

COMBINING MOBILE PHONE CONVERSATIONS AND DRIVING – STUDYING A MUNDANE ACTIVITY IN ITS NATURALISTIC SETTING

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ABSTRACT

Mobile phone conversation is activity that increasingly is pursued in conjunction with car driving. The increase is a concern for the state, which traditionally has taken an active role for traffic safety. But it is also a concern for the driver themselves both in terms of a demand for safety as well as support for convenient phone conversations. In the pursuit of an understanding of the safety aspects of this activity, the researchers discuss how to explain the difference between the low amount of reported accidents with phone talk involved and the high theoretical risk as calculated from controlled experiments. The reported field work of everyday mobile phone conversations driving address this issue by discussing different ways in which drivers combine and adapt driving and phone talk to each other. We suggest that the low amount of reported accidents could possibly be explained by the efforts of the driver to make the conversations as smooth as possible.

Keywords: ethnography, field work, mobile phone, cell phone, traffic, car, driving, hand set, handsfree

INTRODUCTION

Mobile phoning has become an important activity going on in cars on the road. Many people make and receive calls while driving to and from work, as well as during their free time [Goodman, 1999, NHTSA, 1997]. It is not just professional salesmen with car-mounted phones that engage in phone conversation. Ordinary people, chatting in their handsets, as they travel home from work, are visible for anyone to see when out on the roads. It has also become a central topic for the public, both in media and among legislators. Mobile phone use in cars has been subject to legislation in many countries. This study is part of a government investigation on driving and mobile phones undertaken by the Swedish National Road Administration. The investigation will inquire into the need for legislation in Sweden. Thus, the motivation for scientific investigations of the consequences of phone talk in cars is well grounded. Extensive laboratory studies have also examined the effects of cell phone use on driving. However, very few studies focus on this topic in a naturalistic setting.

In this paper we account for the everyday activities that go on when people pursue mobile phone conversations in cars. We focus on how the drivers coordinate their conversations with the practical activities at hand to make both driving and conversation as smooth as possible. This includes, of course, manoeuvring the car in such a way that accidents are avoided.

We have used ethnographic field-work as a method to account for these activities. These methods have only been of limited use in the area of traffic safety research. However, they have been influential in the area of information systems design [Hughes, 1992]. Detailed accounts of everyday life are used to generate ideas for technical innovations. This motivation is applicable also in our field of investigation since the technical support for cell phone conversations in cars is still emerging.

RESEARCH ON DRIVING AND TALKING IN PHONES

The topic of this study, and the government investigation, is related to a broad range of research studies. We will in the following briefly account for the research relevant to our study.

A large body of research has studied the effects of mobile phone use on driving. The results show that drivers react more slowly to the traffic situation when operating the phone. The distance to nearby cars is negatively affected as well as the ability to drive in a straight path. Further, mobile phone use has negative cognitive effects on the drivers' attention to traffic [Alm, 1995, Brookhuis, 1991]. Most of these studies are performed as controlled experiments either in driving simulators [McKnight 1991, Manalavan, 1992, Alm 1994 and 1995] or in more realistic settings i.e. "on-the-road" studies [Fairclough, Reed, 1999, Brookhis, 1991] Many studies concern the effects of making a call, i.e. dialing, while driving [Reed, 1999]. The need to control the experiment has distorted the unit-of-analysis when accounting for phone conversations per se in their studies. All these conversations are very unrealistic [Fairclough]. For example Alm and Nilsson have the driver interact with a tape-recorder, which provides queries to be solved [Alm, 1994 and 1995]. Brookhuis et al [1991] provides the driver with mathematical problems. Serafin [1993] has the driver converse with a computer.

Recently, results from crash data analysis have come to question the value of previous research. First, crash data analysis seems to imply that it is conversation that affects driving more than handling the phone [NHTSA, 1997] Conversation appears to be most associated with crashes where the driver can be so engaged in talking that his or her attention to traffic is critically affected [NHTSA, 1997, Goodman, 1999]. This research implies that legislation demanding hands-free solutions will not have any substantial impact on the safety of driving and talking in cell phones. Instead, new technical solutions could be more appropriate for safety reasons. In a recent short-talk article, Punitha Manalavan et al presented a study where car conversations are treated as an awareness problem [Manalavan, 2002]. They argue that it is not the holding of the phone, listening to music etc that impedes the driving, but the conversation. Further, they claim that it is conversation with non-present participants that cause the problem. The problem occurs when non-present people on the phone lack accurate awareness about traffic situations, which requires the drivers' full attention. In such situations, they just keep on talking even though the driver finds himself in a tricky situation. Manalavan et al suggest that an awareness mechanism should be developed, which would provide non-present participants with an audio signal or even silence which could make the other person aware not to engage the driver in conversation during that particular situation.

Second, crash data analysis suggests that the number of crashes that may be attributed to cellular phone use is much smaller than would be predicted in a statistical model based upon driver inattention factors [NHTSA, 1997]. The remainder could be explained either as a result of insufficient crash data, or inadequately designed experiments. The latter case is supported by additional experimental findings which indicate that drivers attempt to compensate for the attention deficit during a mobile conversation e.g. by slowing down)[NHTSA, 1997, Goodman, 1999, Fairclough, Alm, 1994] But the remainder calls for more elaborated explanations. Goodman et al, as part of a comprehensive report on the topic by the U.S. National Highway Traffic Safety Administration (NHTSA), calls for a better focus on the conversation itself:

"The relationship between the intelligence test Q&A dialogues and the content of normal cellular communication is unknown. Such results may represent worst-case or atypical voice communications...A better understanding of the nature of actual cellular telephone communications in business and private calls is sorely needed. [Goodman, 1991]."

