KTH Centre for Sustainable Communications

Getting there and back again

Commuting and ICT in six cities across the globe

MIRIAM BÖRJESSON RIVERA
GREGER HENRIKSSON
MARIA ÅKERLUND

Report from the KTH Centre for Sustainable Communications
Stockholm, Sweden 2012

ISSN: 1654-479X
TRITA-SUS 2012:1

Centre for Sustainable Communications
KTH, SE-100 44 Stockholm
www.cesc.kth.se

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Authors:

Miriam Börjesson Rivera and Greger Henriksson, Centre for Sustainable Communications

Maria Åkerlund, Ericsson ConsumerLab

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Acknowledgments

Ericsson ConsumerLab and KTH Centre for Sustainable Communications (CESC) collaborated in writing this report. It is based on a study conducted by Ericsson ConsumerLab (www.ericsson.com/consumerlab) in which the author of this report, Maria Åkerlund, and others including Ola Sandberg, Andreas Timglas and Sigrun Esbensen also participated. The study covered ICT in everyday life regarding interactions with public authorities, use of household energy respectively transport, especially commuting. The parts dealing with transport and commuting were processed by representatives of CESC in collaboration with Maria Åkerlund. This report is intended as a first step towards joint future research on everyday commuting and ICT from a sustainability perspective.

Thanks to Bernhard Huber, communication officer at CESC, who helped complete this report.

Centre for Sustainable Communications (CESC)

The Centre for Sustainable Communications was established in 2007 by VINNOVA (The Swedish Governmental Agency for Innovation Systems). CESC has established a strong research environment at the KTH Royal Institute of Technology in collaboration with several business partners, public authorities and civil organizations. Pursuing an interdisciplinary research approach, CESC's mission is to enable innovative media and communication services for sustainable practices.

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Summary

Ericsson ConsumerLab performed a qualitative exploratory study of how people experience daily commuting in three different countries. This report aims to present the outcome of the study in such a way that the data can be useful for further analyses and studies of commuting in relation to ICT use and environmental sustainability. Based on the study's findings this report will present analytical data on: i) how ICT can be linked to everyday travel in order to facilitate commuting from the user's point of view; and ii) how ICT solutions can enable commuting in an environmentally more sustainable way.

The study, which had an ethnographic approach, showed that in general, commuters would like their commuting time to be, or at least seem, as short as possible. The respondents spend hours commuting every week and often claim to consider it a waste of time. Regardless of means of transport, they would like to get the most out of their commuting time (working, socialising, relaxing etc.), which implies that there is a demand for further technological improvements in this area (voice recognition services in cars, privacy settings in public transport, connectivity in public transport, etc.). An aspect that adds to how people perceive their commuting time concerns the extent to which its duration is predictable – even if the time cannot be shortened, commuters at least want to know how much time they will spend on their daily commute, so that they can plan their day with more certainty.

Irrespective of means of transport, two major frustrations for commuters are lack of flow and the presence and behaviour of other people. People seem to lack good real-time information enabling them to avoid interruptions in their commute and much of their frustration relates to poor infrastructure conditions and management. Frustration with other people derives from their conduct in traffic contributing to inconveniences, congestion or hazards, or from noise, smell or littering on public transport.

The greatest motivators for commuting by car are a feeling of independence in relation to other people, schedule and choice of route, and the private space the car offers. This means that the car provides flexibility in terms of when and how people travel, while also providing a private space both mentally ("in the car you can do whatever you want") and physically ("you don't have to hustle with others on the bus or train"). The major frustration when commuting by car is the need to focus on driving, so drivers cannot utilise time as they would wish.

People generally justify their choice of public transport by anti-car arguments, which include difficulty in finding a parking space at work, expensive parking, fear of driving, lack of driving licence etc., but can also motivate their choice as giving them 'me-time' without having to focus on driving. The major frustration with commuting by public transport is dependency on time schedules and the shortcomings of the public transport network. This is exacerbated by a lack of relevant information or available options. However, commuting can be improved in a variety of ways for car and public transport users with the help of ICT. From

a sustainability perspective, it is important to exploit the potential of ICT solutions to facilitate more environmentally friendly practices.

Many of the ICT (Information Communication Technology) solutions identified in this report require reliable access to the internet and/or mobile phone network. The mobile phone is currently the single most important internet device while commuting, thus perhaps being the point of departure for many of the solutions, such as travel planner, ticketing options, etc, but for car users mobile phone services need to be adapted through better in-car voice recognition technologies, since the focus needs to be on driving. Current information services could be more personalised and contextualised in order to better suit the individual driver and most of these ICT solutions and services are also applicable to public transport commuters, but an additional function for such commuters could be some kind of 'emergency button' on mobile phones to increase their sense of security in travel.

Home office solutions are a way of avoiding the frustrations of commuting altogether. While working from home is regarded by some with ambivalence and is impossible for many, there are ways of refining these solutions.

Sammanfattning på svenska

Denna rapport har som syfte att presentera Ericsson ConsumerLabs kvalitativa och explorativa studie i tre länder av arbetspendlares erfarenheter på ett sådant sätt att data kan användas för vidare analyser och framtida studier av arbetspendling i relation till IKT-användning och miljömässig hållbarhet. Detta inbegriper att presentera analytiska data på: i) hur IKT kan kopplas till vardagligt resande i syfte att underlätta arbetspendling från användarens perspektiv och ii) hur IKT-lösningar kan möjliggöra arbetspendling på mer miljömässigt hållbart vis.

Studien, som hade en etnografisk ansats, visar att pendlare i allmänhet vill att pendlandet ska upplevas som så kort som möjligt och att man vill kunna få ut det mesta av den tid som ägnas åt att pendla antingen genom att arbeta, umgås eller koppla av. Detta visar på behovet av nya och utvecklade IKT-tjänster. En annan aspekt gällande pendling är människors behov av att kunna förutsäga längden på pendlingsresan, för att kunna göra sig en uppfattning om när man kommer fram.

Gemensamt för både bilpendlare och kollektivtrafikpendlare är den frustration som de känner när trafikflödet stannas upp och över medresenärers närvaro och beteende. Mycket av detta är kopplat till undermålig infrastruktur och skötsel av befintlig infrastruktur. Det som verkligen efterfrågas är bra realtidsinformation som möjliggör planering av pendlingsresan. Medresenärer och medtrafikanters mer eller mindre acceptabla beteenden är också en källa till frustration.

