Drivers using mobile phones in traffic: An ethnographic study of interactional adaptation

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Abstract. Mobile phone use in cars is a highly debated issue. Legislation and policy discussions flourish in many countries and coincide with an increased effort in design of new in-car technologies. The studies which influence policy and design decisions use experimental approaches and are based on a cognitive perspective. In this paper, we discuss why this is a problematic approach. Further, we provide data and initial results from an ethnographic study of mobile phone use in traffic, where the aim is to investigate the 'interactional adaptation' by which the driver fit the involvement with the phone with driving and vice versa. By taking part of drivers' daily work, and video recording their activities of driving and handling the mobile phone, we are able to reveal details which we believe could not be found in experimental studies with a constructed setup. We end with a discussion of the benefits of this method and how it can be developed further.

1 Introduction

In recent years, handsfree systems, and car-mounted systems, have become commonplace to support mobile phone conversations in cars. These systems are motivated in terms of traffic safety, in comparison to the mere use of handheld phones to make and receive calls while driving. The safety of mobile phoning whilst driving has become a central topic in the public debate and among legislators. It has been subject to legislation in many countries around the world (McEvoy et al., 2005). Despite legislations, observational studies reveal that phones are still being used in cars (McD Taylor, Bennet, Carter and Garewal, 2003; Johal, Napier, Britt-Compton and Marshall, 2005).

The fact that people talk while driving, and the safety problems this might infer, has received a significant amount of attention from researchers. As early as 1969, well before the widespread use of mobile phones, a psychological study aimed at understanding the effect telephoning had on driving, was published (Brown, Tickner and Simmonds, 1969). Drivers were given logical problems which they needed to respond to over a telephone connection, while driving a car. Since then, numerous studies using similar cognitive perspectives have been presented. (e.g. McKnight and McKnight, 1993; Manalavan, Samar, Schneider, Kiesler and Siewiorek, 2002; Alm and Nilsson, 1995; Fairclough, Ashby, Ross and Parkes, 1991; Reed and Green, 1999; Brookhuis, de Vries and de Waard, 1991). The topic has been addressed using controlled experiments where the driver takes part in staged conversations. The studies support arguments that

mobile phone use dramatically increases the cognitive load of the driver, which multiply the risks for accidents. The increase on drivers' attention is either explained by the need to handle the phone device per se, or by the demand to handle the conversation.

However, we argue that these conclusions are based on theoretical and methodological assumptions that are questionable from a sociological approach. *First*, traffic safety and mobile phone use is approached from a cognitive perspective. We argue that safe driving is not only about the responsibility for the individual driver. Traffic is a social activity (Juhlin, 1999) where risks are handled in collaboration. Mobile phone talk is a social activity taking place in this context. *Second*, safety is not only a concept which draws upon traffic theory and research. It is of practical and everyday concern for drivers, and as such has to be investigated in real use situations. *Third*, the emphasis to control the data collection in earlier research has raised concerns about the validity of these experiments (Goodman, Tijerina, Bents and Wierwille, 1999). "The relationship between the intelligence test Q&A dialogues and the content of normal cellular communication is unknown. […] A better understanding of the nature of actual cellular telephone communications in business and private calls is sorely needed." (ibid.).

In this paper, we approach the problem of mobile phone use in cars from a perspective which is different from what is applied in previous work. By using an ethnographic approach, and study naturally occurring mobile phone use in cars, we can learn new things about how drivers fit mobile phone use with 'car use', to accomplish safe driving. Similar to the topic in the experimental studies, we focus

particularly on the use of the phone alongside the manoeuvring of the car. Further, we specifically focus on the unfolding moment-by-moment activities when driving in complex traffic situations, where the demand on the driver to manoeuvre and coordinate the movement with others is high. The detailed level of the analysis provides insights on how this 'work' is concurrently and collaboratively organised. We show how the drivers rely on a number of resources to adapt talk to the driving situation. First, we show that the traffic situation is made visible in the phone conversation. This is done when the traffic situation becomes more complex, and the driver puts increased focus on the manoeuvring of the car. Second, drivers adjust their phone handling to collaboration in traffic. We call these strategies, by which the driver fit the involvement with the phone with the driving and vice versa, *interactional adaptation*. Interactional adaptation includes both interaction with people in the immediate surrounding and with the remote people on the phone, as well as interaction with the technologies at hand such as the car and the phone. We discuss how the ethnographic approach is crucial to understand driving and mobile phone use in context. We end with a discussion of the benefits and limitations of using this method to understanding mobile phone use and driving.

2 Background

Driving a vehicle in traffic is a collaborative and social activity, since drivers have to share the road space with others (Juhlin, 1999). Collaboration is essential when two drivers compete for the same part of the road. Disagreements may lead to crashes and accidents, whereas successful coordination provides a specific order in which the drivers can move forward. In order to establish a functioning collaboration, routines and rules are used as resources. Formal rules are provided and sanctioned primarily through the work of the authorities. Coordination also depends on informal rules (Dannefer, 1977), which are ongoingly interpreted by road users depending on the situation, and in negotiation with other drivers (Juhlin, 1999). The social character of traffic is also visible in the way a specific decision on the use of the road space is morally accountable. Some decisions by a driver are visibly supported by other drivers, whereas other decisions are equally visibly disliked.

Previous studies of driver support systems in general, and mobile phones in specific, are based on experimental setups. In the following, we give an account of a number of such studies, and finish off by summarising why this is a problematic approach.

