Conventions and articulation work in a mobile workplace

Ulrik Christensen
Information and Computer Science
University of California, Irvine
Irvine, CA 92697, USA
ulrik@ics.uci.edu

1. INTRODUCTION

My research interest is in the role of information technology in cooperative systems. My work is grounded in ethnomethodologically informed observation-based workplace studies focussing on procedures, conventions and coordinative artefacts. Recently I have started investigating work settings characterized by a high degree of mobility. This work is part of the project "Developing a Research Methodology for Studying Mobile IT Usage and Person Mobility", that I work on with Gloria Mark.

2. AMERICAN PICNIC - A STUDY OF A WORKPLACE WITH A HIGH DEGREE OF MOBILITY

The experiences discussed here are the first results of the first part of a workplace study in an organization, here called American Picnic. The underlying premise of the work is that workplace studies, aimed at providing a better understanding of cooperative work and the role of technology in actual organizations, are a sound foundation for CSCW. An analysis of how a cooperative ensemble characterized by a high degree of mobility structures itself and of how artefacts and conventions are used and produced, is a way in which to find out what mobility means from a CSCW perspective. The study has consisted in a little more than 200 hours of observation with note taking (over two month) combined with communication-like interviews. The small size of the company has allowed me to spend time in all parts of the organization. The current phase of the project is using the insights from this work to introduce new technology in the company. Yet another phase will follow this implementation, where the adoption and role of the new technology will be investigated.

2.1 The setting

American Picnic arranges large events, mainly company picnics, ranging from little less than hundred guests to several thousand. The company designs the event with the customer, provides the necessary products and services (e.g. foods, entertainment, staff, location) and takes care of the actual carrying out of the event (running rides and family games, catering, serving beer, entertaining, etc.). The company often has more than 200 employees working during events, but the core of the company is about 15 people working with selling events, running the warehouse (distributing and building and maintaining equipment) and support functions (hiring, payroll, accounting). The picture below is from a typical event. During high season there will be around 20 of these every week.

Figure 1. Photo from a typical event.

The reason for people moving (and moving things) in the company is mainly that their field of work is distributed over a large geographical area. The events are held in a variety of public and private parks and most of the equipment is brought there specifically for the event and brought back or to another location later. This means that several persons are employed with moving equipment (carnival rides, game booths, popcorn machines, beer, etc.) back and forth between a central warehouse and event locations and with picking up equipment from various suppliers. The sales force move to these locations to present them to potential customers and to be in charge of an event as it unfolds.

Also, the sales people will often walk from their office to the warehouse nearby to inspect the inventory - or to ask some of the warehouse workers about the status. This interaction leads us to the second reason for people being mobile - they are mobile to be with people, who are somewhere else. "Local mobility" is an important part of the organization - not just because the physical objects of the work system are distributed, but because the physical layout of the workplace results in people being distributed as well.

It is important to note that people move (themselves or things) for other reasons than getting near to or away from a person or object (see e.g. [9]). This is however the aspect of mobility primarily addressed in these pages.

Arguably leaving a lot of interesting aspects of mobility unattended. For instance interesting areas are how people in a shared office space move in relation to each other as part of interaction (e.g. how do people position themselves when one needs help from the other) and the way in which pointing and moving helps two people orient towards their shared physical environment.

In the following sections two issues are discussed in relation to this workplace. The first is the meaning of "a place" seen from the perspective of mobile people and technology. The second is the way in which people arrange their work in this type of setting - mainly the tools and means that people bring to use in the articulation of work.

2.2 The "place" in "workplace"

It seems that it may be very useful to approach the meaning of "workplace" by considering what Harrison and Dourish ([7]) discuss as the difference between "a place" and "a space". They use this distinction to point to the importance of an understanding and a set of associated expectations, typical activities and norms that go along with the tools or physical properties of a setting. The realization of this difference brings with it a necessary interest in mutual understandings and conventions and their nature, how do they appear, how are they negotiated and changed. Central is the way in which workplaces can be seen as settings that support an ongoing negotiation and construction of the mutual understandings and conventions that are seen to be critical for many efficient cooperative ensembles. Characteristics such as the available communication media, the time spent together, common activities, number of participants, communication style (e.g. ongoing vs. interactions with distinct openings and closings; informal and social vs. directed towards an explicit formalized goal) may have critical implications for the way in which conventions and understandings are created/emerge, are changed and maintained. This issue is of central interest in relation to people whose interaction are to a large extent mediated by technology - for instance people in virtual environments or people working in the same computer system and on related tasks but from different offices and of course in relation to mobile settings, where highly mediated interaction is often found.

