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Snow, Buses, and Mobile Data Services

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Abstract
Development and advancement of Information Society in on agenda of many nation states today. As scholars, we can contribute to the effort by attempting to reconcile the official rhetoric with the real life situations of citizens. Triggered by an observation of social behavior of public transport passengers during one of the winter bus drivers' strike day in the City of Copenhagen, this case study attempts to reveal the extent to which advanced mobile data services are used by the population. This study adds to the growing awareness that the success of establishing Information Society should not be measured by the number of available services to citizens over the wireline and mobile Internet. Drawing on theories of social learning, sensemaking, and ethnographical studies of infrastructure, we are attempting to answer the question â why people do not use advanced data services in situations when the use of such services is perceived as important?â

Keywords: Cellular Mobile Data Service; Information Society; Social Behavior; ICT Infrastructure; Case Study; Anecdote

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Snow, buses, and mobile data services

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Abstract

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Keywords: cellular mobile data service; Information Society; social behavior; ICT infrastructure; case study; anecdote

1. Introduction

Every year, Information Society Index (ISI) show ever growing measures for nation states' abilities to participate in the Information Revolution[1] (The WorldPaper, 2003a) (Table 1). Denmark has been topping the list since 2003 (The WorldPaper, 2003a, 2003b). This means that Denmark is one of the few countries, which has been visibly successful in development of Information and Communication Technology (ICT) infrastructure and promotion of the diffusion of ICT in all spheres of social and economic activity.

The recent statistics on Internet and mobile communications use in Denmark show high diffusion rates of both these technologies. The number of mobile subscribers in Denmark surpassed that of Internet-enabled PCs. In 2004 it reached high 95%. The same year, 83% of the population had access to the Internet either at home or from work (Danmarks Statistik, 2004). Wheres only 7% of the population had fast Internet access in 2001 (e.g. ADSL), the figures for 2004 read an impressive 32% (Danmarks Statistik, 2004).

[1] Information Society, National Information Infrastructure, Information Technology Revolution – all these concepts center around the issue of building *pervasive* national information *processing and communication infrastructures* (Castells, 1996, p.29).

Table 1.
The 2003 Information Society Index. Source: (The WorldPaper, 2003a).

Country	Rank						
					Overall		
	Comp.	Telco	Web	Social	2003	2002	2000
Denmark	3	5	4	5	1	5	5
Sweden	7	6	1	3	2	1	1
Netherlands	1	10	13	9	3	6	10
Finland	15	11	6	1	4	8	3
Canada	5	25	3	6	5	14	12
Norway	12	13	5	4	6	3	7
U.S.	2	23	8	8	7	4	4
Switzerland	10	12	9	11	8	3	7
U.K.	8	15	12	12	9	7	6

The number of data-enabled cellular mobile subscriptions at the end of the same year was 43%, reaching 70% by the end of 2005 (National IT and Telecom Agency, 2005). Having made a tremendous leap forward from only 3% in 2003, the gap between PC- and phone-enabled Internet access terminals is closing rapidly. At the same time, communication and information continue to be the most popular purpose for use of the Internet by the Danes.

Another benchmark on the advancement of the Danish Information Society is the ITU Digital Access Index (DAI). DAI measures the overall ability of individuals in a country to access and use Information and Communication Technology. It takes into account five variables: infrastructure, affordability, knowledge, quality, and usage (Table 2).

Table 2.
ITU Digital Access Index: Top 10 countries. Source: (ITU, 2003).

Country	Index	Country	Index
Sweden	0,85	The Netherlands	0,79
Denmark	0,83	Hong Kong, PRC	0,79
Iceland	0,82	Finland	0,79
Korea (Rep.)	0,82	Taiwan	0,79
Norway	0,79	Canada	0,78

All benchmarks combined, official rhetoric portrays Danes as "netizens"[2] – well equipped in terms of availability of both technical infrastructure for provision of advanced data services, knowledge on how to access and use these services, and means to pay for it.

On the backdrop of the official rhetoric, there is a growing criticism (1) that the provision of advanced data services to the citizens is often driven by political rationale (Lines, 2005); (2) that focus in developing service infrastructure is almost always on the producers of ICT systems and services, but not on the citizens or end-users (Ilshammar *et al.*, 2005, p.36); and finally, (3) that there is a lack of proper measurement methods – all rankings exclusively focus on the supply of services, and fail to look at the demand side of services (Andersen *et al.*, 2005).

[2] The citizens of Information Society (Hauben & Hauben, 1997).