Driving and mobile phone handling has been extensively studied in traffic psychology, and the policy discussion is influenced by the results in this field. An overwhelming majority of the studies on safety issues on mobile phone use while driving are performed as controlled experiments, either in driving simulators

(McKnight and McKnight, 1993; Manalavan et al., 2002; Alm and Nilsson, 1994; 1995), or in more realistic settings, i.e. 'on-the-road' studies (Fairclough et al., 1991; Reed and Green, 1999; Brookhuis, et al., 1991). The drivers are exposed to traffic situations as they use the mobile phone. A controlled secondary task is introduced, to produce measurable differences depending on variations in phone use or traffic situations. Some studies concern the effects of making a call, i.e. dialling while driving (Reed and Green, 1999), whereas others concern the impact of the conversation per se.

Conversations are staged in two different forms. First, the majority of conversations concern mathematical tests, where the driver has to solve various algebraic problems. For example in studies presented by Alm and Nilsson the drivers interact with a tape-recorder, which provides pre-recorded queries to be solved (Alm and Nilsson, 1994; 1995). Brookhuis et al. (1991) provide the driver with mathematical problems as well as do Kircher et al. (2003). In Serafin, Wen, Paelke and Green (1993), the driver converses with a computer. There are also studies which include drivers engaged in casual conversations, e.g. on what to do next time off or about TV shows (Svenson and Patten, 2003). Both types of conversations have impact on the drivers' traffic behaviour, even though casual conversation to a lesser extent.

A number of 'compensatory behaviours', whereby drivers adapt to make phone use safer, have also been identified. Drivers attempt to compensate for the attention deficit during a mobile conversation, e.g. by slowing down (NTHSA, 1997; Goodman et al., 1999; Fairclough et al., 1991; Alm and Nilsson, 1994). Similarly, Kircher et al. (2003) report that drivers place their phones on the wheel

when dialling, which makes it easier to look forward and on the phone almost at the same time. Further, the studies recognise that people make calls before starting, or stop the car for outgoing calls. Still, the researchers claim that: ”compensation cannot be expected to be sufficiently strong to outweigh the decrease in driving performance accompanying a mobile phone conversation – in particular in sudden critical traffic situations” (Svenson and Patten, 2003). But their interpretation of the risks at stake is made even more uncertain when recognizing available crash data, which in some sense should reflect actual accidents where mobile phone has been the cause. Crash data analysis suggests that the number of crashes that may be attributed to mobile phone use is much smaller than would be predicted in a statistical model based upon driver inattention factors (NHTSA, 1997). The second major crash data study made in the UK came to a similar conclusion. Here, mobile phone use is only one of several ‘distractions’ which in general is present in 2-6% of the reported accidents (Svenson and Patten, 2003). Two epidemiological studies from 1997 and 2005 present figures comparable to the top range of the results from the crash data analysis (McEvoy, et al. 2005; Redelmeier and Tibshirani, 1997). Both studies were conducted through analysis of phone billing records from drivers involved in car crashes. The rate of phone use in a specified time span in proximity to the crash was compared to the use rate at control intervals, of 24 hours, 72 hours and 7 days before the crash. Both studies came to the conclusion that there was a fourfold increase in the relative risk of an accident if the person was using the phone. McEvoy et al. reports that 9% of drivers used the phone during the hazard interval, whereas only 3 % used it in the control period.

Traffic researchers such as Svenson and Patten (2003) interpret the figure from the crash data analysis as a major difference vis-à-vis the controlled experiments, which point to higher figures than reported from actual crashes. This could be explained either as a result of insufficient crash data, or inadequately designed experiments. Svenson and Patten (2003) blame crash data analysis saying that "epidemiological post hoc data are always difficult to interpret", and that the UK "numbers quite likely underestimate the true figures" (ibid., p. 7).

Another possible explanation is that the experiments are insufficiently valid. First, the type of staged conversations, interacting with a tape-recorder providing pre-recorded queries or mathematical problems to be solved, must be quite rare in traffic. Second, the driving situation is far from realistic when performed in a driving simulator. The collaboration with other road users is restricted, and the drivers do not need to consider potential risks of their driving behaviour. Third, irrespective of whether the experiment is done in traffic or in a driving simulator, the driver is forced to use the mobile phone. Accordingly, the test-subject cannot fully adapt his behaviour, regarding the timing of mobile phone use in relation to the traffic situation.

Drawing upon the work of social science methods such as ethnography, ethnomethodology and conversation analysis, we argue the need to consider this activity in its proper context. In a commentary on mobile phone research, Schegloff, one of the founders of conversation analysis, emphasizes the importance of studying new technology in its context of use:

> "For the many who appeal to other sorts of data to ground their inquiries, let me just suggest again the long-term pay offs of setting new technological inventions in the proper context, an

> analytically conceived context. For they are like naturalistic versions of experimental stimuli: given precise analytic characterizations of the field into which they are introduced, their effect can be revelatory. Examined as objects in their own right, they may yield only noise." (Schegloff, 2002, p. 298)

Hence, in line with Schegloff's arguments this concerns the study of mobile phone use while being in traffic. We advocate the benefits of studying driving and mobile phone using observational ethnographic methods, where these activities are everyday concerns of a driver. This is in line with ethnomethodologically inspired ethnography. Ethnomethodology has been taken up into the design related disciplines (e.g. Computer Supported Cooperative Work and Human Computer Interaction) for its strength to show the ways in which social organization of work is an ongoing practical accomplishment by the members of the setting. This is a useful approach when trying to grasp the activity, since it will reveal the moment-by-moment organization of adaptation including temporal aspects. Such thick descriptions can be useful resources when thinking about design and deployment of new technologies.