In relation to the discussion of the emergence of new types of workplaces, it may be worthwhile to notice the way in which mobile technology has been shown to offer blurred boundaries and intermeshed contexts (e.g. [1]). A very rough example is a person engaging in a business meeting through his PDA while in the opera. Clearly this person is at the same time connected to two different places - with (at least somewhat) different norms, goals, expected events, etc. Mobile technologies offers the possibility of bringing "places" with you and of combining "places", possibly leading to situations where a person at one moment finds himself positioned in several contexts (or in

one strangely complex context with potentially conflicting motivations and guidelines for action). This of course is not only possible with mobile technology - but it may be more likely to occur and maybe occur in more complex ways, than it is often the case. Something that may be a very important feature of some of the new types of workplaces that will emerge.

American Picnic is characterized by being very informal in relation to work procedures - no written descriptions of job content or division of labor are used. The way in which things are done is an ongoing process of negotiation and trying out ideas. An example on the emergence of a conventions may illustrate this. A sales person has a few small changes to make on the flyers (an invitation with maps, a sign up slip and schedule that they mail to the customers). These flyers are made by one of the salespersons with a background in the graphics industry. The salesperson wanting to make the change asks if she can make changes herself and how this is done. The graphics person first tells her that the Acrobat Reader will not allow her to change the document (the flyers are e-mailed out as pdf) and then shows her how to use Illustrator on her computer to make the changes. After this the salesperson will - at times - make small changes to the flyers, changes that were made by the graphics person before. A very simple change and a change that may easily be abandoned if it shows to be inefficient - but only so because the people know each other, know the work of each other, have easy access to each others tools, are not concerned with protecting their sphere of work, have easy and flexible means of interaction etc. A vast amount of similar examples on the construction or change of the way things are done is found. Problems occur, are detected, and discussed; remedies are constructed and tried out and the way in which things are done emerge as the outcome of an often vague, ongoing process of negotiation and collaborative problem solving.

This points to a very important issue. If people are rarely engaged in meta-discussions about work or informal conversation not related directly to the work at hand, how will mutual understandings and conventions emerge and evolve? Is it possible to change technical functionality into useful (self-sustaining and evolving) cooperative environments that supports the creation and negotiation of places (conventions, mutual understandings, handing over experience) when people are not together. How do we make technical systems that can evolve with the sometimes highly dynamic structure of which the system is part and be a medium (or part of a such) for the construction of conventions that allow constructive (or at least non-disruptive) interaction through the systems. Or in other words, make technology that, as part of the entire influencing system, supports the necessary continuous changes of this entire system according to met demands. To address this issue it is of central importance to investigate the means and tools that people use to coordinate their activities in settings where their face to

face interaction and even their access to a shared field of work is limited.

2.3 Articulation work in a workplace with a high degree of mobility

To allow work to proceed a) with the advantages of people combining their efforts and b) without potential disadvantages of (unforeseeable consequences of) unavoidable interdependencies a range of coordinative artefacts and procedures are employed. These are the central part of the cooperative ensemble and the core of any supporting technology (as directed towards cooperative work and not enhancements of solely individual capabilities related to solely individual work) and the natural focal point for investigations of cooperative work.

At least two important characteristics related to mobility are found in this setting: a) there are important part of your field of work that are not immediately accessible for inspection and manipulation - something that makes movement or communication with someone who has or can get the information necessary and b) people, with whom you need to coordinate your activities, may not be available for face to face conversation or even real time conversation. These characteristics of course can be found in settings that are not characterized by a high degree of mobility as well - it is a question of degree and of the combination of different features and not about some special features that only pertain to mobility. These two characteristics however seem to be closely related to what is often considered "mobile" workplaces or "mobility". Surely both of these two characteristics influence the artefacts we find in American Picnic. Because of the frequent "being out of the office" people use various technologies to deal with the communication needs in situations, where people are not available for synchronous face to face conversation. Fixed line phones, fax machines, pagers, mobile phones and walkie-talkies are essential parts of the work. People also have various methods for dealing with the unavoidably occurring needs for information exchange and coordination with co-workers who are not accessible for direct synchronous communication. A few of these are outlined next. First however it is important to note that an often highlighted aspect of mobility is that people as they change locations will also at any time have specific locations where they are not. And thus that mobility will mean that certain information and work tools at times are inaccessible. However the activity of moving may have valuable non-planned-for byproducts as well. For instance in the form of allowing communication with people you meet along the way or seeing the state of the workplace along the route. In American Picnic "oh, by the way" conversations (A walking to B and asking a questions, after which B asks A something - something she had been planning to ask A, or had been wondering about recently, or was brought to think about because of the conversation, etc.) or people addressing someone passing them on their way

to meet someone else are continuous and make up a large percentage of the information transfer and negotiation in the organization. Work has been done both on supporting these "opportunistic meetings" when they occur and on supporting the "making them occur", e.g. [3]. People move back and forth a lot and two people are very likely to meet each other during a day - unless one person is out for meetings for half of the day or more. It is likely that other arrangements would have to be made if this was not the case. Mobility is here not what keeps people apart or make them inaccessible, it is what makes them meet. Now, which arrangements are found in American Picnic to deal with the problems of mobility.

