. Alongside undertaking initial transcription of a series of fragments in which particular actions and sequences arose, we began to assemble candidate or provisional collections of particular phenomena – bringing together from the data corpus instances of particular phenomena so we could compare and contrast their character and organization across different occasions and potentially identify any deviant cases and their implications for our emerging analysis. In assembling these candidate collections of phenomena we were able, where helpful, to integrate data from the different cameras, selecting as principal views those that, at least initially, appeared to provide clearest access to the actions in question.

Analysis of particular fragments begins with transcription and transcription frequently begins with the transcription of talk. The orthography was developed by Gail Jefferson (see for example Atkinson and Heritage 1984) and is widely used in research on social interaction, language use and discourse. Consider the following fragment. It is drawn from our initial collection of sequences in which one participant refers to a feature of a document. The particular feature is the line of a proposed cycle path that one of the participants, namely Conor, has drawn on the map of the region that they are redesigning. The paper plan is positioned on Conor's desk and his co-participant, namely Lucy points to the map as it appears on a display in her own office. We join the action as Lucy checks that whether the line does indeed represent the potential bicycle path.

Fragment 1 – Transcript of Talk

L: So your (0.8) right here you have drawn this line right?=
C: =ye:s
(0.5)
L: So we have to sa::y like
(1.5)
L: to build the: (1.3) the footpath or the:: bicycle pa ⌜:th (or) whatever you want to
C: ⌞(yep)
L: call it↑
(0.1)
C: do you think it should join up here though? (0.1) or::>because it is going to be pretty congested here perhaps↑ or should it join up somewhere else?
(3.3)
C: because if they all converge in the same spot↑ (0.2) ⌜ (maybe)
L: ⌞you know it should be before the hill goes up↑

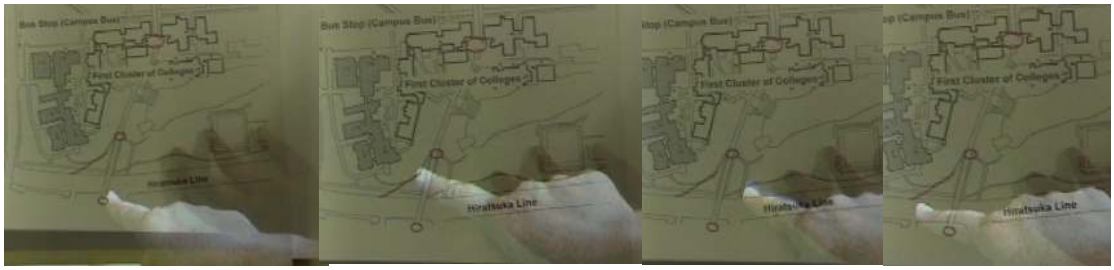
One feature of this example of reference that drew our attention when transcribing the talk, was the seeming uncertainty of Lucy and we were interested in whether there was an issue in constituting the sense and determination of the object in question. It can be noted that there is

a lengthy pause in Lucy's opening remark 'So your (0.8) right here you have drawn this line right?' and an attempt clarify the reference. The utterance is accompanied by a gesture in which Lucy repeatedly moves her index finger up and down the line of the bicycle path as it is displayed on plan on the monitor in her office. To determine the characteristics of the participants' visible conduct, including their gestures, bodily comportment and visual orientation, we take the transcription of the talk and progressively inscribe aspects of the participants' actions.