An example, if not the *only* previous example, of such an approach to driving and phone use, is Laurier and Philo's investigation of the adaptive behaviour of drivers (Laurier and Philo, 1998). In their studies of the office work taking place in cars, they argue that when people engage in doing other things than driving this is integrated into the driving task in the same manner as the manoeuvring depends on moment-by-moment coordination in a contingent situation. Combining driving and office work is not so new and obscure that we initially imagine (ibid.). It is

combined in the same manner as we coordinate e.g. looking through windscreen and the rear mirror:

> "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 and Philo, 1998).

Further, they argue that the attention put to office work, such as reading documents, is always secondary to driving, and takes place when the car is moving slowly as traffic is queuing up on motorways. In these situations, some of the mobile workers bring forth their paper documents and even their laptops. According to Laurier and Philo, fast moving traffic and traffic in smaller cities, precludes this type of work. From studies such as this, we can gain an increased understanding of the role of the conversation and the resources available to fit talk to traffic.

However, ethnographic studies have a number of limitations. The main critique concern how an: "ethnographic study of a single, small-scale setting (or of a small number of such settings), at a particular point in time can have relevance for a wide audience" (Hammersley, 1992, p. 5). We acknowledge that this critique is highly relevant, and must be accounted for, in this context where studies are claimed to represent large user groups, and the consequences of those claims affect the safety of people.

3 Method and data collection

We have been studying drivers by sitting in the front passenger seat, observing and video recording their activities. The data collection took place during 2002. Motivated by the increasing proportion of commercial drivers on the roads, which currently reaches approximately 25% in the Stockholm region [SOU, 2003], we choose to follow four drivers working with sales and delivery. The decision was further motivated by the lack of detailed ethnographic studies either on how private drivers handle mobile phones in traffic, nor how commercial drivers do. Hence, in line with Sacks' arguments on choosing a topic for exploration: "one gets started where you can maybe get somewhere" [Sacks in Silverman, 1998, p. 72], the group of professional drivers provides an advantageous case for an exploratory study. Further, professional drivers were chosen since availability is an important aspect of their everyday work. They spend a considerable amount of time in their vehicles, and handle their mobile phone conversations while being in traffic. In average, mobile phone use while driving reaches approximately 8% [Glassbrenner, 2005], and the frequency of interactional adaptation should be seen in light of this number. However, the choice of professional drivers increased the likeliness for us to observe and video record conversations and driving in a natural setting. The participants agreed on being recorded, and we promised to present them in a way that maintains their anonymity. They were also requested to inform us if they wanted a recorded conversation to be deleted. For an overview of the people studied, see table 1.

Table 1. The participants in the study.

- *Anders* works as a lorry driver, delivering food to supermarkets in the Stockholm area. He used two handheld phones: one for work calls and one for private calls. During the three days we were studying him, we recorded ten outgoing calls and five incoming.
- *Paul* works as a manager for a group of salespeople at the same company as Anders. He shared his time between the office, and meetings at the stores. During the one-day fieldwork, he used a hands-free phone. In our recordings from the fieldwork on Paul we have eight calls.
- *Eric* works as a salesman who travels over a vast geographical area. He used his car both as a means of transportation, but also as a mobile office. He is responsible for the display of his products at the stores, and for the logistics. In our recordings from our three days of fieldwork, we have in total sixty-four calls, most of them performed on his car-mounted phone.
- *Sven* works as a manager at a company responsible for telecommunications infrastructure. He drives to visit different sites in a large region to organize their work tasks. As a consequence, during the fieldwork, he mostly drove on country roads. We spent two days with Sven. While phoning he used a car-mounted phone. During the fieldwork, we recorded eight calls.

In total, the study generated a substantial body of recordings. We collected a corpus of 95 phone calls. After sorting out the missed calls, resulting in messages in the voice mail, we reached 74 conversations, all of them performed while seated in the vehicle. However, numerous other mobile phone conversations were observed during the fieldwork, unfortunately several of them were not recorded

due to technical reasons. The analysis presented in this paper relies on the whole empirical corpus, the recordings as well as our ethnographic observations.

We video recorded different perspectives of the activities in the car and the traffic situation, by sitting in the front passenger seat and using a single handheld video camera. We altered between recording inside the car and the traffic situation outside. Hence, the role of the researcher was to observe and record the activities around driving and making mobile phone calls. However, the video recordings show only some part of the visual details that demand the drivers' attention in every situation. Thus, in this study, the video camera was not a way of collecting a comprehensive collection of visual data. Rather it was a tool which provided more data than only field notes or audio recordings. In the data from Anders, only one part of the conversation was accessible to us, as he used a handheld phone.

Video recorders are increasingly used to collect data during HCI studies (Hindmarsh et al, 2002). However, there is, as of yet, no common standard for transcribing video recordings similar to the coding schemes used in conversation analysis (Heath and Hindmarsh, 2002). Consequently, we have developed a coding scheme that accounts for the details of the drivers' activities of relevance for this study. The recordings have been transcribed and categorised. When analyzing the data a set of themes emerged, with reoccurrences of different forms of interactional adaptation. The transcription notations are adapted from Jefferson (1985), as related in Atkinson and Heritage (1985, p. ix-xvi).

4 Initial findings on interactional adaptation

The empirical data suggest a number of ways in which people adapt driving and phone use to each other. During the fieldwork, we were able to observe how drivers acted to situate calls to the driving; how they preferred specific traffic situations for handling the device, and how they provided awareness of the traffic situation to the non-present conversational partner to adapt the talk to the complexity of driving. We use the term interactional adaptation, rather than a cognitivistic oriented concept such as 'compensatory behaviour', to make visible the social dimension of that work. The activities we have observed are done in and through collaboration with other people. First, traffic is a social place where people negotiate right of way by use of e.g. rules interpreted in particular situations. Second, phone conversation depend on constant negotiation e.g. on rights of turns.