Detailed studies of everyday driving and talking could increase our understanding beyond the suggested characteristics. It could provide knowledge about situational adaptation, not only in terms of conversational issues but also in a broader sense. Therefore, we suggest an additional methodological approach to account for this issue. The analysis of naturally occurring conversations is the focus of ethnographic research and conversational analysis. In this field, there is a growing interest in social and interactional studies of mobile phone use [Brown, 2002, Weilenmann, 2003]2002]. The researcher Eric Laurier has, in a specific project, applied an ethnomethodological approach to the study of mobile work and mobile phone use in cars. His project serves as an important source of inspiration to our study.

The central question in Laurier's work concerns holistic issues on how mobile work is accomplished in a car setting and in an office [Laurier, 2002a]. In the article "Notes on dividing the attention of a car driver", he provides some answers to the question how the drivers perform what he calls, "bad driving". By "bad driving", he means doing other things at the same time as driving, i.e. without colliding, hitting other persons, having breakdowns in the manoeuvring etc [Laurier, 2002b, p 2]. Following his interest in the study of details of everyday activities, he claims that doing other things when driving is not so new and obscure that we initially imagine. Laurier claims that:

"There are legitimate involvements of driving that could cause an accident but are dealt with as part of the commonsense grounds of driving: looking for too long at the speedo, fuel gauge or rear view mirror. Learner drivers have to learn how to divide their attention appropriately between monitoring speed ahead, the rear view mirror and the instrument panel." [Laurier, 2002b]

According to Laurier, the attention put to office work is always secondary to driving and takes place when the car is moving slowly as traffic is queuing up. In these situations, some of the mobile workers bring forth their paper documents and even their laptop. Fast moving traffic, and traffic in smaller cities, is a problem that precludes work.

At the same time, he acknowledges how they adjust the calls they make themselves to those situations in which they believe the call-taker just to be in their cars. Thus, the driving situation is seen as an appropriate place to receive calls whereas, among other things, it interferes little with their office work.

Their phone conversations cover different topics that relate to the driving situation. First, the emotional experience of mobile car workers is a combination of loneliness and autonomy. Cell phone conversations offer sociability, but not enough to substitute for face-to-face sociability [Laurier, 2002c]. Second, the topics concern ephemeral forms of minute-by-minute geographical knowledge for the purpose of navigation [Laurier, 2002c] and positioning to make adjustments in the "time-space co-ordination" e.g. delaying a meeting only by saying that "I am stuck in traffic" [Laurier, 2002c].

STUDYING EVERYDAY ACTIVITIES IN NATURALISTIC SETTINGS

The study is informed by the ethnographic research tradition as well as a more specific ethnomethodological approach.

The ethnographic tradition has its roots in anthropology and is conducted with the guidance of three important principles: participant observation, inclusion of members' viewpoints and holism [Prus, 1996, p 109]. Basically, it is a method designed to study social activities and interaction. First, the method is based on the assumption that the researcher must share the day-to-day activities of those studied to be able to describe them thoroughly. Second, the researcher must not only represent what is visible, but also the intentions, norms etc that makes the activities rational from the members' perspectives. Thus, the method provides a familiarity with the members to understand their motivations. Third, human conduct must

be understood with reference to the naturalistic setting in which it occurs. Field observations make the researcher understand both the details of the human practices and the norms and intentions of the members in a culture. The sociologist Joseph Gusfield is a champion of ethnographies of traffic events [Gusfield, 1981]. He has argued for close analysis of everyday activities also to understand traffic behaviour:

“My intent in raising the question of purpose and the meaning of the driving event was to focus attention on the immediate context in which the event occurs...It concentrates on how the event emerges in interaction with others...To look at traffic safety at its microlevel is to understand how the actual situations of using traffic are enacted [Gusfield, 1990, p 7].”

The ethnomethodological approach, as outlined by Harold Garfinkel in the 1960s has much in common with the three principles of ethnographic fieldwork. By ethnomethodology he means “the investigation of the rational properties of indexical expressions and other practical actions as contingent ongoing accomplishments as the phenomenon of interest.” [Garfinkel, 1996] Ethnomethodology is much more interested in the tiny details in the process of group life as on-going accomplishments [Prus, 1996, p 110]. By detailed analysis of empirical material, such as tape recordings of conversations, this research has revealed the ways in which members accomplish common understanding during social interaction and achieve coordination by engaging with observable activities of other members. In the ethnomethodological approach, understanding is generated as an on-going accomplishment through hard work of the participants, rather than as a result of common culture or norms, as is often portrayed in anthropology. The detailed analysis of naturalistic activities reveals the importance of this accomplishment given the situated and contingent nature of interactional settings. But it also shows many of the resources that enable people to understand each other and coordinate their activities despite uncertain conditions.

This approach has influenced us to record and analyse the observable details of this practice. We focus on what is said by the participants as well as what we can actually observe them doing. We have put less effort into interviewing them to ask for their motivations or their qualifications of observable behaviours.

DATA COLLECTION

The project was conducted during 2002. The researcher accompanied seven drivers in their vehicles and collected data by video recordings. We choose to study people who spend time on the roads while working e.g. salespeople and service technicians.

Despite getting access to the setting and the choice of using a video camera, several complex issues concerning data capture remained. The analysis required complete conversations, a comprehensive view of the traffic-situation, and at last a view of how the driver handled the vehicle. We could record both conversational partners if the driver used car-mounted hands free. This was preferable for recording purposes. But we also wanted to study people using standard cell phones. By participating and using a single video camera we have been able to alter the perspective between activities in the car, and the traffic-situation. But the video recordings show only some of the visual details that occupy the drivers' attention. And if the camera is directed towards traffic we miss both the drivers face and the perspective showing gearshifts. Thus, the video camera is not a way of collecting complete visual data. It is rather a tool for the researcher that provides much better data than an audio recorder.

The ethical considerations in our study concern the private character of the conversations and activities going on in the cars. However, the subjects have agreed to being recorded, and we have promised to present the results in a way that protects their anonymity. They have also been requested to inform us if some conversations were not appropriate to record, and should be deleted. In some cases their colleagues were informed about the study.