Fragment 1 – Lucy gestures at the shared screen

Conor **Lucy**

L: so your (0.8) right here you have drawn this line right?= (0.5) So we have to sa::y
C: =ye:s



Fragment I – Transcript of Talk and Visual Conduct (simplified)

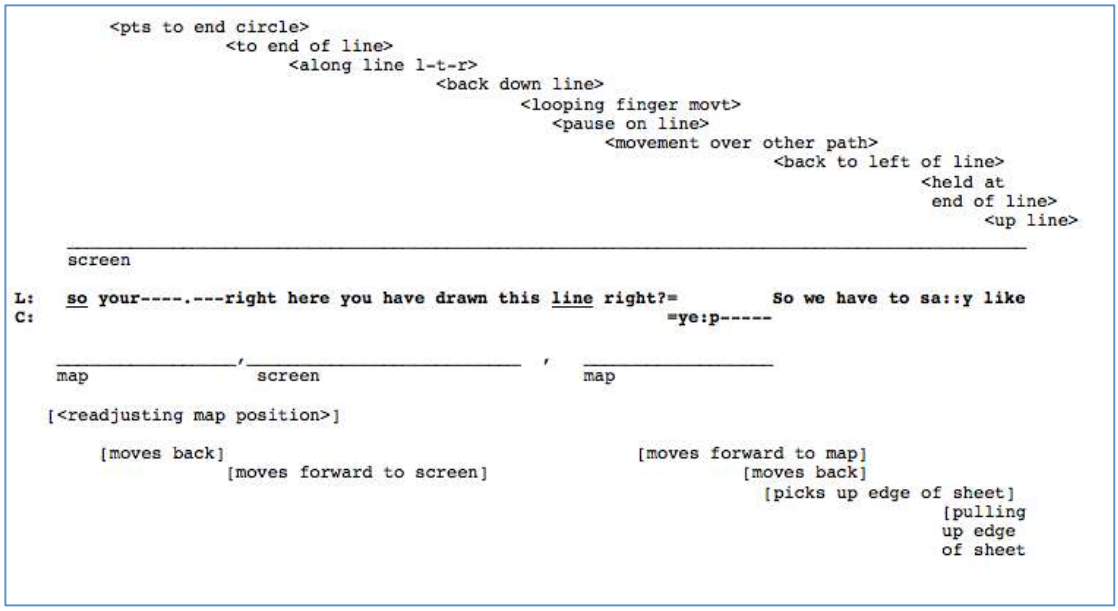


Figure 4: A visual transcript of the conduct of the participants used as a tool to support analysing fragments of visual and vocal conduct. This has been developed from the format used by Goodwin (1981) and Heath (1986). Conduct is transcribed horizontally across the page, centring on the talk of the two participants: Lucy (L) and Conor (C). In lines just above and below the talk the direction of gaze of the participants are transcribed. Above and below that visible actions are transcribed. These include actions of the projected hands that are visible on the shared screen (<enclosed in angle brackets>) and bodily movements visible through the large screen ([in square brackets]). The positioning of the arrows indicate the onset of these actions and the completion.

Transcribing vocal and visible aspects of the participants' conduct provides resources with which to begin to examine the organisation of action within the fragment and in particular, potential sequential structures that inform the activity's accomplishment. For instance, in this fragment, we find that Lucy's reference to, and initial gesture at, the line, 'right here', is produced immediately following Conor turning towards the shared screen. Moreover, Conor's shift in orientation, begins within the pause, in turn following, Lucy producing 'so your' and raising her hand towards the monitor. Both the gist of the utterance and the accompanying the gestures illustrating the line therefore are produced with regard to securing the visual orientation of the recipient to the plan that in turn is established through the way in which Lucy begins the utterance. As she begins to continue 'So we have to sa::y like', Lucy pauses, the pause appears to be occasioned by Conor moving the paper map displayed on the monitor at which she is pointing. As the map comes to rest and Conor reorients to the map, Lucy continues readjusting the alignment of the gesture so it corresponds the line on the plan. We find therefore an emerging negotiation concerning reference to a feature within the environment and how it is recognisably constituted between

the participants themselves, a negotiation that evolves through sequences of action that enable the relevant and mutual constitution of the object within the 'shared' environment.