The participants in the study evidently consider the car as an appropriate place for mobile phone conversations, irrespective if they are driving in 110 km/h on a highway or through dense city traffic. In a majority of the recorded conversations, the mobile phone use takes place while driving. The choice of the driving situation, and consequently the car, as a suitable place for conversation is evident both in how they are using the phone, and in the conversations.

4.1 Making the traffic situation visible in the phone conversation

We identified five calls where various forms of conversational cues were provided to the remote conversationalist as a way of interactional adaptation. Sven used conversational cues in a simple traffic situation. This was done at one occasion when bringing forth pen and paper to take notes during the conversation simultaneously as driving. Anders conducted four of these in complex traffic situations. In the following we will in detail analyse one of these occasions.

When the traffic situation became more complex, and Anders needed to focus more on the manoeuvring of the car in order to ensure safe driving, he made the traffic situation available in the phone conversation. Accordingly, when more attention is demanded on the traffic, conversational strategies are used to keep the conversations going with minimal contribution from the driver.

In the following two excerpts from the same phone conversation, presented in the sequence they occur, problematic traffic situations are made visible in the talk. In the first part, Anders is about to make a left turn, but is hindered by a construction work. In the second part he comments on the narrow street which, as he states, forces him to focus on driving.

Time	Conversation	Car	Traffic situation	Pictures
01:26	And then (..)Yeah I was probably home around eight and then Ulla came over		The car in front overtakes a cyclist, by driving on the "wrong" side of the street.	
	(2.3)			
01:31		Hits the turn signal, to indicate a left turn at the		

		intersection/traffic light.		
01:32	He he he. (.) hehe		The white car in front of him turns left at the intersection. A number of orange road signs indicate a construction work, and a backhoe loader is partly blocking the street.	
	(2.7)			
01:35		Slows down to make the left turn.	Several orange signs on the left side of the street.	
01:37	Yes yes yes it's sad there I couldn't drive			
	(3.6)			
01:38		Turns off the turn signal indicating left turn.	The traffic light turns yellow. The distance to the cars in front increases, as they accelerate.	
01:43	Exactly	Shifts gear with his right hand.	The street is still narrow, with cars parked along the right side.	

Excerpt 1: Anders provides the remote conversationalist with awareness of the traffic situation.

As Anders prepares to turn left, he discovers the construction work on the street making it impossible for his large truck to pass. The complicated situation is introduced in the conversation as he says: "there I couldn't drive" (01:37). This is delivered in the same tone of voice and tempo as the talk preceding it. There is no pause after the previous statement ("it's sad"). Although we cannot see the consequence of this utterance, since we do not have access to the other end of the conversation, it is noteworthy how smoothly he comments on the traffic. It is as if he is conveying that there are some concerns, but it is not a big deal that needs to take more space in the conversation. Still, he could change his focus of attention a

bit by making the tricky situation available for his conversational partner. Making the problematic situation visible in the conversation allows him to continue the conversation but without continuing on the previous topic, by switching to talking about traffic.

Also, it is noteworthy that this is the first time in this particular phone call that it becomes evident from *the talk* that Anders is driving while having this conversation. There has been no explicit mentioning of the fact that Anders is in the car. However, it might be that the person in the other end can expect this because of traffic noise in the background. Having missed the left turn, we can assume that he needs to figure out how to reach his destination, at the same time as he is talking. The reference to the traffic situation is then a resource that makes the remote conversational partner prepared for on-coming difficulties.

Anders and his co-conversationalist then get to the reason for the call. This part of the conversation is left out in the transcript below. Anders has helped a friend to sell sweaters, and now there has been a mistake. A woman has received a blue sweater instead of a black. When we come back into the conversation, they have just agreed that there is no black sweater in XL.

Time	**Conversation**	**Car**	**Traffic situation**	**Pictures**
02:43	What was I going to say:: eh:::	Turns left. Using his left hand, in which he also holds his phone book.		
	(2.7)			
02:47	Yes yes yes::			
	(4.4)			

02:51		As soon as he drives straight on the street, he lets go of his phone book. Throws it on the seat to the right. He lets go of the steering wheel, and takes the phone in his left hand.		
02:54	Yes	Changes gear with his right hand. Takes the phonebook with his right hand.		
	(2.7)			
02:57	Yes yes, yes	Hits the turn signal with his right hand, through the steering wheel, while holding the phone book.		
	(4.1)			
03:00	What was I going to say::::	Puts the phone book back on the seat. Takes the steering wheel with his right hand. Looks to the left in the intersection before turning right.	Decreases the speed. There is a car to the left, who lets him pass.	
	(5.5)			
03:06	°I have to keep my tongue in the middle of my mouth° ((idiomatic expression: I have to be careful))	Looks to the right while making a right turn onto a bigger street.		
	(3.8)			
03:11	I'm at Västermalm where it's so damn narrow			
	(2.8)			
03:16	What was I +	Lets go of the steering wheel with his right hand, scratches his right ear.		

	(1.2)			
03:18	No but a medium <u>blue</u>	Moves his right hand back to the steering wheel, but immediately moves it to the gear stick. Changes gear. Looks to the left in the intersection.	Slows down before passing the intersection. Continues straight ahead.	

Excerpt 2: Anders keeps the conversation running while handling the complex traffic situation.