Den främsta drivkraften för att bilpendla är känslan av självständighet gentemot andra människor, tidtabeller, rutter och även den privata sfären som bilen utgör. Bilen erbjuder både flexibilitet och privat utrymme både mentalt (“i bilen kan man göra vad man vill”) och fysiskt (”slippa trängas med andra på bussen eller tåget”). Den största nackdelen med att bilpendla är att man är tvungen att fokusera på själva körningen, och på så sätt kan man inte utnyttja restiden optimalt.

De största drivkrafterna för att pendla med kollektivtrafik verkar vara kopplade till ”anti-bil”-resonemang. Svårigheter att hitta parkeringsplats vid arbetsplatsen eller att parkeringsavgiften är för dyr, rädsla för trafiken eller att inte ha ett körkort utgör skäl att välja kollektivtrafiken. Även argumentet ”tid för mig själv” är vanligt förekommande, då man kan göra annat under tiden man befinner sig på väg till eller från sitt arbete. Den största frustrationen är känslan av beroende, som är kopplat till tidtabeller och kollektivtrafikens linjenätverk, något som också förvärras av bristen på tillräcklig information och alternativa resrutter. Det finns dock en mångfald av sätt att förbättra arbetspendlingen med hjälp av IKT (Informations- och Kommunikationsteknik)-lösningar, både för bilpendlare och kollektivtrafikpendlare. Ur ett hållbarhetsperspektiv är det viktigt att poängtera möjligheterna för IKT-lösningar att underlätta mer miljövänliga praktiker.

De flesta IKT-lösningar i denna rapport är beroende av en pålitlig tillgång till Internet och/eller mobila nätverk. Mobiltelefonen/smartphone har blivit den viktigaste enheten för uppkoppling till Internet under pendlingsresor, och kan således sägas vara utgångspunkt för många lösningar och tjänster så som reseplanerare, biljettsystem, etc. Dessa behöver dock anpassas till röstbaserade teknologier som är utvecklade för användning i bilen då föraren måste

koncentrera sig på att köra. Befintliga informationstjänster kan utvecklas för att kunna bli än mer individ- och kontextberoende och tillämpliga även för kollektivtrafikpendlare med tillägget av ett slags ”överfallslarm” för att öka den enskilde resenärens känsla av säkerhet.

Introduction

Transport is one of the areas presenting the greatest environmental challenges for the future. In this study we monitored people in their daily commute and gained an impression of how commuting functions and is perceived in its specific context. The aim of this type of investigation is to formulate business opportunities based on the requirements in people's everyday lives and to identify and assess how ICT can contribute to environmentally sustainable development of travel in large cities. The contribution made by this study to that aim is description and analysis of cultural aspects of urban commuters' requirements as expressed in the qualitative investigation. The overarching questions concern how to facilitate a commuting system that is least damaging to the environment while still being attractive for people in their daily lives, and the ways in which global development of IT services can contribute to this.

Methodology

The study is based on ethnographic investigations conducted by Ericsson ConsumerLab 2010-2011 (Åkerlund, Timglas, Sandberg, Esbensen 2011). Prior to that, desk research into consumer behaviour and needs was conducted by using existing Ericsson ConsumerLab sources and secondary sources (ibid.). The overall objective with these investigations was to explore and identify people's needs within and across the following everyday activities: commuting to/from work, management of household energy consumption and interactions with public authorities. The results concerning commuting were used in the present report. The investigations included interview questions and observations concerning everyday frustrations on topics such as: lack of time, lack of information, lack of money, lack of control, difficulties in being environmentally friendly, feeling secure, staying healthy, etc. Questions and observations also examined the need for connectivity, mobility and information in different everyday situations.

The study covered six cities: Los Angeles, New York, Berlin, Ruhr District (Essen/Bochum), Mumbai and Delhi. The fieldwork was conducted from November 2010 to February 2011. The choice of cities was intended to provide some form of global spread and to include developed and emerging markets, and to be relevant for the various industry areas included in the study:

- Los Angeles: Car city in a state where the environment issue is relatively commonly discussed, where energy consumption is prominent due to the climate (air conditioning needed in summer) and where there has been some discussion on deregulation
- New York: A large city where people mainly commute using public transport.
- Bochum/Essen: Small town in a district of Germany where smart energy meters are being/have been tested and where solar panels on private buildings are relatively common (subsidised in Germany). From a transport perspective, the residents mainly commute by car.
- Berlin: The capital city where many commute by car, but public transport is also common and the public transport system is well-developed.

- Mumbai: India's most populous city and business centre, situated by the west coast.
- Delhi: is the more traditional capital and the third most populous city in India, located in northern India.

The qualitative ethnographic study was conducted in two phases, Activation and Immersion, including the same respondents in both parts. In all, 9 interviews were conducted per country (3 interviews per research area and country). In the first phase, each respondent focused on the area for which they had been recruited, but in the second phase they also shared their experiences from the other two areas. Details of each phase in this primary study are given below.

1. Activation – Accompanied interviews were held for commuting and energy management and in-depth interviews were conducted at an interviewing facility for interactions with public authorities.
    a. The purpose of this step was to encourage the minds of respondents/interviewees and researchers to focus on the relevant behaviour, needs and frustrations.
    b. For the area 'Commuting to/from work', there were 3 respondents per country, i.e. 9 interviews. In all, 27 persons participated in the overall study.
    c. Each interview lasted for 4 hours and we started out in the informant's home and then accompanied him/her during the commute, observing and interviewing during this time. All interviews were also filmed.
2. Immersion – Online forums in Germany and the USA, mini focus groups in India.
    a. The focus of this step was to further examine and explore the behaviour, needs and frustrations identified in the Activation phase.
    b. In the USA and Germany all 9 respondents met in a 10-day online forum. They were given an exercise for each day and asked to write about their experiences on the forum and also to comment on the other participants' notes. During the first 5-6 days, the topics were separated, but during the last days all respondents shared their experiences from all three topics.
    c. In India, Ericsson ConsumerLab chose not to conduct the online forum for several reasons[1] and instead 2.5 hour mini-focus groups were conducted, one in Delhi (4 respondents) and one in Mumbai (5 respondents). Before the focus group meetings, the respondents were asked to complete certain exercises and bring their experiences to the focus group. As in the online forum, all topics were discussed with all respondents.