2.3.1 Making unavailability visible

One method is people making information about their unavailability available - for instance people take care to make sure that at least the secretary knows when they are on their way out, where they are going (which will often contain information about when you will be back - lunch, dentist, customers in "wild rivers park") or when they expect to be back. And often people mention that they will be going well before they actually plan to leave - often leading to some hectic fifteen minutes before they get out of the office because co-workers are aware that this is their chance for communication. The sales people have started a tradition of leaving notes telling that they will be at a meeting for a certain part of day scotch taped to the side of filing cabinets - so that anyone looking at the place where the person would normally be sitting will see it. Thus people can get an overview of who will not be in the office as they walk through the office in the morning. This is allowed by the physical layout of the workplace where overhearing phone conversations and observing each others desktops is deliberately made easy.

2.3.2 Making availability visible

People also make information about their availability visible. The secretary usually takes the incoming calls (unless she is busy with other calls or away from her desk in which case the sales persons will take the phone). She will then call out (through a speaker system or just with raised voice) "Jane, John Doe from Flower Technologies is on line 4". Most often this simply leads to the sales person finding the relevant files and then answering the call. However if the person calling is wanted by another sales persons (in which case the calling person will usually be a caterer, a person working in one of the parks that American Picnic owns, or a sales person working out of the office) they will (with raised voices) say "I want to talk to him next". One of the owners of the company acts as the manager and is often consulted about non-trivial problems. When he calls someone in the office he will often have this person or the secretary ask out loud "Does anyone need John ?". Which will often - without having a real count I'd estimate it to be around 25 percent of the times - lead to additional conversations. This is allowed by the physical layout of the workplace where overhearing phone conversations and observing each others desktops

is deliberately made easy. Clearly the term "awareness" will be valuable in describing the practices here. The same counts for many other parts of the work, suggesting that "awareness" is part of practice in most situations where peoples work is interconnected and peripheral monitoring and making oneself available/visible is possible and that "mobility", at least in this setting, can not be studied as isolated from "awareness". Studying awareness-related practices in settings, where features we would connect with mobility are pronounced, is valuable contributions to CSCW research on both mobility and awareness.

2.3.3 Making information available

Another way of dealing with the hindered direct communication is leaving information in the personal work space of the other person or leaving it in the shared work space. For instance notes with phone messages (e.g. from customers who do not wish to use voice mail) and revisions to be made to a flyer are left for the sales people on their keyboard, on their desk or in dedicated inboxes. The sales persons also have information available even when the "owner" of the information is not there. People leave files in their workspace so that other people can find them (electronic documents are saved in a commonly accessible file structure on a machine that is always on and files on events are kept in two copies - one in a master file at the secretaries desk and one at the desk of the responsible salesperson) and the other sales persons may consult these files if a time-critical problem occurs. They do however, for a range of reasons, prefer to let the responsible person deal with all matters related to an event. The most important/often-used information is made highly accessible through shared artefacts. Calendars with booking dates for the event locations and for the carnival rides are kept in a common place allowing easy coordination of shared resources - even when people can not engage in direct communication. These artefacts would be valuable even if people where not often away from the office - they allow an easy overview, combine information stemming from many information sources, heavily reduce the time spent with consulting the other sales persons and make sure that information will be available instantly (e.g. you will not have to wait until the other salesperson is off the phone to consult her). This again stresses that mobility - or at least parts of what is related to mobility - is about characteristics that are already known and considered in CSCW - but in a configuration that may lead to a very different workplace.

One especially interesting way in which people leave notes is found between the sales persons and the people working in the warehouse. The people in the warehouse scotch tape versions of the contracts for the events of the week to a part of the shelf system allowing an easy overview of the forthcoming events including notes on what has been packed in the trucks already (and several other parts of information of special interest to the warehouse). The picture below shows a few contracts hanging (bottom row) and over that a table that

summarizes the location of larger pieces of equipment. This system is used for several tasks, here the important function is that it tells people what should be brought to specific locations at specific times - and thus what should be loaded on which truck and when. In case of last minute changes (which are quite common since customers often come up with changes during the week of the event) the sales persons will write these changes on a piece of paper and bring them to the warehouse. If people are there the changes will usually be given to them with a few comments - if the warehouse is empty the sales person will simply attach the notes at the bottom of the contract.