Here Anders is busy handling his phone, his phone book, the steering wheel, and the turn signal. During these activities, his contribution to the conversation is reduced. Two times he says "What was I going to say" (02:43 and 03:00), but without getting to what he was going to say. This sentence, along with the repeated use of "yes", is a way to fulfil his obligation in the conversation, i.e. to provide some material for each turn, without providing any new information. These strategies give him more time to focus on the traffic situation, and less on the conversation. Still, he does not have to engage in explaining to the conversational partner what is happening.

He also has the opportunity to make the problematic traffic situation a topic of the conversation. When traffic forces him to leave the current topic, he explains why: "I have to be careful" (03:06). This displays a current problem. He then explains what sort of problem this is, i.e. that he is driving in a particular part of the city where the streets are narrow: "I'm at Västermalm where it's so damn narrow" (03:11).

Perhaps this explicit reference to the fact that he has a complex traffic situation is a way to account for why he has not been more active in the conversation. Another "what was I going to say" would not be appropriate. This time he has to

come up with an explanation. By explicitly referring to the traffic situation he explains his rather passive contribution to the conversation, at the same time as he again makes the remote conversationalist aware of his need to focus on traffic.

Summing up, there are various ways in which the conversation *per se* could be used to provide the non-present conversationalist with an understanding of the traffic situation, or just allow the driver to focus on traffic. The shift of attention between driving and talking is interactionally adapted using different conversational resources. This aspect of mobile phone talk has hitherto not been studied in traffic research. It is apparent from the conversation that he is not just doing talking on the mobile phone; rather he is doing talking on the phone while driving.

4.2 Adapting phone handling to collaboration in traffic

We identified eight cases where calls were initiated in conjunction with traffic signals or in proximity of junctions or roundabouts with other traffic. The driver has different opportunities to fit the phone handling with his pressing concern for the manoeuvring of the vehicle and coordination with surrounding drivers, to increase safety. The intensity of the traffic situation, and the complexity of the manoeuvring, varies during a journey. Our findings support the hypothesis made in previous research that drivers actively make use of these variations when engaging in other tasks than driving. Laurier (2002) has shown that slow moving traffic, and especially car queues on motorways, were chosen as suitable situations for office work. Further, Svenson and Patten (2003) suggest that drivers choose suitable traffic situations when they make calls. Such activities frequently occurred in our study.

In the following we will examine a situation where Anders makes a call when driving in the city centre. The excerpt shows the way in which he adapts the manoeuvring of the vehicle, with attention to the traffic, to the making of a call. When we enter the conversation, Anders drives his lorry towards a roundabout and decreases the speed. As the vehicle comes to a stop, he brings out his phone and starts to make a call.

Time	Conversation	Car	Traffic situation	Pictures
00:04	**Anders:** Normally he calls	Slowing down to full stop. Holds the phone in his left hand, and moves his right hand from the gear lever to	Approaching a roundabout.	

		the phone. Looks down on the device.		
00:05	**Observer:** hehehe			
	(2.5)			
00:07	**Anders:** You ( )	Looks up, and puts his right hand back on the gear level.		
	(10.6)			
00:08			A cycling postman appears on the pavement on the left i.e. the other side of the street going towards the roundabout.	
00:10		Looks at the phone again, and presses some buttons with his left hand.	Heavy traffic in the roundabout	
00:11			Two pedestrians cross the road leading into the roundabout	
00:12			A red car in front of him, probably waiting for the pedestrians to cross, accelerates towards the roundabout.	
00:16		Looks down at his mobile. Continues to dial. Accelerates very slowly.	A gap occurs between his lorry and the roundabout.	
00:18		Looks up. Lifts the phone to his left ear with the left hand.	The cycling postman passes on the zebra crossing in front of the lorry.	
00:19		Lifts his right hand, from the gear level, and waves to the postman.		
00:20	**Anders:** °you're welcome°	Grabs the steering wheel with his right hand.		

	(1.1)			
00:21	**Anders:** It wasn't my intention to let you go first	Brakes to full stop again at the rim of roundabout. Looks at the cars. Moves his right hand from the steering wheel, to the gear level.		
	(6.4)			
00:26		Waits for the traffic in the roundabout to decrease. Puts his right hand back to the steering wheel.	A gap occurs in the traffic in roundabout.	
00:28	**Anders:** (turn around)			
	(6.7)			
00:33		Moves his right hand to the gear level, and back to the steering wheel.		
00:35	**Anders:** Hi man!	Accelerates, and starts a conversation in his mobile.		

Excerpt 3. Anders chooses a situation of slow movement to dial.

Anders has stopped behind a red car which is standing still in front of a zebra crossing. The red car has yielded for two pedestrians who are about to cross (00:11). Anders makes a call (00:04). The situation is convenient for phoning because the coordination work with the surrounding people is settled for the moment, giving first the pedestrians, and then the red car right of way. Then it is possible to do something else. Further, the halt frees him from the practical work of manoeuvring the vehicle. When the pedestrians have crossed, the red car accelerates towards the roundabout (00:12). But it accelerates only very slowly (00:16). This creates a gap between the red car and the zebra crossing.