[1] The reasons were that good internet access, particularly in the home, is not as common in India and that Ericsson ConsumerLab's institute in India did not think that the respondents would be so involved that they would be active for 10 days via an online forum. When personal meetings are booked, however, e.g. mini focus groups, there is a greater chance of people turning up. However, Ericsson ConsumerLab completed their records in India so that they resembled the 10 days of exercises that the respondents in the USA and Germany did online.

Ericsson ConsumerLab employed the market survey institute H,T,P Concept to carry out the fieldwork.

The criterion for selection of the commuter participants for this study was that they commute to and from work every day in one way or another. It was ensured that there was a mix of means of transport (bus, car, subway, train etc.), and that some respondents with a certain level of 'green' attitude were included in the sample.

The participants in the study were also recruited on the basis that they were talkative and engaged in the topic. Another important recruitment criterion was that respondents were really committed to the demanding set-up, where they had to contribute much time and thought. The respondents were all 25 or older but we aimed for a good mix of gender and age. In recruiting the Indian respondents, these criteria led to a sample of relatively affluent people, something that should be borne in mind when reading the report.

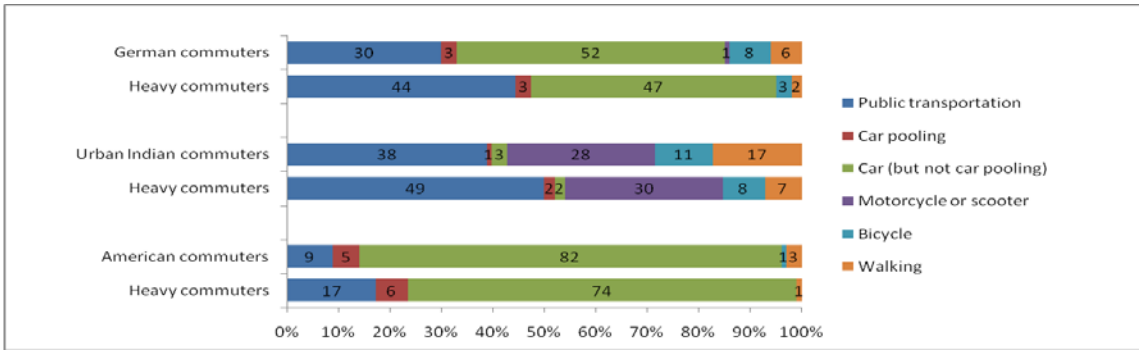

Figure 1: Choice of means of transport when commuting. Source: Ericsson ConsumerLab 2009

Results

According to Ericsson ConsumerLab's analytical platform 65% of the German population commuted to work every week (Ericsson ConsumerLab 2010). In the USA and urban India the corresponding value was 70% and 55%, respectively. For the 20% longest commutes, the average commuting time per week was 11 hours in Germany, 12 hours in the USA and 20 hours in urban India. The most common means of transport in Germany was the car, although public transport was quite common, especially for the longest commutes, in large cities and among young people. In the USA the car was by far the most popular means of transport for all commuters, but those with the longest commutes were more prone to commute by public transport. In India public transport was the most common way of commuting, followed by motorcycle or scooter. Cycling and walking were also relatively common ways of commuting. (see figure 1 above)

A Swedish report (Trafikanalys, 2011) showed that the majority of commuter trips in Sweden are made by car, including trips within and to/from the major urban regions. Another study concluded that the advance of private motoring has led to residence and workplace being increasingly uncoupled from one another and to increasing urban sprawl (Waldo 2002:6). However Waldo also concluded that population diffusion does not necessarily have negative consequences for the environment (ibid., p.58), because for example the average travel time has remained constant. Lyons & Urry (2005) confirmed that travel time has remained practically unchanged, but claimed that with better communications, people tend to travel longer distances.

Germany – Berlin & Ruhr District (Bochum / Essen)

Germany is characterised by a fairly well-developed local public transport network, especially in comparison with the other two countries examined in this study. Public transport was normally on schedule and very frequent, and there were usually several alternative routes to choose from. There was also a high level of synchronised and far-reaching interconnections, enabling commuting both between city centre and suburbs and between different suburbs.

The experience of the German respondents was one of general satisfaction with public transport, although there are certain aspects that could be improved.

The road network in Germany was considered to be relatively well developed and connected, with good road conditions and traffic management. The car drivers in this study appreciated the flow on German highways, but of course there are still traffic jams and roadworks going on from time to time and 'Stau' (traffic jam) is quite a common sign on the Autobahn.

The study showed that the preconditions for good public transport and good car commuting were considered equally good or bad by the respondents.

USA – New York & Los Angeles

There are huge differences in the quality of the public transport system between New York and Los Angeles, something that was reflected in the respondents' attitude to public transport. In New York, the attitude to public transport was more positive, it was seen as a real/actual alternative to travel by car, even among people belonging to a higher economic stratum. In Los Angeles the public transport system was seen as unclear and difficult to understand, leading to it not being viewed as an alternative means of transport by the respondents, except for the ones who cannot afford a car.. The desk research showed that public transport networks in many American cities are built in a star shape, making it easy to go from city centre to suburb, but not between suburbs, where much of the commuting takes place.

A conclusion from the observations made in Los Angeles is that driving a car is part of the daily routine for the respondents and that commuting by car is the primary choice. However the respondents expressed strong negative emotions when discussing the highways. Some of the opinions were that there were too many lanes, making it complicated to drive and that there were traffic jams and a great risk of accidents. There was an expressed fear of major roads and highways and respondents tried to avoid these if possible in order to improve commuting flow, reduce stress and avoid car accidents.

India – Mumbai & Delhi

Both Mumbai and Delhi are densely populated and this significantly affects the commuting situation. Public transport and streets have to carry an incredible number of people every day, and lack of space is a major topic. The size of the population leads to different challenges than those in the other two countries. There is a great need for a satisfactory solution for these cities.