The method generated a substantial body of recordings. In total we recorded ninetyfive phone calls, all of them performed while seated in the vehicle. The conversations have been transcribed and coded. The coding scheme evolved while working with the material, and has been a necessary tool when analysing the material.

The transcriptions, as presented, account for only a part of the conversational activities. The level of detail is chosen with reference to the claims we are making. For example, we have not coded the pauses more accurately than by inserting three dots when necessary. And we only briefly refer to the tempo of speech. To make the excerpt accessible for the reader, we present the material in two columns. The left hand column presents the conversation, whereas the right hand column describes non-verbal actions.

Participants' Backgrounds

The data analysed derives from phone conversations of seven drivers. In the following we briefly account for their work tasks as well as how much they used their mobile phones during our observations. Three types of mobile phones were employed. Those used in the car with no extra equipment will be referred to as 'handhelds' in the following. Second, those temporarily put in a holder on the dashboard, and connected to a remote speaker and microphone, will be called 'car-mounted' phones. Third, those equipped with an earphone and microphone on a cord, will be called 'hands-free' phones.

Peter and Leif

In the first phase we spent a total of twelve working days accompanying two consultants, hereafter referred to as *Peter* and *Leif*, in the construction business. They were working at one of the larger Swedish consultancy companies in the construction of district heating. The main area of expertise for these consultants was the practical supervision of construction such as adjusting building plans. Their work also included economic accountability towards their client, when ordering material for the construction sites. On average the consultants spent half their working hours outside of the stationary office either with customers or on construction sites. During the one-week study, they spent an average of 7.5 hours in the car and took part in thirty-one cell phone calls. We followed one consultant at a time, during a whole workday. This included spending time in the office, at customer sites, and in the car while driving in and around Stockholmcity such as during inspection tours at construction sites. Extensive field notes were taken, and immediately after ending a day of observation

they were transcribed. Peter and Leif used hand held mobile phone, with no hands-free equipment.

Anders and Lars

In the second phase, we followed five persons working with four different tasks in very different settings. First we followed *Anders* and *Lars* who worked as lorry drivers, delivering food to supermarkets and shops in the Stockholm area. Anders was observed during three full days. He used two handheld phones: one for work calls and one for private calls. During our field study he made ten calls and received five. Nine of these concerned private issues and six were work related. He delivered food in the downtown area of Stockholm. The traffic situation was normally intense on the narrow streets.

Lars was observed during two working days. He delivered food in the northern suburbs of Stockholm. To handle the large amounts of goods he drove a lorry, while visiting the stores on a daily basis. The tour is a daily routine, with the goal of delivering as early as possible. Hence, he starts work at four a.m., and as a consequence of the early hours he do not

use his mobile phone too often. During the two days we were following him we did not record any calls. He only received a single call, and that was while working inside the store.

Paul

Paul works as a manager responsible for a group of salespeople at the same company as Anders and Lars. He shares his time between the office, and meetings in the field, i.e. at the stores. He plans campaigns, negotiates with the stores, etc. Each year he drives approximately 30000 kilometres. He has been a frequent user of a car-mounted phone, but due to a recent change of phone, the units did not work together. While performing the fieldwork, during one day, he used a hands-free phone while in the car. In our recordings from the fieldwork on Paul we retrieved in total eight work related calls, none of which were incoming.

Eric

Another type of salesman was *Eric*, whose travels cover a vast geographical area. Each year he drives approximately 100 000 kilometres with his car, and is a frequent user of a car-mounted phone. The fieldwork took place during three days, as he travelled between cities in the southern part of Sweden. The main office

of his organization is situated in the western part of the country. Seeing that he lives in the east, he has his own office at home, with a computer, an Internet connection, a printer and a fax machine. Only a small portion of his work can be done in this setting, and most of it is done on the field. He uses his car both as a means of transportation, but also as a mobile office. He visits his customers, (primarily sport shops), on a regular basis, every sixth week. He is responsible for the display of his products at each store. He also takes responsibility for the logistics with the help of his main office. In our recordings from the fieldwork with Eric, we retrieved in total sixty-four calls.

Sven

We also followed *Sven* who works as a manager at a company responsible for telecommunications infrastructure. He has to drive by car to visit different sites in a large region to organize their work tasks. As a consequence, during the field work, he mostly drove on country roads. We spent two days with Sven, which included almost five hours of driving each day. While phoning he used a car-mounted phone. He made three calls, and received three calls. We also recorded two additional calls he either made or received.

RESULTS

In the following sections we will give an account of the findings in the empirical work. Our field-work revealed a number of ways in which people adapt driving and phone conversations to each other. We were able to observe how they acted to situate calls to driving situations; how they favoured specific traffic situations for button pressing, and how they provided awareness of the traffic situation to non-present conversationalists to adapt the talk to the complexity of driving. We also saw how they used the mobile to manage their journeys, as well as ease the loneliness, by interacting with colleagues and family. We also saw how they transformed different kinds of work tasks to things that could be solved through talk in order to get the most out of the time spent in traffic. Finally, we saw how they occasionally just stopped the car to engage in conversations.

A decent place to talk

The participants in this study visibly favour a car in motion for phone conversations. People adapt their activities to make calls fit to driving. During our fieldwork we have seen many examples where they choose the car as a place for conversations. Despite the high number of cell phone calls, none of them seemed to be very problematic, or result in any inconveniences. The conversations continued while simultaneously handling the vehicle, i.e. manoeuvring in traffic.

During the fieldwork with Eric, we observed conversations where he explicitly said to a conversant that it is legitimate to talk while driving. Eric used a car-mounted phone, which made it possible to record both the conversationalists. Eric listened to a message on his voice-mail preceding the excerpt. He immediately returned the call to Hasse. Hasse started the conversation by answering the call from Eric who is driving:

Hasse: Sport Shop, Malmö, Hasse

Eric: hi Hasse Eric, sportproducts

Hasse: hi

Eric: how are you

Hasse: I'm fine

Eric: sounds good...