The gap between the red car and the lorry could in this situation be filled either by Anders and his lorry or by the cycling postman (00:08), who has been advancing in parallel. Anders engages in dialling, and meanwhile the postman uses the gap to cross the street. Anders raises his arm and wave towards him saying rather silently “you’re welcome” (00:20). The postman apparently greeted him with thanks for allowing him to use the empty space first. We interpret Anders’ waving as an answer directed towards the postman’s greeting. However, the postman could not hear him talk. Thus, “you’re welcome” is only heard by himself and by the researcher present in the car. Then, he says in a much louder way that ”it wasn’t my intention to let you go first.” Although “you” always refers to the postman, the utterance itself cannot be heard by him. Thus Anders utterance per se is either directed to himself or to the participating observer to account for why he was allowing the postman to use this particular gap. His comments displays that the gap did not occur because he gave the “turn” to the postman; it occurred as a consequence of him standing still and attending to his phone. Put in another way, he opts out of his turn in traffic and instead chooses to prolong his standing still, with the intention to dial. This makes visible the involvement in driving and to the traffic situation in such a way that the phone use is convenient, and is interactionally adapted to other participants in traffic.

Further, we learn that he has to account for the way he uses and creates gaps in traffic. In this case, he was explicitly praised by the postman for generating a gap and then allowing him to use it. The opposite is of course also an alternative where driver scorn each other for hindering each other in traffic (Katz, 1999). The humorous comment (00:21) probably also draws upon the paradox of being

thanked for standing still in traffic to dial, something which could provoke anger. If a driver just stopped their vehicle on a busy street they would be made accountable for this behaviour. Needless to say perhaps, none of the drivers in our study just stopped their vehicle in traffic to make a call. However, in the previous case, Anders can allow himself to prolong the stand-still and engage in traffic without being accountable for obstruction, since another person benefits from the gap he causes.

Further, we argue that the choice of the entry to the roundabout as a place to make the call was chosen for the low speed. The conversation itself provides no clue as to why he chose that particular occasion to make a call. However, during our study, Anders makes eleven calls as he drives, and looking at them in general help us to better understand the situation. The great majority of his call initiations occur either when decreasing the speed of his vehicle or when standing still for a while. The dialling takes place either when he brakes as he is coming up to a traffic signal showing red, or in conjunction with braking before making a turn in a junction. The number of such occasions of co-occurring dialling and slow movements indicates that this situation, in which Anders choose to make a call, was chosen because the vehicle was moving slowly and coming to full stop.

Summing up, the interactional adaptation of phone handling to the collaboration with other road users, allowing for the most convenient interaction with the phone, is an important and empirically available activity. Such adaptation to the situation positively affects traffic safety, and must be accounted for when setting up experimental studies examining the impact of mobile phone use on traffic safety in general.

4.3 Parking and interactional adaptation

Interactional adaptation occurs in conjunction with traffic interaction and phone interaction. In the following we will discuss how such adaptation is pursued as part of parking the car. The car and the driver are then not being part of the continuous collaboration and negotiation of road space. We identified three types of such adaptation i.e. parking during phone conversation, starting the car after call initiation as well as making full calls while being parked.

First, we observed three examples where the driver parked the car during the conversation. For example we observed how Sven parked the car, as he was driving on a country road with very little traffic. When a bus stop emerged at the same time as he was bringing forth his pen and paper he told the remote conversationalist that: “I’m going to stop over here“. He stopped the car and continued to talk at the same time as he was writing with his pen and paper. Similarly, Eric once stopped during a phone call, in a situation when the traffic was not that demanding. In both situations, parking was used in conjunction with writing with pen and paper.

Second, the drivers used the parked car to initiate phone calls. For example, this procedure took place when Eric returned to the car, after having had a meeting with customers. Immediately after coming back, he put the phone back in the rack, turned it on, and called his voice-mail, to check if there were any messages. When he had pressed the buttons and the call was coming through, he started the car and left the parking area.

Third, the drivers also make full phone calls while being parked. This was observable at 17 occasions in the empirical material on Sven, Eric and Paul. They either performed their calls just before starting the parked car, or when having reached the destination before getting out of the car.

Summing up, interactional adaptation also occurs in between being part of traffic interaction and parking. The possibility to conduct phone handling while the car is standing still, without disturbing other drivers, is an additional option to the resources previously discussed. The availability of full conversations further points to the drivers' orientation to combining phone handling and driving in a convenient way.

5 Discussion

The methodological approach taken in this study, i.e. to focus on the details which concern the drivers in a naturalistic setting, is of great importance. Based on the excerpts presented in this article, which are taken from two specific conversations by a single driver, we have argued that drivers engage in what we have termed interactional adaptation. Interactional adaptation of phone handling to the contingencies in the traffic situation, allowing for the most convenient interaction with the phone, is an empirically available activity. The strategies which are explored in this initial study concerns: (1) how the drivers make the traffic situation available for the remote conversationalist; (2) how the drivers adapt their phone handling to their concurrent collaboration in traffic; and (3) how interactional adaptation is pursued as part of parking the car. In the following we will discuss how the initial results from our ethnographic study have consequences for setting up experimental studies and how they provide implications for the design of new in-car technologies. However, we will first examine the possibility to generalize from those findings.

5.1 Generalization of interactional adaptation

Ethnographic fieldwork methods have previously only been scantly applied to study the issues discussed in this article. In that light, the detailed analysis of interactional adaptation is a contribution to our understanding of phone use in traffic. Our study is only a first step towards understanding phone handling and driving in an uncontrolled but realistic environment. At the same time, it is important to recognize the limitations of this method.

As previously discussed, results of ethnographic fieldwork do not easily generalize to other drivers and other situations. Although the examples discussed could be seen as valid, they could refer more to these particular drivers and their individual skills. In the following, we will discuss these events and their relation to the whole body of collected empirical data, as well as their relation to other drivers. Even though such an analysis is normally beyond the scope of ethnographic fieldwork, we suggest that it could enrich this specific problem where the scale of generalizations are often very high, and where the implications on policy and design affect peoples' lives.