The metropolitan area of Delhi has a population of around 14 million and a public transport system with buses and metro. The metro, which began to operate in 2002, has become a symbol of modern Delhi, but buses still seem to be the most used means of transport and the car is becoming increasingly common. In the Indian context, the car is also a status marker and the growing middle class are buying cars. According to Butcher (2011) more than 1000 cars are added every day to the already crowded Delhi roads. In Mumbai, a large proportion of the population also depend on commuter trains for their daily commute. This is usually the fastest alternative and the schedules and routes of trains and busses are well-planned and synchronised, but because of the enormous volumes of passengers, the system often crumbles.

Commuting by car was reported to be difficult in both cities, since the streets are not able to handle the huge number of cars. Traffic jams are regular and road conditions and traffic management are not equipped to deal with the quantity of traffic. Another aspect mentioned was the tendency to disregard traffic rules, all of which leads to more or less chronic traffic congestion.

Motivators for using car or public transport

This study focused on two means of transport, car and public transport. In the case of the car the focus was on car owners, who generally drive the car themselves, but in India one respondent who had a driver was also included, as this is relatively common here. In the case of public transport, we did not divide the category into different means of transport, but talked about it as one means of transport.

Commuting by car

One of the main reasons people chose to commute to work by car was that they felt free and independent. The respondents noted there was no need to follow schedules or fixed routes, they could go when and where they liked and organise their commute around life and not the other way around. This was how commuting by car was perceived, but it was not always so in reality due to the traffic situation, weather, etc. Another important characteristic associated with commuting by car was the sensation of having a private space to do whatever one wanted: sing, relax, listen to music, talk on the phone or just sit in silence. The greater physical space and comfort were also stressed, especially from an Indian perspective, where public transport is very crowded.

The car was also preferred for transport of items, such as the weekly grocery shop or moving large objects. The transport aspect of car travel also allows a more spontaneous lifestyle, according to the respondents. The car filled with familiar objects, which was appreciated by both car commuters and public transport commuters who use the car on other occasions.

The car makes transporting family members easier and it was seen as a more cost-effective option when several family members travel together in comparison with public transport. The fact that the car affords time and private space for the family outside the home was also appreciated and cannot be achieved to the same extent when travelling by public transport. The feeling that the car can become a mobile 'home' and family space while enabling the owner and his/her family to connect with the 'rest of the world' was also important when choosing to travel by car.

Status was also a very important driver and motivator in owning and driving a car and was connected to life values and attitudes. In India, the car in itself was an important symbol of financial status, regardless of model and make. In Los Angeles, the status aspect applied too, as public transport there is considered to be for those who cannot afford a car. In the USA the car is a symbol of mobility and strongly connected to a feeling of personal freedom, while in Germany there is a saying that German men love their cars more than their wives.

The last aspect of choosing car over public transport seemed to be the rationalisation of choice. Many respondents stated that the car is their only choice. This choice was connected not only to the availability of public transport infrastructure, but also to the life and work situation. The work position or family situation might require the use of a car, at least according to our respondents. Maxwell (2001) claims that people are fully aware that cars and car travel are not

good for the environment, and this message also reaches people every day at many levels. At the same time, people have a positive image of their car and their use of that car, which is deeply related to their social relations, e.g. driving children to various activities or visiting their old mother and taking her for a drive. He also claims that the significances that people attribute to their use of cars are intended to decrease the guilt and angst experienced on using the car more often. The final outcome is a constant negotiation between social virtues such as saving time and spending time with relatives and the environmental burden contributed by car use. Steg (2005) notes that people tend to respond instrumentally when asked a direct question about the qualities of the car. If the research objective is more multifaceted, it can be easier to uncover the symbolic and emotional aspects associated with car use and car ownership. This was taken into consideration by Sheller (2004) in her analysis of the emotional significance of the car and car travel, in which she concluded that "We not only feel the car, but we feel through the car and with the car" (p. 228).

The 'role of the green', i.e. whether people take certain actions in order to lead a more sustainable lifestyle, was another of the issues investigated in this study. When asked about changing to a more environmentally friendly car, most respondents said that this was unlikely to happen. The barriers were first and foremost the cost, as 'greener' cars are more often more expensive. Secondly, the green cars currently available often contradict the key motivators for car driving in the first place by being smaller (i.e. not as much private space) and less flexible when it comes to re-fuelling (particularly electric cars). The conclusion was that although people seemed to definitely be aware of the environmental effects of car commuting, car drivers seemed to be very unlikely to change their current commuting habits. This confirms previous findings (c.f. Steg 2005; Sheller, 2004; etc.) showing that habitual drivers are less willing than more sporadic drivers to choose public transport because of what the car means for them in terms of personal freedom, etc. Sheller (2004) also noted that "To create a new ethics of automobility (…) will require a deep shift in automotive emotions, including our embodied experiences of mobility, our non-cognitive responses to cars and the affective relations through which we inhabit cars and embed them into personal lives, familial networks and national cultures." (p. 236). Based on this reasoning, it is obvious that the question of how a decrease in car travel could be achieved relates in part to issues other than simply improving the alternative, e.g. expanded and better public transport. However, Kenworthy & Laube (1996) claim that in order to decrease car use, certain targets must be met, for example decreased investment in infrastructure for car traffic and increased investment in fixed track public transport of a high quality and in more numerous and safer routes for cyclists and pedestrians.

Commuting by public transport

The motivators for commuting by public transport can be summarised in two areas; 'me-time' and 'anti-car'. Commuting by public transport means not having to focus on driving, which creates a relaxing and less stressful commute compared with the car. This 'me-time' can be used for sleeping, working (checking e-mails,

making business calls, text messaging, etc.) and leisure (listening to music, reading, checking Facebook, calling friends or even meeting them during the commute, etc.). It should be noted here that in India these options are slightly more difficult to realise because of the over-crowding on public transport. However, people still try to some extent.

Not using the car seemed to be a strong motivator for going by public transport and the arguments against using the car appeared to be more numerous than those for going by public transport. Reasons against included not having a driver's licence, lack of parking at the office, fears about driving in dense traffic and traffic jams. From an analytical point of view, we believe that this implies that the respondents would choose the car if they could, or at least those mentioning 'fear of traffic', i.e. those with more emotional reasons for choosing public transport. On the other hand, in congested cities the responses given might reflect a need to position, explain and reason about the choice of transport in contrast to the other available option, in this case commuting by car.