Figure 2. Photo of the shelf system.

A last example on shared information artefacts is found where people work together on loading trucks. Several of the reasons for cooperation are clear from this simple example: they lift things together, are able to make a truck ready to leave sooner, one person usually organizes and straps things down in the truck body while other persons find equipment in the warehouse. People are engaged in several activities at the same time or they intermesh - meaning that often no person has a full overview of what is in a truck at a given time. To deal with this a load list is placed on the lift gate of the truck - this is a list of everything that goes on the truck and people cross items out as they add them, allowing people to leave the work to engage in another activity without having to pass their knowledge on (except for with the load list) and for people to take over the work without having to find the persons, who worked on the truck before. The list serves as a commonly updated representation of the state of the field of work allowing for an easy overview as well as an easy update for people joining.

2.3.4 A centrally placed mediating contact

During the weekends, where most of the events take place, the salespersons are working in different parks, either moving from park to park chatting with their customers or as coordinators. The job of the coordinator consists in making sure that the event runs smoothly and that the clients are happy. The coordinator will supervise the

activities from setup till the last person leaves the place - up to 12 hours later - and will spend the majority of the hours walking around, solving problems and putting people to work. Rides break down, game prizes are for some reason not sent out, keys do not fit padlocks, employees do not show up - in all these situations (and many more) the coordinator will call the office where the manager of the warehouse is on duty. She has the role of sending out replacements and figuring out how to solve problems. In this situation the work is supported by a person in the middle of a "network", who has access to an overview of the entire situation (are there employees that can be moved from a nearby location, do we have a spare bounce, how long time will it take to get there etc.) and who also has experience with how to solve many of the problems. This setup allows the centrally placed person to serve two other functions as well. She has an overview of the overall situation, allowing her to deploy resources where they will do the most good and she can mediate communication between people who can not communicate directly (e.g. because of it being difficult for them to find a time that is good for both of them or because they are using different technologies, e.g. one is using a walkie talkie and the other is using a cell phone).

These are but a few of the artefacts and procedures that people use to get the work done. The core of the work in the project is an in depth analysis of the interplay of these, focussing on the questions: what are the characteristics of this work place, what does it mean for the artefacts and procedures that people are mobile and how are the conventions, mutual understandings, expectations, competencies, etc. that constitute this place used and reconstructed. The overall aim being to achieve a better understanding of what mobility means in an actual system.

3. METHODS FOR STUDYING MOBILITY

It is an explicit aim of the project to develop and evaluate methods for studying mobility. Especially the usefulness of a wearable micro camera will be considered. The background for this is the assumption that a) there will be situations where it will be impossible or difficult beyond reason to follow people and observe their work, but b) that it will be possible to make video recordings of the work in these situations and c) that these recordings will allow us useful insights that could not have come about in any other way (e.g. by observing similar work or combining observation where this is possible with conversations with the mobile person). A close examination of these assumptions will be a most valuable endeavor in relation to CSCW and studies of mobility.

We use a wearable video camera consisting of a recording device and a micro camera mounted on a set of glasses (described in [10]). It follows the head movements of the wearer and can in many situations be brought with the wearer without much inconvenience. This type of camera has been used to study information technology use before (e.g. [8]) but never for investigations of mobile work.

Figure 3. The wearable camera.

The picture above shows the camera mounted on a pair of sunglasses. The white device strapped to the chest and the waist pack on the right contains batteries, light adjustment electronics and a digital camcorder.

We are letting people from the organization (currently truck drivers, people working in the warehouse and coordinators at the events) use the camera, and we experiment with utilizing the video data in our analysis of the work. Both as an additional data source and as an object of common reference in discussions of the work with the wearers. The work with the wearable camera will result in an evaluation of the usefulness of the camera in relation to various research interests (e.g. interface evaluations, evaluation of specific applications or CSCW) and hopefully, by comparison, in a better understanding of the more traditional methods. At this moment it is still too early to comment on the usefulness of the camera.

4. CONCLUSION AND FURTHER RESEARCH

Careful consideration of the experiences from the observations as well as continuous interaction with the organization will be going on for the next several months to allow a sufficiently thorough understanding of the cooperative arrangements outlined in this paper.

ACKNOWLEDGEMENTS

This work is funded by the NSF grant 0075067. Thanks to Paul Dourish and Gloria Mark for discussions of the field work.

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