The lack of proper measurement methods is substantiated by two dilemmas. First, the question of how to reconcile the political rhetoric of information society development to the use of specific technologies remains largely unanswered (Brey, 2003, p.66; Fomin, 2003). Second, in studies of social behavior of citizens with regard to their use of ICT, reliance on indirect questionnaire methods of measuring behavior is inadequate - the behavior and its interactive elements should be directly observed *in situ* (Davis & Luthans, 1980, p.285).

Mindful about the aforementioned criticism, in this paper we present a case study on the actual use of data services by citizens. Our work is inspired by the publication of Leonard Jessup and Daniel Robey (2002), in which the authors use anecdotes to demonstrate what advanced service possibilities are afforded by ubiquitous technology as contrasted to the residue of social behavior. We present one of such anecdotes of social behavior of public transport passengers during one of the winter days in the City of Copenhagen, when bus drivers were on strike and the transportation services were disrupted. In this case study we report on the low usage of advanced mobile data services by the population, suggest reasons for that, as well as provide suggestions on how design of advanced services must be guided.

The paper is organized as follows. In the next section we present research questions and setup. In Section 3 the case and methods are presented. In Section 4 we analyze the case data. The paper ends with conclusions.

2. Research questions and setup

The actual degree to which the infrastructure and the services are used by citizens (Flak *et al.*, 2005) is at the focal point of this study. We are aiming to respond to the growing criticism on inadequacy of official rhetoric on the degree of advancement of ICT infrastructure and service development, as exemplified in such "successful" projects in Denmark as digital signature and e-procurement portal, where successful policy implementation was followed by system's use at levels below any expectations (Henriksen & Mahnke, 2005).

The question we are posing is this: "to what extent people are using advanced data services permitted by the ICT infrastructure in situation when the use of such services can be perceived as important?" Specifically, we are examining situation when the contextual constraints, that otherwise embody dominant meanings of adequate behavior, have changed, resulting in decrease of meaning and the need to reconstruct it by using available communication channels (Weick, 1993, p.646).

2.1. Theoretical approach

In order to embark on the type of analysis we have outlined, we conceptualize the Information Society as the "structure", defined by three dimensions – the environment (afforded by the ICT infrastructure and availability of services, as well as social routines of citizens), the citizens, and their behavior (See Figure 1).

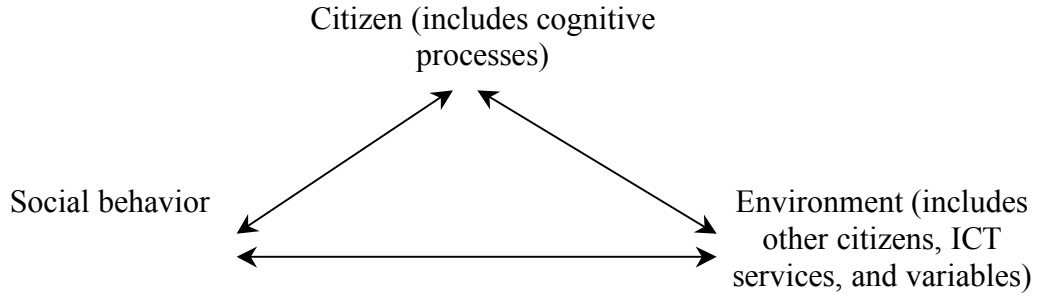

Figure 1. The socio-technical structure of Information society as a social learning system. Adapted from (Davis & Luthans, 1980, p.283).

Conceptualizing Information Society in the aforementioned way is permitted by two relevant bodies of literature for studying uses of advanced data services, and the specific situation to which our analysis is applied.

First, our study is based on *in situ* observation of people's behavior in specific situation, where there is a need for obtaining information in order to make sense of the changes in the environment (Weick, 1993). Thus, we must understand what is perceived as the "normal" environment by citizens in the specific case situation. For this purpose, a micro-perspective on the ICT infrastructure development (Star, 1999) is used. This theoretical base is concerned with how ICT infrastructure is used in and affected by everyday interactions of micro-actors, i.e., citizens. The ICT infrastructure, being the "core" of the rhetoric on the Information Society's advancement (Castells, 1996), is the constituent of environment in which everyday life of citizens takes place.

Second, to make sense of the observed behavior, theory of organizational behavior is used. Specifically, we take the social learning approach to organizational behavior studies, which focus on reciprocal interaction between behavior, cognitive processes and the environment (Davis & Luthans, 1980). In social learning approach, social behavior is viewed as affecting and being affected by the participant's cognitions, the environment, and the person-situation interactions (Davis & Luthans, 1980, p.283).