Analysis of the quasi-experimental data revealed a range of phenomena and issues, both interactional and technical that required further investigation and informed subsequent research including data collection, analysis, and system development. First and foremost, it demonstrated how little we know concerning the ways in which participants establish and sustain mutual orientation towards particular aspects of objects and resources and ways in which they recognise and resolve matters of incongruity, misalignment, and misunderstanding. Secondly, alongside revealing the complexities of establishing, if only momentarily mutual reference, it drew attention to ways in which an orientation, even peripheral orientation, to occasioned features of the 'local' environment provided a critical resource for making sense, embedding the significance, of particular actions. Thirdly, it provided the resources with which to examine activities that had remained relatively inaccessible in our naturalistic data, including for example, the ways in which participants co-produce a sketch, an annotation, a drawing, a note – a particular feature of a document, a plan, a record.

These and a number of issues informed where we chose to undertake further research, how we collected data and the initial analytic focus. In the first instance, we sought to identify a perspicuous setting (see for example Garfinkel 1967, Sacks 1992) in which to explore these issues, a setting that would expose these issues as a practical matter for the participants' themselves and a setting to which we could gain access for field work and recording. We identified a number of relevant settings, undertook a series of focused studies, and gathered various forms of recorded and field data from different perspectives and standpoints. These included video-based field studies of medical consultations, of command and control, of operating theatres, and museums and galleries. One of the most fruitful settings in this regard was design practice in which participants produced ideas and plans for major developments in museums and galleries. The setting not only enabled us to record using multiple cameras but also provided a substantial corpus of data in which the participants examined, review and co-produced complex forms of material and digital documentation both alone and in collaboration with others. Together with our related studies of settings such as control rooms and surgical operations we gathered a substantial corpus of recorded and field data for the analysis of pointing, reference and ecologically embedded action and interaction and formed the basis of analytic papers and publications (see for example Luff et al. 2009, Sanchez Svensson et al. 2009, Luff et al 2008). Our small-scale experiments thus provided the foundation and motivation for the development of this programme of research.

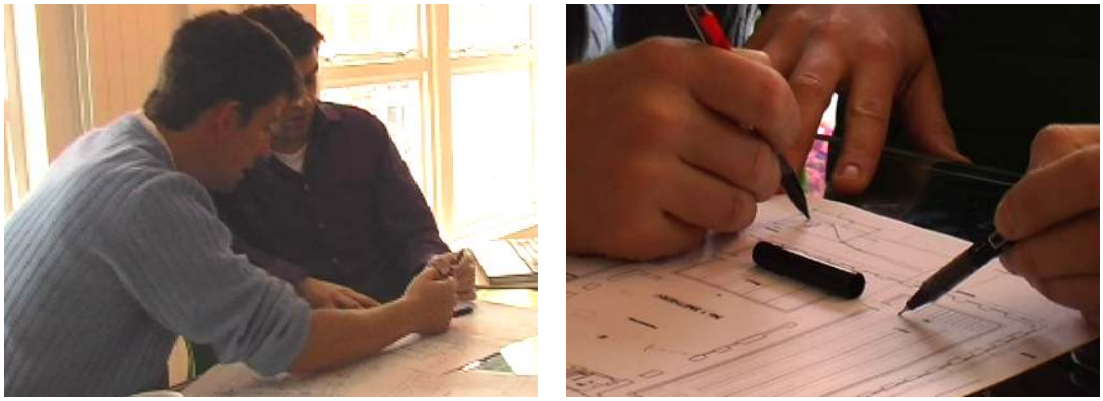


Figure 6. Details of a workplace study of designers informed by the quasi-naturalistic experiment performed using Agora. Here, multiple camera angles, allowed us to analyse how participants secured alignment to objects in the local material environment. (Luff at al 2009).

The issues that were exposed by the experiment have also had an important impact on more applied research in particular, the design and development of systems, including both media spaces and virtual environments, to support remote collaboration (Hindmarsh et al. 1998, Luff et al 2003), as well as the growing interest in how people use widely available technologies to show and discuss visible aspects of each other's environment (e.g. Licoppe, 2015; Licoppe and Morel 2013). They have also underpinned a programme of further experimental work undertaken in close collaboration with industrial research laboratories, and computer scientists and engineers at a number of universities in which we have developed a series of prototype systems and subjected their use to detailed video-based analysis. These projects are reported elsewhere (e.g. Luff et al. 2013, Norris et al, 2013), but it is important to note that they have addressed the ways in which we can provide remote participants with the ability to share, manipulate, annotate and discuss a range of objects, including material and digital documents, to have access to the participants' respective environments, and in particular to refer to, examine and analyse features of these objects including moving images. They have also been concerned with exploring how we can provide participants with the ability to manipulate and move objects and to reposition themselves whilst enabling others to determine their location and orientation with regard to features of the two environments.