Hasse: ...will you be in the car for a while?

Eric: If I will be in the car for a while? yes, you can give me a call

Hasse: yes, I'll call youⁱ

Eric: sounds great.

Hasse: bye

Eric: bye

Excerpt 1

Hasse is busy and would rather speak later. This is expressed by asking if Eric will remain in the car for a while. Eric answers affirmatively, and adds that he will be available for a call. With this answer, he confirms that Hasse's question concerns whether he can talk on the phone more than if he is in the car or not. Further, being in the car is a convenient place to talk.

Thus, their conversation clearly shows how they act in ways in which the time spent in the car is also similar to the time available for incoming calls, i.e. telephone hours. The previous excerpt illustrates also how both the remote conversationalist and the driver relate to driving as appropriate for mobile talk.

Termination of talk when reaching the destination

The relation between termination of the calls and the journey also shows how the driving situation is seen as a good place to talk. In the following, Anders is talking in his handset. Thus, we have only recorded his part of the conversation. He is driving into the parking lot behind a large supermarket. As he approaches the destination he says:

yes, it's probably expensive...yeee now

I'm going to reverse to the loading

platform here..so..clear out yes yeah

he he he..have a ...got to...have a nice

time see ya bye

[He stops the lorry. Looks at the phone and locks it. He attaches it to his belt, and reverses to the loading platform.]

Excerpt 2

Anders co-ordinates his phone conversation to take place while the vehicle is rolling. The reference to the traffic situation is there to terminate the conversation. This is due to the work task of delivering food to shops and supermarkets. It is central in this work to save time and work as fast as possible. When working in the shops with delivering the goods, there is no time for talk. Consequently, the time in the car is available for other activities.

Summing up, the previous examples have shown that the cars are generally seen as a decent place to talk by the drivers as well as those making a call to a driver. It is favoured both by Eric driving on monotonous intercity roads as well as Anders who is driving in hectic driving situations of downtown Stockholm. The first excerpt nicely shows how both the driver, and the non-present conversationalist, orients themselves to the car as a legitimate place to talk. The second excerpt underscores this interpretation by showing an example where the conversationalist goes so far as to terminate the conversation when the journey comes to an end.

The car works very well as a place for mobile phone conversations. When and how they talk is adapted to their work tasks. The first example shows how the driver benefits from the time spent in the car. Driving the car gives him the possibility to perform other tasks, such as speaking with customers. The second example shows a case where the work task is much more focussed on working as fast as possible. Here, talking is seen as less disturbing to driving than work outside of the lorry.

Dividing attention

Laurier [2002b] notes that handling of a phone and handling of a car at the same time is a skill that resembles car driving in general, where the attention has to be divided between many activities. Still, the competent dividing of the attention when manoeuvring and making a call demands special skills, as is visible in the following example.

Anders is driving his lorry through downtown Stockholm, when he decides to make a call. He picks up his handset from the right-side pocket in his trousers. He starts to press the buttons on the phone and looks intermittently down at the phone and out through the wind-screen. He puts the hand on the steering wheel, lets the wheel go and continue to press the buttons. Then he puts the hand back on the wheel and shifts gears with the hand that is holding the phone. He continues to press buttons, and then makes another gearshift. He looks at the phone, and then swaps the hand that holds it. He puts the phone to his ear, and lets go of the wheel with his other hand and quickly touches his nose:

Hi...eee Jeff there [*inaudible*].Sam..Roland...
Sam then?

[He lets go of the wheel for a moment. Then puts his left elbow on it during some six seconds. He moves his right hand towards the gear shift lever. He leans back and grabs the wheel with the right hand]

he's got the same thing then...eee...okay

[hits the turn-signal and shifts gears Then he makes a lane-change.]

...mmm...twentyfife today..does he play in
...that's

[Hits the turn signal again, but unlocks it by putting his right arm through the steering wheel]

[*inaudible*]..burgers

[turns on the turn-signal, turns it off with his right hand]

you've not seen any playlist..you can only

see the gamedates..mmm..but you can't see
that either..it's just games tuesday..
wednesday and thursday...but there's nothing
there if he's playing..okay then I have to..
can't be all these days..it'll be game..
it's a series that is easier...it's two games
that are more difficult..you call me?
himself

But what do we do tomorrow?

what do we do tomorrow?..let's see
...how Sam is feeling then [*inaudible*]

no but I'm thinking whether you should
have had it on tuesday then it wouldn't
have been any idea if he's ill...mmmm...
yeah...see you tonight..good yes bye...

[He lets go off the wheel and scratches

with his right hand on his left chest. Then
he grabs the wheel again]

[Lets go of the wheel and puts his phone
with the right hand against the left ear. He
scratches himself on his head. Grabs the
wheel.]

[Switches the phone to the other
ear]

[Lowers the phone. Looks at it. Presses a
button. The lorry has been standing still in
a queue for a while, but now it starts to
move. He stops pressing the buttons.
Holds his right hand on the wheel together
with the phone. Shifts gears. Right
hand on the wheel takes the phone with
his left hand and puts it in the pocket]

Excerpt 3

This excerpt shows the skilful performance when dividing the attention between making a call; steering; hitting the turn signal; etc. It is one of those tacit skills that are hard to describe in text even though it is captured on the video recording. But the act of dividing the attention between the phone and the manoeuvring is an everyday thing, as are the dividing of attention between all the other small tasks that are going on when driving such as combining gearshifts; looking at the speedometer and looking out through the windscreen [Laurier, 2002b].

Further, there are other things going on in this excerpt. He let go of the steering wheel five times in this excerpt. But four of these occasions are not required to make the phone call and drive. Rather, he let go of the wheel to scratch himself and to be able to lean forward as to take something of a rest.