By drawing on studies of infrastructural development and social learning, we are able to conceptualize the daily interactions of citizens vis-à-vis ICT services as a structure, defined as "a complex medium of control which is continually produced and recreated in interaction and yet shapes that interaction" (Weick, 1993, pp.644-645).

Indeed, the official political rhetoric on advancement of ICT services is guided by the "control" rationale – citizens must be given ever-more efficient mechanisms to organize their daily routines, especially, when something in the environment is perceived as "out of control" (Council of the European Union, 2002). One dimension of Information Society which has seen a tremendous advancement during the last decade, and which is often credited for affording the citizens "more control" over their lives, is cellular mobile communications.

2.2. Research context

Since the introduction of affordable services and mobile handsets in the early 1990s (Fomin, 2001), there number of cellular mobile phones in use worldwide reached 1.3 billion, exceeding the combined number of PCs and TV sets (Tilson & Lyytinen, 2004). This fact contributes to the vision of Information Society, were information services must be accessible by using different communication media channels, including the cellular mobile data (Council of the European Union, 2002).

On the backdrop of explosive growth of cellular mobile communications, the mobile

industry has been offering data communications services since the early 2000s, when WAP[3] protocol has been introduced. The cellular mobile phones sold today offer a varying degree of computing capabilities built into the handsets for the delivery of a very wide range of non-voice services (Tilson & Lyytinen, 2004). Not only access to public authority's web sites is afforded by the use of cellular mobile handsets. There is also a growing number of mobile-device-tailored WAP-sites offered by public authorities.

The volume of cellular mobile data (GPRS) in Denmark can be taken as a proxy for measuring extent to which people use their mobile handsets to access information services (including entertainment). The actual mobile data usage increased from zero Mega Bytes (MB) in the first half of 2002 to 323.564 MB in the 1st half of 2003, and to 7.575.868 MB by the end of 2005 (National IT and Telecom Agency, 2004b, 2005). This growth is suspiciously proportional to the growth of the usage of Multimedia Messaging (MMS), which requires the usage of GPRS, and which grew from 0.5 million MMS in 2003 to over 8 million in 2004 (National IT and Telecom Agency, 2004a). This fact reaffirms the concern that reliance on indirect measurement methods is inadequate for studying social behavior (Davis & Luthans, 1980; Ellwood, 1924).

Despite the rising ubiquity of communication technology, and the density of information services offered on web- and WAP-sites of public and private organizations, there is a growing awareness that the availability of often very complex services does not necessarily reflect the extent to which people are using the services, and the percentage of population using the services (Daniel & Wilson, 2003, p.285). Having this issue in mind, we present the case study for subsequent analysis.

3. The case study

3.1. Research methods

Among the sources of evidence used for presenting this case were direct observation, statistical records on data and phone usage, interviews, personal experience, and newspaper and company publications.

Direct observation (Ellwood, 1924) occurred in January of 2006, during one of the bus drivers' strike days. Personal experience of the author as an advanced user and knowledgeable scholar of mobile telephony technology allowed him to suggest initial hypothesis (Weick, 1993) on the lower-than-official-rhetoric-tells usage of mobile data services. Direct observation also triggered the initial interest (Weick, 1989) is conducting the case study.

Consequently, the Copenhagen City's public transportation authority (HUR) was contacted in order to obtain data on the availability and usage of different media channels offering information on times tables, routes, etc. Short telephone interviews with HUR employees responsible for mobile data portal and customer call centre were conducted. Data collection was complemented by newspapers publications on the consequences of the strike, statistics from HUR's annual report, and direct observation of the "case site", i.e., the public bus' stop.

[3] Wireless Application Protocol (WAP) – is an open international standard for applications that use wireless communication (for example, Internet access from a mobile phone). WAP was designed to provide services equivalent to a web browser with some mobile-specific additions, being specifically designed to address the limitations of very small portable devices. It is now the protocol used for the majority of the world's mobile Internet sites, otherwise known as WAP-sites (Wikipedia.org, 2006).

Having collected data using the above sources, we tried to draw as representative picture as possible on how people in the Copenhagen city use (or do not use) advanced mobile data services provided by the public transportation authority.

3.2. Public Transportation Authority – HUR

HUR is a politically-governed regional organization for public transport covering the Greater Copenhagen Region. Every day, HUR transport carries approximately 550.000 passengers in the Greater Copenhagen area (HUR, 2006c). A-lines are the backbone of public transport in the greater city of Copenhagen. All six A-lines are among the top-ten bus lines in terms of passenger traffic (Table 3). They run with an interval of just several minutes, and each third stop features an electronic interval display (displaying the number of minutes for the next bus to arrive). In 2005, A-lines have carried over 61 million of passengers. This represents some 60% of all passenger traffic in the greater city of Copenhagen (HUR, 2005).