Figure 2: Two experiments with prototypes with technologies informed by the Agora studies and subsequent workplace studies. On the left is an experiment with tRoom, a high-fidelity, 'blended environment' where participants can manipulate, discuss and refer to objects on various surfaces, including documents on the desktop and moving images on the 'walls' (Luff et al. 2013). On the right, a quasi-naturalistic experiment of video-mediated interaction through small robot proxies placed on a desk. The design of both these experiments drew from workplace studies of museum designers.

The design of these experiments reflects the structure and format used in the original study. They involve setting two, or some cases four participants (two at each site), a particular task, based upon an analogous workplace activity, and following a briefing, requiring the task to be undertaken in 30 or some cases 40 minutes with little or no intervention. The tasks are recorded using multiple cameras, and selective transcription of both talk and visible behaviour is undertaken following the event. We also undertake discussions with participants immediately after the event to identify any overall reactions, problems and the like with the system. The focus of the task is primarily designed not simply to require participants to undertake certain activities, but to set tasks that encourage, if not demand, particular sequences or packages of collaborative action that necessitate certain forms of interaction. Some obvious examples are that the tasks require participants establishing mutual reference not only to stable objects but to moving images, the tasks may require annotating or in other ways transforming materials such as architectural plans, they may require the manipulation and rearrangement of objects, and interaction between participants within a particular local setting and with those at the remote site. The experiments therefore are primarily driven and set to explore how a particular technological environment provides the resources to undertake specific forms of interactional action and activity, action and activity that is found to arise within conventional organizational settings. In turn, the experiments expose phenomena, aspects of action and interactional organisation that demand further investigation in everyday workplace environments.

Quasi-naturalistic field experiments

In parallel with the emergence of office based naturalistic experiments we have witnessed the emergence of qualitative field experiments in which techniques or technologies are deployed into a naturally occurring environment and subject to detailed investigation based on video-

recordings of the event augmented by observation and in some cases discussion and interviews with the participants. These experiments are not typically concerned with generating quantitative data that can subject to statistical analysis. It is recognised that attempting undertake randomised control experiments in the field can prove highly problematic, both in assigning subjects to treatment and control groups and in the selection and control of the events themselves (see for example Sekhon and Titiunik 2012 and King et al. 2012); indeed, Lawler (1977:577) suggests that the 'methodological requirements of traditional experiments fail to mesh with the realities of life within in organizations'. In contrast therefore to more traditional approaches to quasi-experimentation that prioritizes causal inference and attempts to manipulate independent variables to test hypotheses (see for example Grant and Wall 2009), these small-scale, field experiments derive from analysis of everyday organizational activities and in turn inform further investigation of particular issues and phenomena.

There are two broad types of these quasi-naturalistic, field experiments. The first are experiments that are narrowly focused and involve analysis and in some cases the assessment or evaluation of a practice, a procedure, a technique or a technology. The second are experiments that are more open-ended and exploratory not infrequently involving the deployment of systems or configuration of techniques and technologies that are designed to engender new, but relatively unspecified forms activity and participation. It is perhaps worthwhile briefly elaborating on the two approaches.