A greener or more sustainable lifestyle did not seem to be a key motivator for choosing public transport, but was often perceived as an additional benefit. People are to some extent proud of only playing a small part in polluting the environment while commuting, and living green and sustainable is also perceived as an expression of a modern and smart lifestyle, so people feel better about themselves while commuting by public transport.

A commute consists of routine practices, i.e. it is done on a regular basis with few major variations, also as a "public endeavor/routines as vehicles of boundary control, moving back and forth between states of public and private; work and leisure; and home and away" (O'Dell 2009: 86). The routine aspect means that expectations quickly build up regarding how the trip should proceed, so any disruptions that occur have high significance. This study also clearly showed that lack of predictability is that which created the greatest among the participants. Jain (2011) described a similar phenomenon in a study of coach commuting in England, where a persistent ring tone from a mobile phone caused the other passengers to mutter in irritation and to look around for source of the interruption and the 'guilty' party to apologise when he realised it was his phone that was ringing. In the case of the coach commute, it was also clear that the expectations and informal rules upon which the exclusivity of this means of transport was based had to be upheld by the passengers so that they could maintain the calm atmosphere and feeling of nothing unexpected happening. At the same time, the commute is a liminal[2] experience between the home and the workplace. O'Dell (2009), cites Nippert-Eng, who calls the commute a "corridor for ritualized processes of identity transformation". In this 'corridor', use of ICT

[2] The concept liminality comes from anthropological theories on (rituals and) rites of passage, where the liminal phase is regarded as a state in which the individual is between two social roles, such as between child and adult. An example of how these liminal phases are dealt with are the initiation rites that some cultures have to mark the transition from boy to man. In this study, the commute can be regarded as a form of transition, although between different aspects of a person's identity, from the private role at home to the more professional role at work.

comprises an important part of micro-processes that transform public space to semi-private space and thus help to 'warm' public space. ICT also comprises an important part of the transition from private to professional persona. Making work-related calls in the car or answering e-mails on the commuter train are examples of ICT-related practices, as is calling on the way home to decide on the food for dinner. A study in England concluded that ICTs "have led to the blurring of boundary spaces between home and place of work" (Line et al 2010: 6), with home activities bleeding into work and vice versa.

Commuter frustrations

Interestingly, the study discovered that the frustrations with commuting by car were much greater than those with public transport – both in number and in strength.

Frustrations with commuting by car

A key disadvantage with driving a car, according to the respondents, is that time in the car needs to be focused on driving, which requires both body and mind to stay alert. The hands have to be on the steering wheel, the eyes on the road and the concentration on the traffic. This focus on driving leads to a sensation of inefficient use of time.

Another frustration noted was the dependency on the traffic situation. Unpredictable traffic jams result in car drivers having to plan their life around their commute, and thereby traffic jams counteract with one of the key motivators for taking the car –freedom and independence. These traffic jams steal precious time, demand active attention, create stress and make it difficult to plan the commute.

Poor road conditions such as many potholes, blockages due to roadworks and lack of by-pass roads or alternative roads, leading to congestion and a stop-and-go traffic rhythm, were also major frustrations. Poor traffic management (traffic lights, lanes, road tolls, traffic police, signs, etc.) was another area creating a lot of annoyance for the respondents. In some cases there was no management at all and in others it was poorly constructed or inflexible. Today's traffic management systems were considered too general and did not help the individual. In addition, they always operated in the same way, not taking time and situation into account. Another issue was that some people ignore traffic regulations.

As well as these infrastructure-related problems, people expressed other frustrations about commuting by car. Too many vehicles of different kinds and speeds were perceived as the main reasons for disruptive traffic jams and stop-and-go traffic. Other drivers making unexpected and dangerous manoeuvres or jaywalking pedestrians increased the need to focus while driving. Interestingly enough, the car drivers interviewed did not mention themselves as part of the problem – just everyone else. Considering that one of the greatest motivators for choosing the car is the freedom and flexibility it represents, it is perhaps not unexpected for the frustrations associated with car travel to be greater than those associated with travel by public transport.

Finally certain safety concerns were expressed about commuting by car. The fear of people causing accidents by unexpected and dangerous behaviour (e.g. changing lanes without warning or texting while driving) resulted in a defensive way of driving that might add to the feeling of not being particularly safe.

There were also concerns related to the car itself and the risk of a breakdown, e.g. a puncture or malfunctioning warning signals. Unpredictable weather conditions such as black ice also caused concern, with respondents stating that they did not believe that the existing warning systems such as weather reports on the radio were good enough.

In a report by IBM (2010), a commuter pain index was compiled based on 10 different topics and approx 8000 car drivers in 20 cities. The topics were commuting time, time stuck in traffic, anger, stress, start-stop traffic, fuel prices, etc. The index showed clear differences between Delhi, Los Angeles, New York and Berlin – cities analysed in this study by Ericsson ConsumerLab. It was clearly more 'painful' to commute by car in Delhi than in the other cities.

The IBM report also included the following facts and figures:

- 67% of drivers in the 20 cities studied believed that road traffic had deteriorated in the preceding 3 years, 18 % believed it had greatly deteriorated.
- 31% reported that during the preceding 3 years, traffic had been so bad that they turned around and went home (Beijing was top, with 69%).
- 57% stated that traffic had affected their health.
- If their commuting time could be significantly reduced, 53% stated they would spend more time with friends and family and 44% that they would spend more time on recreation.

However a study from the UK shows that the perception of congestion as a problem was greater in a general perspective than when interviewees were asked if they personally felt that congestion/traffic was a problem for them (Goodwin & Lyons, 2010). Their conclusion, which is supported by other research, is that people have come to accept congestion as part of what it means to commute. Instead of getting agitated about traffic jams, people try to cope in various ways, for example by listening to the radio/music, talking on the telephone or trying to relax in some way.

Frustrations with commuting by public transport

One of the major frustrations with commuting by public transport is dependency and/or lack of control. Lack of influence, information and sometimes infrastructure makes people dependent and frustrated, as they are not fully in control of their own life. They have little or no influence over timetables, which creates stress and anxiety, and if something breaks down or there is bad weather, there is nothing they can do about it. Lack of information, or at least relevant information, about weather, breakdowns, delays, etc. and alternative ways to get to and from work adds to this feeling of lack of control. In addition, the existing infrastructure restricts people's travel to certain routes.