This excerpt underlines Laurier's interpretation of phone use as only one of several ways of dividing attention. In the other cases we also find similar examples, such as when Eric is plays with a pen on a number of occasions and when Paul folds a paper in a way resembling origami at the same time as he is driving. Making a call with a cell phone and driving is on the one hand a new phenomenon that originated with the new technology. On the other hand it is as old as the need to scratch yourself when you drive.

Adapting button pressing to driving

Making a call is an activity that calls for preparation. It involves a number of skills such as accessing a phone number and dialling that number, at the same time as manoeuvring the car. Our fieldwork reveals differences in the ways in which drivers adapt the preparations of conversations to driving.

Preparations in the proximity of a junction with traffic signals

Anders performs calls in highly complex traffic situations. He is a lorry driver working in the busy downtown region of Stockholm. He makes his calls on a handset phone. During our two-day visit in his lorry he made nine different calls. Our study reveals an interesting pattern as to how and when he makes these calls. It seems that calls are timed to coincide with traffic signals or intersections. Five of these calls were made when approaching, or having arrived, at an intersection with traffic lights.

In the following case, Anders makes a call when approaching an intersection in the crowded and narrow streets of downtown Stockholm. He hits the turn signal and then grabs the handset from his pocket. He presses the buttons to enter the phone number without looking out of the windscreen even once. He lifts the phone to his ear, and then looks carefully to the left and to the right. He has had no hands on the steering wheel. He shifts the gear with his right hand and the lorry makes the turn. He drops the right hand from the wheel and shifts the gear. He lowers the phone and looks at it. He puts it back to his ear and says

Howdy Adam, it was the daily
dose so you could make me a call
when you come into your room
...see ya ...bye

Excerpt 4

In the field study of Anders' phone use, there is a clear tendency to make an outgoing call when coming up to an intersection or traffic signals. As in this case, the choice of situation makes it easier to drop the hands from the steering wheel and dial the number without looking out of the windshield. As the lorry is standing still, he will not get into any trouble when he prepares for the conversation. Further, the preference for situations where the lorry is standing still is even more evident when considering that the traffic situation is the most complex in intersections where the paths of the vehicles intersect. Still he looks for an intersection to make a call.

It is also important to recognise that the intersection and the traffic signal do not necessarily provide him with an opportunity to stand still when dialling. On some occasions, he has already initiated the call before the lorry comes to a stop. On another occasion, the light turns green and the vehicle accelerates as he dials. Thus, Anders does not wait until the lorry stops before he makes a call. He is in no way dependent on that situation to establish a phone conversation. The intersection and the traffic signal is rather a resource, which occasionally makes his life easier.

Expected calls

Occasionally, Anders expects that an incoming call will arrive soon. It could be due to a preceding lost connection during a call. Only in these situations does he put down the phone on the chair between his legs and not in the ordinary place in his pocket or attached to the belt. This preparation is to easily be able to retrieve the phone and answer the call. Seeing that he uses this procedure only on occasions when he is expecting a call, and not as soon as he enters the vehicle, it does not seem to be the most convenient solution while driving.

Preparations before leaving

The initial step, necessary for becoming a mobile phone user on the roads, is the act of getting into the car. This is the opportunity for the driver to configure his environment, which will be his "mobile office" for the forthcoming minutes or hours. But this is also an opportunity for him to perform tasks which he otherwise would have done while driving. In the fieldwork on Eric, this procedure repeatedly took place each time he returned to the car, after having had a meeting with customers. Immediate after coming back, he started to configure the driver's environment. He put the phone back in the rack, turned it on, and meanwhile there was time to receive any SMS from his voice-

mail. Alternatively he immediately called his voice-mail, to check if there were any messages. This illustrates how he prepares, and benefit from a moment of being stationary. It also displays the similarities as in the case of Anders whose main task is performed outside the car, i.e. in the store. While in the car, other tasks are performed, preferably the ones which are possible by the use of the cell phone.

In conclusion, the driver has different ways to adapt the button pressing on the phone to the traffic situation. First, he looks for those moments in the journey when the vehicle is moving as slowly as possible. This is preferably when he comes up to a red traffic light or traffic circle with car standing still in his lane. But dialing is not restricted to stationary moments in traffic. Further, the placement of the hand-set varies according to the likelihood of an incoming call. Finally, the drivers plan for outgoing calls before starting the drive.

Adaptation through Traffic Talk

Occasionally, the traffic situation itself becomes a topic of conversation. This occurs most often in the conversations of Anders as he travels in the city centre of Stockholm. It happens eight times during fifteen recorded conversations. These comments were of two different kinds: to terminate calls (see section *Termination of talk when reaching the destination*) and to configure the focus of attention, which will be discussed in the following.

Providing remote awareness

The most common form of talk about traffic in Anders' conversations is conducted to provide the non-present participant with awareness of traffic situation. This occurs in situations that place demands upon the driver's attention in a way that refrains him from continuing the conversation as up to then.

In the following example, Anders has dialled a friend when approaching an intersection (see section *Preparations in the proximity of an intersection with traffic signals*). The call comes through as he makes a turn in the intersection, and we recorded his part of the conversation on the handset:

Hi man...what's up? ...No it got late yesterday ...I probably was home aaaa at eight something ..then Anita dropped by	[Anders puts on the indicator as we head into the junction]
...ha ha ha...yeah yeah it's sad...it's not possible to pass there.....exactly... yes they came in second...they lost in the final	[Quickly spins the wheel around] [Puts on the indicator to prepare for the turn taking in the next section]
...what was I about to say?...the sweaters.. the jacket..she got a blue XL but she wanted a black XL...yeah but it was no that she didn't... you said there was some colour that didn't exist...it doesn't?	[He holds a document in his left hand that holds the wheel. He quickly let go of the wheel as he hits the indicator]
...okay so there's no black..okay..yes I got the two last...	[Turns the wheel with the left hand]
...yeee....noo..what was I about to say? Eeee..yeah..yee	[Puts down the paper at his right side and switches the hand that holds the phone]
mmm yes yes	[gears up, takes up the paper with his right hand this time. Hits the indicator with the

	right hand, which requires that hereach through the wheel. Puts down the paper again]
...what was I about to say...	[long pause, makes the turn with the vehicle]
..I have to make sure to proceed cautiously I'm at Östermalm where it's so damned narrow	[sighs]
...but a medium blue	[gears up]
medium	[drives straight forward, shifts gear by letting the right hand drop from the wheel]
no but I don't have the energy for that...	
a medium blue..yes	