In the first case, consider for example the growing interest in using studies of talk and interaction in organizational environments to enhance the communicative practices and skills of the members of particular professional and vocational groups (see for example Antaki 2011, Sarangi and Roberts 1999, Heritage and Maynard 2006, Heritage and Robinson 2011). These initiatives rest upon the detailed, systematic analysis of social interaction in particular settings in areas such as health, the news media, and business, and the discovery that alternative ways of performing particular actions can have an important impact on such matters as diagnosis, public opinion and even the sale of merchandise. Experiments can prove critical in this regard, not only in clarifying how individuals may be taught to understand and use particular communicative practices, but to expose the limitations of our analyses and understanding of particular phenomena and aspects of interaction organisation. For example, in a recent study of auctions of fine art and antiques, we identified specific techniques involving the combination of spoken and visible behaviour that have a significant impact on sales of goods and the overall revenue generated an auction (see Heath 2013). For example, auctioneers were encouraged to explicitly seek confirmation from bidders at certain times or to pause and maintain their visible and bodily orientation towards a bidder, at others.

To assess our original analysis, its limitations, and the issues raised in the deployment of these techniques, we organised an experiment with a leading auction house in which auctioneers attempted to use the techniques during a live auction of three hundred or so lots. The auction was video-recorded and the data subject to detailed analysis.

The operation of this type of focused, naturalistic experiment poses a number of challenges. First and foremost, an exemplary event(s) has to be identified, that enables the relevant deployment of the particular practice or technique whilst preserving the integrity of the particular activity and the routine characteristics of its organization. Secondly, in this case the principal participant has to be instructed on how to deploy the techniques and provided with guidance on the contingencies that may bear upon when and how the techniques should be used. Thirdly, data collection, in particular audio-visual recording has to structured so as to enable access to, as far as practically possible, the various aspects of all the participants' conduct that might bear on our understanding of the deployment and impact of the techniques within the interaction. This can prove more challenging than might be imagined given the slightness and nuanced character of participation in interaction and the necessity to preserve the unobtrusiveness of cameras and recording, that is to avoid any inadvertent or unanticipated disruption to the routine operation of the event. These experiments serve not only to expose the limitations of the original analyses, but also reveal hitherto unnoticed phenomena and issues. In turn they inform subsequent research of conventional naturalistic data and in some cases bear upon the ways in which further video-based field studies are undertaken.

In contrast, the more open and exploratory naturalistic experiment is not necessarily concerned with the assessment or evaluation of, for example, a particular technique or technology, but rather with the forms of action and interaction that arise in the light of significant change or disruption to an activity, a setting, or an environment. These interventions are more akin to Garfinkel's (1963, 1967) breaching experiments, but as Crabtree (2004) suggests are not necessarily designed to engender 'bewilderment, consternation and confusion'. A substantial corpus of research that has used these more open-ended, exploratory naturalistic experiments is concerned with exploring novel technologies and techniques and the ways in which people in everyday settings respond to the introduction of unusual and in some cases highly idiosyncratic systems and configurations of tools and artefacts. In some cases, these naturalistic experiments have been undertaken within the workplace, and indeed it will be recalled that Suchman's (1987) original study examined the use of prototype 'intelligent' photocopier, but given the tentative, experimental character of many prototypes and innovative systems, it is proved more suitable, at least in the first

instance, to use domains where the problems and difficulties would not lead to severe disruption or danger.

Museums and galleries have proven particularly important in this regard. They have provided an everyday setting in which prototype techniques or technologies can be deployed without significant risk to the routine operation of particular activities (e.g. Galani and Chalmers 2009, Reeves 2011, Yamazaki et al. 2010, vom Lehn et al 2001, Meinser et al. 2007). These experiments are commonly part of a programme of naturalistic research that is exploring the interactional organisation of particular activities that in turn are often used to inform the development of the techniques or technologies. The design of this type of experiment differs from more focused assessment and evaluations. First and foremost, while the technique, technology or intervention may derive in part from some general findings concerning particular forms of action and interaction, the experiment is designed to engender and explore unanticipated activities and patterns of communication and participation. Secondly, participants are given minimal introduction to the intervention, rather it is deployed in many cases within a public or semi-public domain and analysis is concerned with exploring how people, both alone and with others respond and manage for example the prototype systems. Thirdly, this can pose significant challenges for data collection, since the forms of interaction and participation that arise can be relatively unpredictable. In consequence the intervention is often deployed over a period of some days or more and how data are collected, for example when, where and how recording takes place evolves iteratively, in the light of successive phases of analysis. Most critically, analysis is not primarily driven by some pre-established ideas or issues, but rather grounded in a review and transcription of the data and the discovery of particular phenomena and sequences of interaction; that is analysis is more akin to more conventional case-by-case, qualitative field research. In consequence, these forms of quasi-naturalistic experiment routinely expose aspects of social organization that hitherto had passed without notice.