Table 3: Top 10 bus lines in terms of passenger traffic. Source: (HUR, 2006c).

Line	5A	2A	4A	6A	350S	1A	3A	18	15	300S
Passenger traffic (mil. per annum)	17	10,5	10,2	9,5	8,3	8,2	5,4	5,3	5,2	4,6

The public transport authority of the city of Copenhagen offers advanced information services accessible to citizens over a remarkable number of media: Radio, TV text, billboards, Internet, cellular mobile data services, SMS, to name few (Table 4).

Table 4: HUR service information offered through different media channels. Source: (HUR, 2006b).

Priority #	Media channel	Information push / pull	Premium priced
1	Radio news broadcast	Push	Free
2	TV Text	Pull	Free
3	TV news broadcast	Push	Free
4	Call center automatic voice response	Pull	Free
5	HUR web page	Pull	Free
6	HUR information boards in the downtown	Push	Free
7	SMS automatic response	Pull	Premium
8	WAP (HUR's own WAP portal, and through 3rd party service providers)	Pull	Premium

Additional media channel, delivering “immediate” information to people at the bus stop, is an electronic display indicating remaining wait time in minutes (see Figure 2). Other channels are either accessible from home (TV, Internet pages), or from portable mobile devices: radio, cellular mobile handset.

Figure 2: Bus stop, line 4A

According to HUR (2006a), the actual use of WAP portal, where there are bus timetables offered in real-time, is some 10 times lower than originally expected. In the month of May 2006, HUR will be discussing a possibility to abandon the nominal fee of DKK 1,50 per WAP inquiry, as the revenue from this service provision is far below the expected, and dropping the charge may stimulate the use. However, the real concern for low use of WAP services is the small number of lines covered with the real-time bus schedules service – i.e., this is available only for six A-lines at the moment (HUR, 2006a).

Despite the significance of A-lines, provision of real-time schedules over WAP is rather a political or technocrat solution at the moment (Ilshammar et al., 2005, p.36) – when the time intervals are short, and there are other, free information channels available, the need for premium-paid WAP services is not justified.

This "problem" is, however, being fixed. HUR has already developed a technological solution to provide real-time schedules for all 303 bus lines. If the challenges of negotiating with independent entrepreneur companies providing bus services for HUR and providing training to some 4.000 bus drivers can be coped with successfully, HUR will be rolling out the real-time WAP scheduling for all lines by end of 2006 (HUR, 2006a).

To summarize on the services provided by HUR and their actual use, phone call inquiries appear to be the preferred way for obtaining traffic information by citizens (Table 5). On average, customer centre receives 1.700-1.800 calls per day (HUR, 2006b). Number of visitors at www.hur.dk in 2005 varied between 8.000 per month during the summer holiday season, and the maximum of 11.000 during the winter months (HUR, 2005). This represents only some 25% of the phone call inquiries. Number of premium-priced WAP inquiries is only some 25% of the number of web visitors. Finally, the least popular media channel for traffic inquiries is the premium-priced SMS service (Table 5).

Table 5: HUR media channel statistics during the months of 2006 winter strikes. Sources: (HUR, 2006b).

	# of calls to the call centre	# of visitors at www.hur.dk	# of premium-priced requests at wap.hur.dk	# of premium-priced SMS requests
January '06	70.220	14.251	3.949	1.221
February '06	48.728	12.664	2.895	1.294

4. Snow, buses, and advanced data services

It was just another winter day in the capital city of Copenhagen in Denmark – country which prides itself, not unreasonably, with sound achievements in the field of Information Society. What was making this day different was a snow. Snow which was falling for a third day in a row, and which, apparently, city authorities were not well prepared to cope with. While reason for unpreparedness is simple and well grounded in trivial economic considerations, the effects the snowfall was causing were several. One effect to mention was that roads were not cleaned properly, causing traffic congestion, accidents, and apparent dissatisfaction of public bus drivers with the road conditions. More so, the bus drivers were blaming the city authorities for not cleaning the roads properly. The dissatisfaction grew proportionally to the amount of snow on the streets, reaching its apogee in a form of a bus driver's strike. The strike was reported to have disrupted the daily routines of some 200.000 passengers (Nivaro & Agger, 2006).

I happened to be waiting for one of the buses which did not go that day. It was the morning rush hour, and the bus line was 4A. The bus stop I found myself at, was a busy traffic intersection with several other bus and train lines. The time interval for 4A is 5 to 7 minutes throughout the day – this was clearly stated on the timetable displayed at the stop (see Figure 2). After waiting for some 10 minutes, I started to pay attention to what was going on around me, trying to make sense of the situation.