Excerpt 5

Anders performs the conversation as he manoeuvres through dense traffic on narrow streets. He even succeeds at holding a piece of paper in his hand, which is needed for the conversation. His voice is calm through the entire conversation. But as the traffic situation becomes more demanding, he conveys the trickiness of the situation to his conversational partner. He was supposed to turn left at an intersection, and had put on the turn signal. But as he started to make the turn he discovered that one of the cars was parked too close to the intersection. He tells the person in the phone "it's not possible to pass there". Directly thereafter he returns to the topic without changing the tone or the tempo of the conversation at the same time as he quickly spins the wheel around and finds his way back to the road where he came from.

In the following intersection, which also demands a lot of attention from the driver, the non-present speaker is provided with several conversational features that provide him with awareness of the situation. It starts when the tempo of his talk becomes slower revealing his hesitation. Then, he explicitly pauses the conversation twice by saying "what was I about to say?" Pausing the conversation, by making it explicit that he has to think, indicates that the conversational partner has to wait for Anders to resume the conversation. This gives him time to cope with the traffic situation. Finally, he topicalizes the situation by talking about the narrow streets in those particular parts of Stockholm "I have to make sure to proceed cautiously. I'm at Östermalm where it's so damned narrow [sighs]".

All these parts of the conversation conveyed the traffic situation to the person on the phone. Thus, the division of attention between driving and talking is facilitated by various conversational resources such as shift of tempo, turn taking and choice of topic. Further, the sequence of these resources can be seen as an escalation, which provides him with an increasing amount of control over the conversation to adapt it to the traffic situation.

Timing

The timing of the traffic talk is of importance. In the previous section, Anders had more or less time to provide the other person with these different clues. The first situation occurred rather quickly even though the vehicle was standing still. Thus, he got straight to the point as he said that it was "not possible to pass there". In the second case, the situation unfolded more slowly which was made clear to the non-present conversation partner by the escalation of comments. Occasionally the situation occurs suddenly, demanding his immediate attention. Then, there is no more time than to give a whistle as the demand for attention is coming up very fast. This is the case when Anders makes a turn and the lorry hits the curb-stone. He whistles before continuing the conversation.

Thus, even though there is no time to use the previously discussed conversational resources, he can make the non present conversationalist aware that he has to pay more attention to driving and less to talking for a while.

Reserving traffic talk for situations of adaptation

The importance of talk about traffic as a means to provide awareness of complex situation is underlined in the following example. Again, Anders is driving in the central parts of Stockholm talking on his handset:

...he he...does it work...where are you? [He stops at a red light and shifts the gear
with his left hand]
...we were just at Tomtebo Street...
we are in Vasastan here now so here
you get the creeps...no it's not so bad...

Excerpt 6

There is a pause just before Anders start to talk about his location. It is probably the other person who asks him where he is, as Anders himself asked where the other person was located. Thus, the location does not become a topic because he wants to provide awareness about a tricky traffic situation that requires his attention; even though he makes the claim that the situation gives him the creeps. He quickly withdraws that claim saying "it's not so bad". We interpret this statement as restricting the interpretation of the traffic claim to avoid the conversation partner acting in ways, which give Anders time to focus on traffic. Thus, Anders reserves traffic talk for situations requiring coordination of the phone conversation with traffic interaction.

Thus, the remote conversationalist has an awareness of the traffic situation although he is not present in the vehicle. The conversational resources that are described provide the non-present person with a means to understand both how much time that is needed by the driver as well as the urgency of the driver's attention towards the traffic situation.

Context Dependent Conversational Topics

The phone calls conducted during the journeys covered a wide variety of topics. The subjects covered both work-related and private issues. Consequently, many of these topics were discussed irrespective of the drivers' setting, but several exceptions occurred. In the following we introduce two categories of conversational topics that relate to the context of the driver.

Journey Planning

During the field study of Eric we noticed several examples of conversations, which related to his journey. While performing his work he usually turned up at the stores unannounced. This was the normal procedure for visiting his customers. However, on one occasion during the fieldwork, a customer requested that he call in advance of his next visit. She wanted an informal meeting. This advance planning did occur on several other occasions, e.g. when he held evening classes on his products. These classes were always arranged at least one week in advance, often more. Another task that had to be planned in advance was his daily accommodation. He travelled over a large area, and the final destination each day was problematic to predict. Several factors contributed to the uncertainty, such as the weather; traffic conditions; length of visits; problems with the car; etc. Hence, he could not be certain about the best place to stay. Consequently, the hotel-reservations could not be done too long in advance. The following excerpt illustrates the arrangement of accommodations. Eric dials a new number on his car-mounted phone. While waiting to be connected, he checks the display to see if he dialled the correct number. Then Caroline answers his call:

Caroline: welcome to Sunny Hotel,
Sorry for the delay
Eric: hi, my name is Eric Anderson
Caroline: hello
Eric: I think that someone has tried
to reach me