Discussion

Notwithstanding the importance of the experiment to pioneering studies within management and organization science, it has become increasingly marginalized within contemporary research. Both laboratory and field experiments have received sustained criticism, not only with regard to the challenges of securing internal or external validity, but in warranting particular explanations and providing secure evidence for causal relationships (see for instance Aguinis and Bradley 2014). Indeed, the very strictures that underpin the methodological foundations of experimental research undermine the ability to design and undertake experiments in organization science that satisfy the requirements of systematic,

statistical analysis. In contrast, we find a growing interest in undertaking small-scale experimental studies within qualitative research and in recent years analytic developments within the social sciences coupled with the emergence of cheap and reliable audio-visual technologies have provided the resources with which to advance the use of both office and field experiments in studies of work and organization. Freed from the ambitions of identifying causal explanations and exercising control over key variables, these quasi-naturalistic experiments are making an increasing contribution to our understanding of work, practice, and technology and in particular social and interactional foundations of everyday organizational tasks and activities.

These quasi-naturalistic experiments rarely stand alone, but rather form part of a programme of field research. Whether laboratory, office or field based, the experiments emerge in the light of naturalistic studies of work and organization. In turn contribute to the further development of these naturalistic studies, not infrequently posing issues and phenomena that demand further investigation and analysis. With the framework of a programme of video-based field studies, these quasi-naturalistic experiments make a number of important contributions. First and foremost they provide resources with which to discover the limitations of an analysis or understanding of particular phenomena and to assess the cogency of recommendations. The experiments with technologies that mediate collaborative activities, for example, suggested ways of developing a sequential analysis of referential action within a local environment. This not only suggested the focus of further analysis, but also informed practical choices made in those later studies, such as for data collection, where to position cameras, what other materials to collect to support the study and how to transcribe the data collected. More importantly the experiments enable ideas and findings to be subject to test and evaluation and they provide the resources with which to return to the 'field' and further develop the analysis of naturalistic data. Secondly, they serve to expose phenomena, actions, and organisation that hitherto remained unnoticed, they provide a vehicle through which aspects and elements of action and interaction that hitherto might have passed unnoticed are brought to analytic attention. For example, the experiments where particular techniques were introduced into a sale by auctioneers revealed subtleties in how those techniques are usually deployed, how they are sensitive to other concerns, like their temporal organisation, that were not apparent in the original analysis. Thirdly, quasi-naturalistic experiments provide the resources with which to reflect on how one might enhance the quality and characteristics of an existing data corpus. They can serve for example to vividly reveal the limitations of recorded data, not simply in turns of camera positions and focus that one might adopt to explore particular issues, but in exposing aspects of organization that necessitate rethinking how data, and what forms, of data should be gathered. For example,

experiments with the prototype media space not only suggested the focus of further analysis, but also informed practical choices made in those later studies, such as for data collection where to position cameras to collect relevant materials. Critically however, the insights, observations, ideas, even theories that arise in the light of these quasi-naturalistic experiments do not stand independently of a programme of naturalistic research, video-based field studies. They derive from the analysis of naturally occurring activities and their contribution is subject to, and developed in the light of, further analysis of action and social interaction as it arises within everyday organizational environments. These different forms of naturalistic experiment are not designed to provide proof or firm evidence of particular aspects of social organization, practice, or even system use. They are through and through exploratory, designed to throw into relief particular phenomena and to expose particular features of organization.