> The problem is really with all the snow and other weather delays, the timetable has really become anyone's best guess. So you have to gauge making a meeting on the other side or getting home to pick up a child at an event by using your instincts.
>
> Female, 42, New York

Once again, the basic problem is being dependent on external factors such as infrastructure, timetables decided by others and unexpected events. Shove (2002) states that: "In a context where personal schedules are complicated and therefore fragile, making and meeting deadlines is a matter of urgency. As a result people do not just need to get to places, they need to get there on time." (2002: 6). Today's demand for flexibility and co-presence to carry out 'normal' practices means that people have an increasingly fragmented personal schedule and thus require increasingly personalised solutions in the areas of mobility and transport. This in turn paradoxically contributes to an even more fragmented and difficult personal schedule, where the possibilities to 'synch' with other members of one's social network (both private and professional) are even more complicated.

Another major frustration is the public character of public transport. 'Everybody' can use public transport and behave just as they like, leading to over-crowded compartments, no available seats and a dirty, smelly and sometimes frightening environment. Among other things, this leads to different classes of compartment (first and second class, female and male compartments etc.) being generally perceived as something positive, particularly among our respondents in India, but also among those in Germany.

Finally, there are certain safety concerns when commuting by public transport, which are closely related to its aforementioned public character. Respondents expressed a fear of being robbed or having an accident in the crowd or of the train breaking down. In this discussion cameras (CCTV) and ticket gates and how these can add to the feeling of being safe, were also brought up. Cameras were considered to give a certain feeling of security, but often they were considered to be there for 'surveillance' reasons and not really to protect travellers.

Ticket gates, which are common in India, add slightly to the feeling of safety and reduce the fear to some extent, but not all security controls are taken seriously. These safety concerns are particularly prevalent in the USA and India, but to a lesser extent in Germany, where people seem to feel quite safe in general when out and about.

Role of ICT in commuting today

ICT applications used while commuting by car include navigation systems, traffic reporting (e.g. via radio), mobile phones and Bluetooth equipment in the car. However, navigation systems and mobile phones were regarded with ambivalence among commuters. The technologies are facilitating but also distracting (and even against the law in some cases), thereby putting the driver, passengers and other vehicles in danger.

ICT applications used while commuting by public transport include travel planners (online and in smart phones), MP3 players for entertainment, mobile phones, smart phones, tablet computers and e-book readers for communication, entertainment, etc. Respondents unambiguously viewed personal ICT devices as positive, enabling them to be both productive and entertained throughout their commute. ICT can thus be used as a form of 'diversion' by passengers, to avoid boredom. It was also observed that smart phones make a great difference in commuting – enabling work and play to a much greater extent (Bull 2006). Lack of connection or power are obstacles, however. The most used internet device while commuting is the mobile phone, as it is easy to use and people always have it to hand (see figure 2 below).

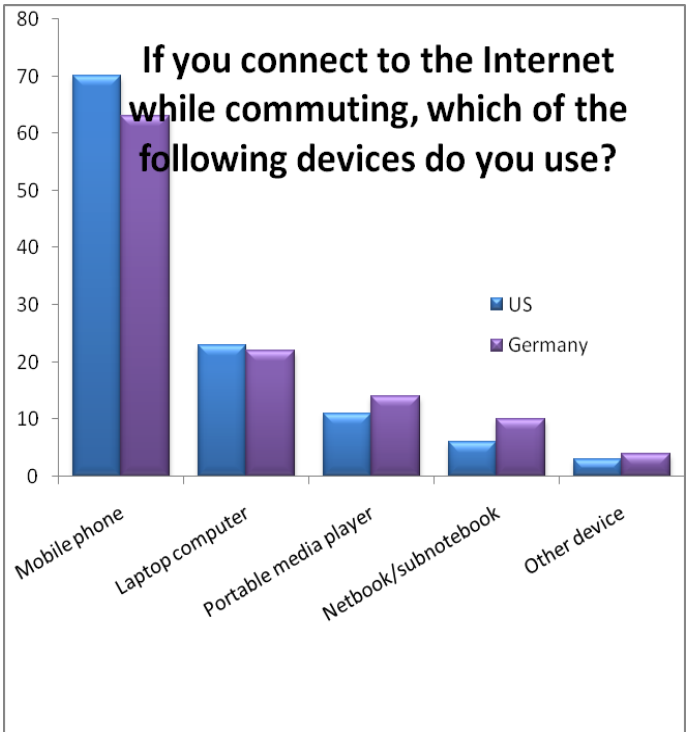

Figure 2: If you connect to the Internet while commuting, which of the following devices do you use? Source: Ericsson ConsumerLab 2010

Another example of an ICT application for public transport is buying tickets from a ticket machine. This means less queuing to buy tickets at a window. Ticket machines are clearly perceived as facilitating by the German and American respondents, but the Indian respondents showed some scepticism about these machines, most likely because they are a relatively new feature.

The above examples indicate that the role, use and barriers for ICT only partially overlap when commuting by car and public transport. These overlapping but different needs must be considered when improving and designing new links between ICT and commuting.

When considering the examples above, the following findings are relevant. The increasing significance of mobile phones is in line with a study showing that the

traditional differences between various types of equipment have dissolved and that "the interpretive flexibility of the 'new' ICT" (Røpke 2010:5) is so much greater than that of the old that the possibilities for integration of computer, mobile telephone and internet into everyday practices are virtually infinite and that they permit ICT integration of practices that were previously not linked to ICT.

This study also identified a couple of general problems with ICT in relation to everyday travel that need to be handled. There is a risk in viewing the development towards a 'broadband society' without a certain degree of criticism. The conclusions of Røpke (2010) are partly linked to this, since they claim that there has been no analysis from a sustainability perspective of the potential environmental consequences (e.g. energy use and toxic emissions) of this development of a 'broadband society'. According to Røpke, "the hype on 'green ICT' tends to focus on the promises of ICT, but few of these promises are fulfilled without public intervention" (Røpke 2010:8). Our conclusion is that even if there is a need for political measures in the form of policy instruments (c.f. Shove & Walker 2010), ICT still has the potential to change, but that an objective approach should be taken to all aspects of ICT use.

However, a report from the UK (2007) shows that people like to take things with them on their journey. While they do not necessarily use these, the potential to use commute time with the help of ICT (mobiles, laptops) through having the infrastructure in place for this (wifi, sockets, tables) is regarded as important. At the same time, it is impossible to ignore the tendency for increasingly integrated functions, for example smart phones, whether commuting on public transport or by car.