We argue that even though in our data, one driver (here called Anders) does most of the empirically observable adaptation, others do it as well. We argue further that conversational cues, as well as collaboration in traffic, to achieve safer phone handling occur more frequently when conversing in complex traffic situations and finally we discuss in which way professional drivers are representative of drivers in general.

First, even though Anders is most frequently involved in interactional adaptation, other drivers occasionally employ it. We have seen cases in which the three other drivers (Sven, Eric and Paul) are involved in it. One of them providing conversational cues at one occasion, and they benefit from the traffic situation to handle the phone at seven occasions. Thus, although most occurrences refer to Anders, the other drivers also adapt their interaction.

Second, we argue that conversational cues are more frequent in complex traffic, than in simple situations. The argument is supported by the conversation itself, whereas Anders makes explicit reference to the traffic situation. In excerpt two, Anders refers to the road network as being "narrow". We took this category as a starting point for an initial analysis of the traffic situation in which each conversation is pursued. We analyzed whether the traffic situation in which they use the phone, as visible on the video recordings, could be described as complex or simple. Complex traffic refers to a situation where the driver turns, accelerates and look in many directions, in response to passing a road network with crossings and lots of other vehicles in the proximity. Simple traffic acquires much less manoeuvring since there are very few crossing roads and not many other vehicles in the surrounding. The traffic situation is available in the video recordings, which occasionally show the situation in front of the vehicle or around it. Anders conducted four out of the total five calls, all in complex traffic situations. In all, we recorded phone conversations in 15 complex traffic situations. Conversational cues appear as much as in every fourth of them, but only in around 6 % of the totally recorded 74 conversations. Thus, conversational cues appeared much more

frequent in complex traffic situations, than in general. It can be seen as an indication that conversational cues are related to the traffic situation.

Third, the interactional adaptation of phone handling to the collaboration with other road users seems to be done mostly in complex traffic. All drivers conducted totally 34 outgoing calls. The majority of those (65%) was done in simple traffic conditions, where there were not many crossing roads with turning traffic, or much other traffic in the vicinity. The eight cases where calls were done in conjunction with traffic signals, or in proximity of junctions, or roundabouts with other traffic, occur in 67% of the situations where calls were made in rather complex traffic situations, but only in 24% of the total amount of outgoing calls. Thus, there seems to be a tendency to make that type of adaptation in complex traffic.

Finally, the selection of drivers speaks somewhat against generalizations. All of the drivers studied where professionals. It is possible that such selection is not representative for drivers in general, since they spend considerably more time on the roads than daily commuters. Thus, the adaptation strategies discussed could be applicable more to the professional drivers than to other drivers. However, they themselves represent a non-negligible quarter of the total amount of drivers in Stockholm. To possibly reveal also other forms of interactional adaptation, we see many benefits with extending the focus to other groups, for example ethnographic studies of everyday drivers rather than professional drivers. Including other groups of drivers would probably also results in a variation of traffic situations. Additionally, with more empirical data we could generalize or findings further.

It must be noted that this initial statistical analysis is only made on a heuristic level and the technical detail is premature. For example, the classification of traffic as complex and simple is very basic. In all, the generalization of these findings to other drivers and other traffic situations should be handled with care. The ethnographic method indicates a practice which could be more general than just referring to these drivers in complex traffic and in complex activities.

Ethnographic fieldwork should not be seen as a choice which excludes the use of experimental studies. We argue that the experimental and the ethnographic studies should complement each other in traffic safety research, i.e. they could be done in parallel. Here, both the detailed analysis and the following statistical discussion could inspire future experimental studies of interactional adaptation to further substantiate these findings. We argue that the simulations in the experimental studies can be made more realistic, e.g. by giving the drivers the possibility to choose when, and if, to make a mobile phone conversation, or making the situation (both the traffic and the conversation) more social. We also believe that the simulator studies could continue for longer periods of time so that drivers can do the sort of things we observed, e.g. postpone a conversation until a later and more appropriate point. In general it supports the argument that the driver themselves engage in various ways to make the combination of driving and phone handling more safe, than if it were not conducted, and if taken seriously it has consequences both for design and policy.

5.2 Implications for the design of studies informing policy decisions

Previous studies clearly show that there is an increased risk associated with the use of mobile phones when driving a car. However, the level of that specific risk, as well as which particular activities of mobile phone use that generates the problems, is still debated. We add to this discussion by arguing that the two activities of driving safely and handling mobile phones should be considered in parallel. The act of dividing the attention between the phone and the manoeuvring is an everyday thing, as is the dividing of attention between all the other small tasks that takes place while driving. The study reveals previously unrecognised *interactional adaptation*. The driver fits the conversation to driving, which includes collaboration with the remote conversational partner, and the driver fits mobile phone handling to the interaction with surrounding drivers, cyclists and pedestrians.

These findings have consequences for our understanding of the previous research in traffic psychology, which has been influential on the vivid policy discussion and legislation on phone use in cars. Goodman et al. (1999) suggest that the difference in the amount of crashes, as prognosticated from the experimental studies and the figures derived from crash data analysis, could be explained by a 'compensatory behaviour' of the drivers, a term which points to the same phenomenon as interactional adaptation.

Our study underscores the concern about the validity of previous studies. The drivers do not just pursue their mobile conversation unaffected by the traffic situation. Rather, they actively make the situation as smooth as possible. Thus,

the residual between theoretical prognostications from experiments and the crash data, as discussed by Svenson and Patten (2003) could be explained by the efforts made by the driver to make the talk as safe as possible. We suggest that the drivers' own work to reduce risks could be an explanation to the difference between the number of actual crashes due to mobile phone use, as identified in crash data analysis, and the risks as suggested based on controlled experiments.