Caroline: ok, let's see
Eric: ok
Caroline: now I know why they have
tried to reach you...you have made a
reservation for tonight
Eric: that's right
Caroline: we 've miscalculated, and
we are overbooked, and we have
to...
Eric: yes
Caroline:...to another hotel...I've
made a reservation at another hotel
and I wonder if you could consider
staying there? you will of course re-
ceive compensation the next time
you visit us
Eric: which hotel are we talking
about?
Caroline: it's called Hilton, right
next to the railway station...I will
make sure that you receive your bo-
nus points
Eric: ok
Caroline: do you think you could
help me with this?
Eric: yes, or if you could call Brom-
stad to check out if they have any
rooms available
Caroline: of course
Eric: I'm between those cities, and I
will be in the vicinity tomorrow also
Caroline: I'll check Bromstad
Eric: check if Bromstad has any
rooms, then you call me back and
tell me where I am supposed to stay
tonight

Excerpt 7

In this case Eric calls an unknown number, since he missed an earlier call. It turns out that it is the hotel at which he has made a reservation for tonight. It turns out that a problem has arisen. The problem occurred when the hotel discovered its overbooking. Seeing that they are responsible for the inconvenience, they offer him a room at another hotel in the same city. As the opportunity arises, Erik asks for help making a reservation at a hotel in the same chain of hotels, but in another city. He is not yet finished with the customers in the current area, and needs to spend some extra time. The stores are just about to close and he must wait until tomorrow before continuing. Caroline agrees and promises to take care of it and call back to inform him of her progress. This call is followed up by two additional calls where the details of the reservation are discussed.

This excerpt shows one of several examples of a conversational topic that deals with the organisation of the driving itself, i.e. the planning of activities related to when and where he is going (see also Laurier, 2002a).

Sociability

Laurier's ethnography resembles our study in terms of the topics of the phone conversations. Most of the talk concerns work related matters, as discussed in other sections of this report. But there are also a significant number of conversations that clearly are about other things than getting the work done. First, as in the field studies of Laurier, the conversations with colleagues are a form of sociability, and concern e.g. family life. In this case Anders has just received a call from his boss, as a return of a call that Anders made earlier. He responds on his handset by saying:

...is it the daily dose? Yes now it works okay...noo..yes..yes...that works fine..we will be ready..will go down to...if it's urgent? no no ...just was killing some time

Excerpt 8

His boss asks him to account for the reason why he called initially. There is of course the formal reason. Anders should report once per day that's why he says "the daily dose". But he also claims that he wants to talk because he is bored and lonely and want to talk i.e. he was just "killing some time." Second, the drivers also make calls to non-colleagues e.g. to arrange family practicalities. In both cases, the mobile phone makes their work situation less lonely.

To summarize, we have presented two types of contextual dependency in the conversations. The first one concerns the advance planning of accommodations, a task with an essential geographical connection. The second excerpt illustrates another view of the relationship between context and phone calls. Seeing that he spends a lot of time alone in his truck, he calls a colleague just to talk.

Linking Conversations

Even if it is possible to perform office-work while driving [Laurier, 2002b] we have seen examples on their attempts to decrease this kind of activities. A legible strategy to handle the complexity is to link conversations, that is to handle work tasks introduced in a call, by directly making additional calls. At least fourteen of the recorded calls performed by Eric can be categorized in this way, such as the previous call when he talks to Matte using the car-mounted phone:

Eric: I'll call immediately

Matte: super

Eric: bye.

[We have stopped at the traffic light, with a few cars in front of us. Eric hangs up and dials a new number.]

Answering machine: welcome to Sportproducts

...many people are calling at the moment

Rebecca: yes

[interrupts the answering machine]

Eric: super

Rebecca: yes

Eric: I have a panic-order to the Sport Shop in Göteborg

Rebecca: calm down

Eric: I'm in a panic...send the stuff

Excerpt 9

In this case, he promises to take care of an order while speaking with Matte at a store. Due to the relationship he has to his customers and his routine visits, they prefer to call him when making their orders instead of calling directly to the office. He ends the conversation by saying that he will call at once. The remote party accepts this as a confirmation that Eric will take care of the task. Immediately after hanging up, he benefits from the stop at a traffic light and dials the number to the office. He asks them to deliver the goods as soon as possible. This procedure is an obvious strategy to avoid the paper work, since otherwise he would have had to fill out an order form. When performing the tasks immediately, i.e. linking conversations, he only needs to memorize the details for a short period of time. This was also observable in the fieldwork on Anders in his lorry. Two of the calls he made were directly preceded by incoming calls.

By directly linking conversations they both solve the problem of lacking the possibility to do office tasks such as writing notes and documents, scheduling etc. They adapt to the driving situation by delegating that sort of work to somebody else. But this adaptive behaviour generates additional conversations as compared to a non-driving situation where they could have taken care of the task themselves.

Standing still as a Resource

The study has so far concerned how the driver adapts phone use to the activities demanded by the movement through traffic. This is of course directly relevant from a safety perspective. However, a fundamental resource for the driver is to do things in the car when it is standing still. We will in the following discuss phone talk in relation to stopping, parking, and starting the car.

Initiations of calls before starting

In the following case Eric initiates a call while the car is standing still. But as soon as he has dialled he starts to drive. After having visited the store, we are back at the parking lot. As usual, Eric has mounted his mobile phone in the rack on the dashboard, and has already dialled a number. While hearing the tone, he looks in the catalogue, which he used to find the number. Before he receives an answer, he puts the catalogue back between the two front seats. He fastens the seatbelt and starts the windscreen wipers. Still no answer. He turns his head so he easily can back out of the parking lot. The ringing from the phone continues, without an answer. He grabs the steering wheel with both his hands and starts to drive towards the exit.

This is a strategy, which we observed on eight occasions during the field study with Eric. He utilized the brief moment of being stationary to look for the number and to dial. Thereafter he can focus on driving the car. Since he is using a car-mounted phone he does not need to perform any manipulations to handle the call, except hanging up.

Making a stop during a conversation

In some cases the drivers choose to stop their cars in the middle of a conversation, or in advance of making a call. This occurs a number of times in the field study of Peter, a manager of construction work in district heating.