Potential for ICT in commuting

How can ICT be linked to everyday travel in order to facilitate commuting from the user's point of view and also to enhance driving and opportunities for commuters to travel in an environmentally more sustainable way? What do consumers want for the future to make their commuting experience better? In the best of worlds our respondents would probably want fewer vehicles on the roads, fewer people using their choice of public transport and perfect weather conditions. Focusing more on what changes in technology and infrastructure could contribute, Ericsson ConsumerLab drew up the following list (not in any order of importance):

- Real-time Information
- Automated Safety
- Emergency Button
- Smart Traffic Management
- In-Car Voice Recognition Technologies
- Network Development and Mobile Power Reliability
- Personalised Navigation
- Improved Ticketing
- Home Office Solutions
- Connecting Car with Public Transport

Real-time Information

The study identified a great desire for more up-to-date information in both the car and public transport context. The type of information demanded is generally more or less the same as today, i.e. about traffic jams, roadworks, weather conditions, arrival times and transport alternatives etc., but one of the great differences is that it should be more personalised and relevant to the user and more clearly connected to the relevant context. For example, respondents would like to know about the road conditions on the particular roads they intend to travel, not all roads in the area, or how crowded the particular train or bus they are about to take is likely to be and whether it would be better to wait for the next one instead.

Another possible application for real-time information is 'early warning' systems, i.e. some kind of system enabling the driver to see and react to events earlier, for example predicting a traffic jam or a traffic incident, or even to 'see' cars coming around corners or through parked cars to make driving safer.

Automated Safety

Respondents expressed some desire for an automated solution that ensures a safe commute, either in the car or on public transport.

Specifics mentioned for cars were automatic braking at stop signs or maintaining a safety gap between cars and some kind of automated limiter to prevent speeding at traffic lights or dangerous lane changes. A corresponding specific for public transport commuters was a system that automatically stops the vehicle in the

event of obstacles on the track or road. Having said that, in many cases our respondents preferred warning systems over automated systems, as they had a strong need to feel in control.

Today automatic braking and similar solutions are often met with concern, as people do not fully trust technology and find it important the driver is ultimately in charge of the vehicle.

> I think an autopilot would be cool on the one hand. On the other hand, giving the control to a machine, I don't think that technology is advanced enough for this yet. Or we are just not used to it. Well 10 years ago, no one had a mobile, now I can't live without it. Maybe we will get used to autopilots. But what if technology fails? I would not feel really comfortable with it.
>
> Male, 36, Bochum/Ruhr District

Emergency Button

There was a certain perceived risk in commuting by public transport, the main fears concerning robbery and attacks. A crowd may be frightening, but not having people around can also be frightening. Therefore public transport commuters would like to have some kind of 'emergency button' to increase the sense of being safe.

This emergency button could be incorporated into the mobile phone, as this device is already seen as an important tool in ensuring safety – allowing quick access to friends and e.g. the police. However, it could be further developed and include some kind of warning system in the event of theft, accident, attack or act of terror.

Smart Traffic Management

Traffic management systems involving lanes, traffic lights, road tolls, cross-walks etc. exist, but there is a desire to improve these so that they are better adjusted to the specifics of the market and better able to adapt to the current traffic situation.

The car commuters interviewed in India, for example, did not believe that it is always possible to use the same kind of lane set-up as in other countries for the crowded streets of Mumbai and Delhi. In all countries surveyed, people believed that the traffic lights did not always act to improve traffic flow, but rather hindered it (turning red when there is no other traffic or pedestrian) and requested more adaptive traffic lights that sense the prevailing situation.

From an analytical point of view, we also believe that there is a need to 'force' people away from travelling during peak hours or when the roads are most congested. A more positive wording of this would be to 'encourage' people to commute during other times or using other routes. This could be done through e.g. dynamic road tolls (more expensive during peak hours or traffic jams) or peak hour prices on public transport, etc.

Another area of annoyance related to smarter traffic management is that road works are not planned or synchronised so that they minimise the effect on the traffic situation. Our respondents wondered whether those responsible for roadworks could plan and synchronise these so that they do not repeatedly block major roads.

Finally, something that was specifically mentioned in India was some kind of tracking system and cameras that identified drivers who do not obey the traffic rules, so that they could be taken off the roads immediately.

In-Car Voice Recognition Technologies

One of the main frustrations with driving a car is the need to focus on driving, which means keeping hands on the steering wheel. However, this frustration could be reduced by utilising the voice more, and thus using commuting time in a more efficient way. This is not simply a question of being able to make voice calls without pressing buttons, but also of turning talk into text and sending messages or taking notes that can be transferred to another device on arrival at the home or office.

The solutions directed to making the car a mobile office were the most interesting to respondents, but others mentioned voice recognition entertainment services or traffic management information too. However, it is important to bear in mind that such solutions should not distract the driver.

Network Development and Mobile Reliability

As mentioned, the smart phone has made a real difference to the commuting experience by public transport. However, there are clear limitations due to lack of connection and lack of power.

In India there may be no connection at all, while in the USA and Germany respondents wanted better, high-speed connection during the whole commute.

Charging devices was another problem. Public transport respondents wanted to be able to charge on the go as is possible in the car and for smart phones to be equipped with better battery packs or power management functions.

Today respondents adopt certain strategies on what functions to use and what to turn off, depending on the battery level, and routines to make sure e.g. that they can send important text message in time, but they would like to be less limited in their use of these devices.

Personalised Navigation

Respondents used existing navigation function, e.g. GPS in the car or travel planners on the mobile phone or online, but expressed a desire for better navigation systems – not only presenting a map, but also contextualising the information to the user's specific needs and thus avoid highways (American respondents) or bottlenecks (German and Indian respondents).

The navigation system should be driven by consumer needs, e.g. for the safest route, ways to explore the area, find a good cup of coffee or a free parking space. It should also start before the commute, providing information on when to leave, what road to take and possible delays.

Improved Ticketing

Electronic ticketing systems in the form of ticket machines exist today, but these were often not used for everyday commuting life among our respondents due to financial reasons (not buying a full month commuter pass) or to being limited to some metro stations to upload credits or buy a commuter pass. Our desk research indicated that there are mobile and online solutions for buying tickets, at least in the USA and Germany, but our respondents were not using or even aware of these.