5.3 Technologies to support interactional adaptation

Various existing technologies are supposed to make mobile phoning in cars more safe and convenient, by releasing both hands for manoeuvring the car, and some countries make the legality of phone use depend on such systems (McCartt and Geary, 2004). As argued earlier, there is a growing understanding that the decreased safety is not due to the need to occupy a hand for the phone (Crundall, Bains, Chapman and Underwood, 2005). However, the identification of interactional adaptation as important to phone use and driving, points in another direction for design. The results of our study provide empirical support for the possibilities to design collaborative technologies which could increase the convenience and safety of phone handling in cars, thereby benefiting drivers. Such *technologies could either improve safety through providing increased awareness of the traffic situation to a remote conversationalist in the phone conversation, or provide increased awareness of phone handling to surrounding drivers.*

In the first case, increased awareness could be technically mediated, e.g. visually or aurally, to the remote conversationalist without the involvement of the driver. It could provide the remote conversationalist more means to interpret the current traffic situation than through available oral cues. Further, it is possible to imagine services where the driver is actively involved by getting extended support to negotiate the conversation to make it fit with the traffic situation. The current systems could be improved by introducing simple interaction techniques like pressing a single button or uttering specific sounds which are automatically

recognised. The interaction would then trigger the phone to put the line on hold and inform the remote conversationalist on the upcoming situation. This would be similar to the "signalling method", as suggested by Manalavan et al. (2002), to mitigate the risks involved. In their experiments the remote conversationalist was provided with signals such as beeping, squealing brakes, a police-type siren, or a synthesized voice message, during critical traffic situations (ibid.).

In the second case, technologies could make the adaptation easier for other drivers in the surrounding, by increasing the visibility of phone handling e.g. by other visual cues. Thus, it would be easier for people in the surrounding to see that the driver is engaged in a conversation, and adapt to this situation.

These two directions for design share the assumption that the technologies should be a support for drivers and conversationalists in better doing interactional adaptation. We argue against Manalavan et al's idea, where they imagine "a cell phone capable of receiving of real-time localized traffic data", interpret the data, and then signal to the remote conversationalist when the driver can no longer attend to the conversation. We do not believe that interactional adaptation through and by the system, would be as useful as the skilful interactional adaptation we have identified. For example, we have seen a number of examples where the drivers make calls in specific situations such as when approaching traffic signals. Drawing on Manalavan et al.'s idea, we could suggest a context-aware system which only allows the driver to engage in button pressing where the conditions resemble those that the driver look for, e.g. a traffic light showing red. Although traffic lights were favourable places to make a call, they were a resource rather than a determinate precondition for this activity. Anders

sometimes favoured calling at places where the car might come to a stop, rather than choosing a place where this is less likely. Thus, the traffic situation does not decide what the driver could do. A context-aware system, which takes decisions, could be disturbing for the driver who does not act and think of particular situations as determined for phone calls, or in the latter case, unsuitable for the call.

6 Conclusion

In a time where much of the mobile phone conversation in cars is contested, we argue the importance to complement experimental studies of mobile phone use in cars, with ethnographic fieldwork methods which consider *how mobile phone use is handled in everyday traffic situations*. It is particularly relevant with the increasing amount of in-car applications and mobile technologies aimed to be used in the car. The future driver will likely have access to several applications potentially distracting them from driving. This study has taken an ethnographic approach to the problem of using mobile phones in cars, and the possibilities to design new in-car technologies.

The ethnographic field study reveals a number of strategies on interactional adaptation used by the drivers to make their phone use fit with driving, which are not previously accounted for in the numerous controlled experiments dealing with phone use in cars. The analysis of the empirical data displays how the drivers adapt their handling of the phone, as well as the conversations, to fit with the traffic situation. They use suitable situations in traffic to retrieve phone-numbers, or to dial. Drivers provide remote conversationalists with awareness of any eventual problems in the traffic situation, which may lead to a demand of more focus on driving. Further, they adapt their driving to fit with the mobile phone use, and with the adjacent road users.

Although, the generalizations of these findings are yet to be determined in future studies, we can still discuss their relevance for our understanding of the

validity of previous studies and indirectly for policy and legislation concerning mobile phone use in cars. Contrary to previous studies in more experimental settings, we have found that drivers do not merely pursue their mobile conversation unaffected by the traffic situation. Instead they make the situation as smooth as possible, in collaboration with other drivers and with remote conversationalists. Thus, the residual between prognostications from experiments and crash data, could be generated by the efforts made by the driver to make the talk as safe as possible. Previous studies are based on an individualistic perspective, not taking the social character of driving and talking into account and the experimental setup reduce the complexity, not taking the situatedness into account. Based on our findings, we suggest that the drivers' own work to reduce risks could be an explanation to the difference between the number of actual crashes due to mobile phone use, as identified in crash data analysis, and the prognosis based on the risks as suggested by controlled experiments.

The results have bearing on the design of in-car technologies, as well as on the design of studies of mobile phone in cars. First, in order to ensure safe mobile phone handling whilst driving, we suggest two possible approaches to the design of such technologies. It could be achieved either by providing awareness of the traffic situation to a remote conversationalist, or through increasing the awareness of phone handling to the surrounding road users. Second, seeing that the previous experimental studies have not revealed the interactional adaptation, the results from this ethnographic study can be used to influence future methods for studying mobile phone use and driving.

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