Video-recordings are critical to these experiments and the ability to analyse the social and interactional organization of particular activities. We have remarked on the ways in which video provides a unique opportunity to undertake repeated scrutiny of particular actions and activities and to examine the ways in which they are accomplished in and through talk, visible conduct and the use of various tools and technologies. The focus on social interaction also provides a resource, sometimes characterized as a 'proof procedure' (Heritage 1984, Sacks 1992, Schegloff 2007, Heath et al 2010). It enables the detailed inspection and scrutiny of sequences of action, to examine how participants themselves respond to the particular actions of others in the developing and contingent course of the interaction, that is, it enables the adoption of an analytic standpoint that prioritizes the endogenous, collaborative production of action and sequences of action. Interaction therefore is both a topic of enquiry and provides the analytic resources for exploring the organization of action. Moreover, unlike other forms of qualitative data, at least in live presentations, video provides to enable the academic community to inspect and assess the evidence on which analyses are based.

Video also provides unique resources for applied research. It enables participants, practitioners and others to examine and reflect upon materials and observations and to provide critical comment and insight for example with regard to their own practice or the circumstances in which particular activities are undertaken. Video-recordings also make an important contribution to what is sometimes characterized in computer science and engineering as 'traceability', the opportunity of returning to and if necessary, readdressing, the materials in which some original observations, analytic insights, and even project decisions were based. Video-recordings of quasi-naturalistic experiments can be a valuable resource for supporting the presentation of analysis, particularly to audiences who are not social scientists. For example, fragments of data from naturalistic experiments with prototype

technologies can be critical to assist designers in assessing those technologies and also for comparing and contrasting proposals for future developments. Similarly, they can serve as resources for practitioners, like auctioneers, to reflect on their current practices.

These naturalistic experiments do however pose a series of challenges; a number of which remain unresolved. If we take for example office based or laboratory studies, and consider our long-standing interest in developing media spaces, we find that usually these experiments can make a contribution to the further development of technology. However, it can be hard to anticipate whether they can expose new and distinct phenomena regarding the interactional organization of an activity. Their success in this regard can rest on how seemingly trivial aspects of how the technology operates. For example, by requiring participants to engage in a series of explicit actions to get the technology to work, any data becomes more focused at the technologies to hand and how to resolve problem with them, rather on how the accomplishment of particular activities. Frequently, such issues can be identified by undertaking preliminary pilot studies, and resolved by redesign of the task and re-configuring the technology. Nevertheless, this usually relies on the capability to reshape and redesign the technology in some way, which often may not be feasible.

Rather than considering the experiment as a vehicle for theory development and generating proof, we suggest an alternative approach, an approach that is becoming increasingly used within the social sciences and resonates with some earlier initiatives within sociology and anthropology, even within studies of work and organization (see for instance Cefai 2000, Hviding & Berg 2014, Gilbreth 1911, Gilbreth & Gilbreth 1917). The various forms of naturalistic experiment that are emerging within studies of work provide the opportunity to expose and discover particular phenomena and to provide observations and insights that can inform, even drive, analytic investigations of particular forms of action and activity that arise within everyday organizational environments. They are not substitutes for more conventional naturalistic analysis, they do not seek to provide evidence systematic and rigorous findings of human action and social organization, rather they are fundamentally experimental, exploratory, and revealing; exposing issues and phenomena that demand further more formal investigation. They also provide the resources through which we can engage more applied concerns, whether it is exploring the design and impact of a new technology, investigating a communicative practice, or creating new forms of public engagement. The naturalistic experiment provides unique opportunity to explore the consequences of particular ideas and developments, to demonstrate their potential contributions, and to discover the limitations of our contributions and how we can more clearly and systematically, provide useful and applicable resources for practitioners. Video-recordings prove invaluable in this regard, allowing us to discover organization and its implications to demonstrate the

importance of the seemingly mundane even trivial and allowing us in concert and collaboration with practitioners themselves to explore and reflect upon the richness and impact of interactional organization.

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