Ericsson ConsumerLab's analytical platform also showed that a relatively low number of people use their mobile phones for tickets in general or for small payments today.

This study and other Ericsson ConsumerLab research showed that people want easier access and greater availability for purchasing and handling commuter tickets.

Home Office Solutions

Working from home was met with ambiguity. Respondents saw benefits in being able to work from home to avoid commuting and some respondents already did so. However, there were some clear barriers, both physically and emotionally. Some people have a job that requires them to be in the office (service sector and production industry etc.) or to visit clients throughout the day (sales person, domestic help, etc.). Other strong barriers were lack of social interaction with colleagues and blurring of the boundaries between home and work.

Connecting Car with Public Transport

The study showed potential for better connecting the car and the public transport network, utilising the best of both worlds (flexibility and me-time). Many respondents in the USA and Germany used both means of transport. Better connections could improve the commute for the public transport commuter and possibly make public transport more attractive for current car commuters.

By connections we mean free parking at the public transport stations, and e.g. combined travel planners for car and public transport commuters so that they show the best possible route using both means of transport.

Conclusion

Commuting time seems to be experienced as a waste of time in some sense, and the focus should therefore be on how to make the arrival faster (physically or mentally), or at least known. In the USA and Germany the respondent's aim seems to be to get between home and the final destination as quickly and smoothly as possible, while the Indian respondents seem to be more resigned and simply want to know how many hours the commute will take in order to calculate their time of arrival at the office. There also seems to be an overall need for efficiency and to save money and time rather than for achieving a more sustainable lifestyle, which is at best perceived as a welcome side-effect. Shove (2003) claims that what is perceived as 'normal' and necessary creeps, when people seek ways of coping with problems of scheduling and coordination in everyday life. If the everyday commute is seen as a social practice, it changes when people 'rush around' to synchronise their increasingly fragmented personal schedules with each other in order to meet an increasing demand for co-presence (Shove, 2002). ICT definitely plays a role in this change through helping people in their individual situations and, from a wider perspective, also contributing to changing norms and social practices. Jain & Lyons (2008) note that time must be spent in order to participate in the various social networks to which people belong. Viewed from this perspective, time becomes a gift that can be given. However in order for this time not to feel wasted, it is highly important that the commute is designed as a positive experience. This can be done by not regarding the commute as a separate entity but by eradicating the boundaries so that people can use ICT during the commute.

One way of shortening the real and/or perceived commuting time is by improving real-time traffic information, enabling commuters to better plan their commute and be more flexible as they are made aware of different ways to get from source to destination. Another is to enable commuters to better utilise their time while commuting, e.g. through offering communication services that allow car drivers to focus on their driving or public transport commuters' devices to stay connected and charged up during the whole commute. The improved real-time information and time utilisation would lead to better quality of life, as commuting can be planned around life and not the other way around.

The Ericsson ConsumerLab study identified common consumer needs across the investigated areas (commuting, energy consumption, interactions with public authorities); Lack of control/Need for efficiency/Need for (real-time) information and guidance, Need for transparency, Search for independence. In the transport area these needs can be approached through e.g. offering real time traffic information systems that better take the commuter's context and preferences into account. Or via more dynamic traffic management systems, that better adjust according to the situation (traffic peak hours, road constructions, accidents, weather conditions, type of vehicles travelling the road etc).

Regarding ICT this report confirms the desire for reliable access to the internet and/or mobile phone network. The mobile phone is currently the most important internet device while commuting. Traffic management seem to have a role to fill

for both car and public transport commuters. Better interconnection between car and public transport in terms of travel planning and parking and ticketing options could thus be beneficial.

Aspirations for continued research

A broad, methodological approach that can be used for a deeper sociological understanding of how and why people travel is the well-established 'activity approach' (Fox 1995). This views travel as a complex phenomenon, depending on the various needs and demands of individual users that justify their activities, and on the potential and opportunities they have to fulfil them. Both objective and subjective factors affecting travel behaviour can be taken into account. The method also takes a 'situational approach' to transportation patterns, whereby individual trips are seen as parts of a "highly complex series of interrelationships of various trips, in-home, out-of-home and household activities" (Fox 1995; Sammer 2009). A qualitative method is necessary to identify how changing conditions, such as the introduction of new ICTs in everyday life, can lead to changes in such complex interrelationships.

A basic implicit assumption in this study was that transport is a constituent of everyday life. It is through transportation, physical or virtual, that humans connect to other people, and get access to different resources and activities. How transportation is interwoven with everyday life and commitments has been theorised previously (Maxwell 2001; Miller 2001; Sheller 2004). A related theoretical starting point is that today's travellers are members of social communities that stretch beyond their local neighbourhoods, and that they are dependent on technological artefacts and infrastructures to maintain their activities (Axhausen et al. 2009). This means that everyday life is a socio-technical project. In order to gain access to resources, activities and other people situated outside their area of residence, people use technology and financial resources in relation to their social relations and cultural values (Hannam et al. 2006).

This study showed that factors in everyday life, such as resources, opportunities and values, seem important. Examples of these were 'me-time' and 'anti-car decisions'. If switching from car to public transport commuting is seen as a means to reduce stress, technology could in some cases tip the balance for individuals and make them actually try out the new behaviour. This implies that methodological tools for understanding how different factors interact in everyday lives are needed. In light of our investigation, this kind of framework seems useful for further studies and analyses.

This study also indicated that commuters in large cities are 'networked travellers' (Axhausen, et al. 2009) in the sense that their social networks are dispersed and complex in terms of coordinating activities and contacts with other people in space and time, and also in the sense that they are dependent on technological networks and infrastructures to maintain their social networks. Thus, the everyday networks that they build are heterogeneous and include humans and non-humans (Law 1987; Latour 1996). Everyday life could be seen as a socio-technical project, and also as a 'residing project', when seen from the viewpoint of the home as a

base from which travel has its start and end points. People manage their residing projects through assembling networks that include everything from technology and financial resources to social relations and cultural values (Hannam, Sheller et al. 2006). How successful people are depends on how they manage to create complete and smooth everyday networks and stabilise and maintain these. The elements of these networks may be more or less co-operative.

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