Peter starts to drive away but remembers that he has to make a call. He stops the car and dials the number. He starts to drive again, less than ten meters before he engages in a cell phone conversation. He stops the car and pursues the conversation. When it is terminated he accelerates, but only to stop again when he remembers to make another work-oriented call.

Peter has the responsibility for a number of sites located in the central parts of Stockholm. He has to visit these sites to see that the work is going smoothly. Thus, he is not as focused on the fast movement of the vehicle as the lorry drivers in our study. He is also able to talk in the phone when out of the car. Thus, making a stop is an appealing option for him to facilitate phone conversation.

This behaviour is also visible in Sven's conversations. He makes and a total of eight calls during one and a half workdays of driving. On one occasion he makes a call while standing still at a location, which is of interest for his work task. In two of the calls, he halts the car a bit into the conversation. In both cases he immediately grabs a piece of paper; a hard cover, and a pencil, as he continues to talk. This tendency to stop the car to talk seems to be related both to his work task and the traffic situation. First, as a manager of telecom operations his task involves planning of work over a vast region. He has to travel to visit the sites, but he is also responsible for administrative work such as scheduling meetings and interpreting documents. Thus, paper work is important for his job. Second, the rural setting, with almost empty roads, makes it easy to park the car.

SUMMARY

The result of our field-work reveals a practice where the drivers adapt their driving and mobile phone conversations to each other:

- Their conversation clearly shows how they act in ways which equate time spent in the car with time available for incoming calls, i.e. telephone hours.
- The specific decisions regarding their use of phones are influenced by their work tasks.
- The excerpt also illustrates how both the remote conversationalist and the driver relate to driving as an appropriate setting for mobile talk.
- The act of dividing one's attention between the phone and the driving is an everyday thing, just like the division of attention between all the other small tasks that are going on when driving such as shifting gears, looking at the speedometer, looking out through the windscreen and scratching oneself.
- Making a call is an activity that requires preparation. It involves a number of skills such as accessing a phone number and dialling that number, at the same time as manoeuvring the car. The driver adapts to the traffic situation and look for those moments in the journey when the vehicle is moving as slowly as possible. This is preferably when he comes up to a traffic light showing red or a crowded traffic circle. Further, the placement of the handset depends on the likeliness of an incoming call. Finally, the drivers plan for outgoing calls before starting the drive.
- The traffic situation is conveyed to the non-present person in the phone. Thus, the attention to driving and talking is coordinated by different conversational resources such as shift of tempo, turn taking and choice of topic. The sequence of these resources, as well as they way in which the traffic is accounted for, make the non present conversationalist aware of the traffic situation. Thus, they can collaboratively converse in a way that is adapted to the traffic.
- Two conversational topics are generated by the driving situation per se. First, travelling along the roads raises a demand to plan activities after the trip, when conditions change and the expected travel time has to be reconsidered. Second, the loneliness generated by the isolation of the car calls for conversation to socialize.
- The drivers conducted office work in their cars. It is possible to handle those issues that should be solved by phone conversations as if the driver would have been at the office. But the driver also takes care of tasks by making an additional call, which in an office situation would have been handled by traditional paper work. This is observable in the linking of conversations.

CONCLUSION AND FUTURE WORK

The result of our study has significance for previous investigations. Goodman et al suggests that the difference between the number of accidents predicted by the experimental studies and the actual figures derived from crash data analysis, derives from compensatory behaviour by the drivers. Our study reveals a broad range of behaviours, which occur as adaptation, or compensation, for the demands required both to drive and to talk. The drivers do not just pursue their mobile conversation unaffected by the traffic situation. Instead they make the situation as smooth as possible. Thus, the remainder could very well be generated by the efforts made by the driver to make the talk as safe as possible.

We have seen a number of examples where the drivers make calls in specific situations such as when approaching traffic signals. This is a parallel to the observation made by Eric Laurier when the drivers took out documents etc only when they found themselves in a traffic queue on a motorway. But our observation differs in an important way. The red light is not in any way a precondition for their activities. It is rather a weak resource. Calling could be done when approaching a place where the car might come to a stop, rather than choosing a place where this is less likely. But the traffic situation does not decide what the driver could do. This is important when considering possible design implications of the study. It is easy to imagine a system which only allows the driver to engage in button pressing where the conditions resemble those that the driver looks for, e.g. a traffic light showing red. But this could be very disturbing for the driver who does not act and think of these situations as so determined for phone calls.

Finally, our result also has an implication for Manalavan et al and their emerging research in the CHI-community. They suggested, in contrast to other researchers, that conversations between present conversationalists were safer than talk between a driver and a non-present conversationalist. This is due to the latter talker's lack of awareness of the traffic situation. But we found a number of examples in the conversation taking place in crowded and narrow streets where the non present conversationalist were provided with resources to understand the traffic situation. Thus, the conversationalists could collectively adapt to the road context. They adapt their conversation to traffic. This finding supports the earlier research (Goodman, 1999) where no difference is seen between these two conversational types. Again, the role of adaptation should not be underestimated.

Finally, the way in which people do their phoning will change with the development of the cell phones themselves. It is important to recognise that the number of calls is not a constant when considering legislation demanding hands free to make these calls potentially safer. As noted by Goodman (1991) technical support that makes phoning easier could lead to drivers calling more. This phenomenon can escalate with the possibility to link calls, i.e. transforming office tasks to conversations. Car mounted phones makes it easier to handle the phone, but the problem of handling other tools such as calendars and documents is not solved. Thus, to use the phone it is essential to transform these activities to talk, which increase the amount of conversations.

Field-work methodology, supported by video recordings, has much to offer when understanding how drivers engage with their phones. But the methodology and the topic have to be developed further. We need more accurate video recordings to be able to analyze the relation between the traffic situation and the driver better. We also need a broader documentation of the drivers' activities, e.g. handling of car stereo, to understand the role of the mobile phone. It would be especially interesting to compare adaptation to traffic between co-located and remote conversationalists.

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