The direct observation of the anecdotal situation I found myself in became a trigger for subsequent case analysis. To find answers to the question "why people are not using available information services in situations when there is a perceived need for it?" data on different media channels available to the passengers were collected. In other words, in order shed light on the cognitive processes or citizens, which represents one of the dimensions of the socio-technical structure of Information Society, as conceptualized above (see Figure 1), we had to reconstruct the other two dimensions – the observed behavior and the environment.

4.1. In situ observation of behavior

4.1.1. Observation 1: people are patient

The first important observation I made was that I was not alone. At least 10 other people at the same stop, and the number was increasing over time. Thus, in the jargon of organizational studies we were a "temporary group in the early stages of its history" (Weick, 1993, p.644). This fact, combined with the lack of communication among the group members made us vulnerable to disruptions in the environment (Weick, 1993, p.644). As everybody's patience was tried by the absence of a bus, people were more often looking into the direction where the bus should be arriving from. Attempting to make sense of the situation, now and then somebody would look at the electronic display (see Figure 2), which normally would indicate

the number of minutes until the next bus' arrival[4]. The display was dead. This caused people to turn away and continue looking into opposite direction – where the bus should be arriving from. As the time was passing, some people were hesitantly taking their cellular mobile handsets into their palms, as if not knowing how to make use of this technology gadget.

4.1.2. Observation 2: people use their mobile phones to tell their are late

Some, though not many people, made phone calls. Few were typing short messages. I did not pay attention to the exact content of the conversations, although from the facial expressions of those talking I could guess that they were talking to their friends or colleagues, rather than calling to the transport authorities to make inquiries on the fact of non-arrival of a bus. In cases when organizational structures are disrupted, people re-create meaning by communicating with others (Weick, 1993). While it may be natural for strangers on a bus stop not to interact with each other, using mobile phone as a communication channel to seek meaning from outside the immediate setting appeared to be the part of "structure" passengers had in mind (Weick, 1993, p.640).

Following the suit, I called my wife and complained about the fact that I had to wait for a bus, and that the weather was lousy. I felt better after having somebody listened to how much trouble I had, hang up, and continued to wait. So did the other owners of mobile phones, some of them continuing to use the technology to kill the time.

4.1.3. Observation 3: people just walk away

As people were starting to loose patience, they'd either waived to a passing taxi, or walked away from the stop. This appeared to be a case, when people are unable to negotiate strangeness through meaning-seeking interaction, have their frameworks and meanings destroyed rather than construct each other, and seek escape by physical means (Weick, 1993, p.645). After some 40 minutes of waiting at the bus stop and not being able to conceptualize the situation as familiar, as one where I can re-create the meaning by drawing on e.g., information services available through my voice- and data-enabled cellular mobile phone, I walked away, too, going in the direction of my school. After walking three blocks, I took another bus, which was a different line, but was going in the same direction. 20 minutes later I was entering my office.

The first thing I did in the office, I asked my colleagues whether they could explain me why I had to wait for 40 minutes for a bus. "There is a strike", was the answer. The answer struck me by its simplicity, and by the fact that I most likely could have found out about the strike earlier, while at the bus stop, by the means of what is acknowledged to be a ubiquitous technology – a cellular mobile telephony. Why haven't I done so? Why haven't the others?

4.2. The environment

The situation-specific direct observation presented above, described the behavior of citizens and attempted to make an "informed guess" on their cognitive processes by drawing on sensemaking theory (Weick, 1979). Specifically, analysis of group behavior in abnormal situations was used (Weick, 1993).

Environment, in which the passengers were emerged, and which was casting "strengeness" on them, has to be reconstructed, too.

[4] Not unlike on the day of strike, when the display was blank, this picture was taken later, on the normal day – hence the display indicates "1".

4.2.1. The wait time display

The electronic display at the bus stop did not display anything on January 20th. Dead. Maybe out of order. Maybe for other reasons. How often do we take a dead display as a sign of non-availability of service? Technologies *are* equivocal because they can be interpreted in multiple and perhaps conflicting ways (Fulk, 1993, p.922).

4.2.2. Voice

While observing how people were using their cellular phones at the bus stop, I came to the conclusions that they were merely talking to friends and colleagues, and not calling for bus service information update. The reason I come to this conclusion is trivial – should anyone called the HUR Customer Center (the phone number is displayed at any bus stop, see Figure 3), following a typical group sense-making behavior (Weick, 1993) this person would have informed the others, and everyone would leave seeking an alternative transportation.

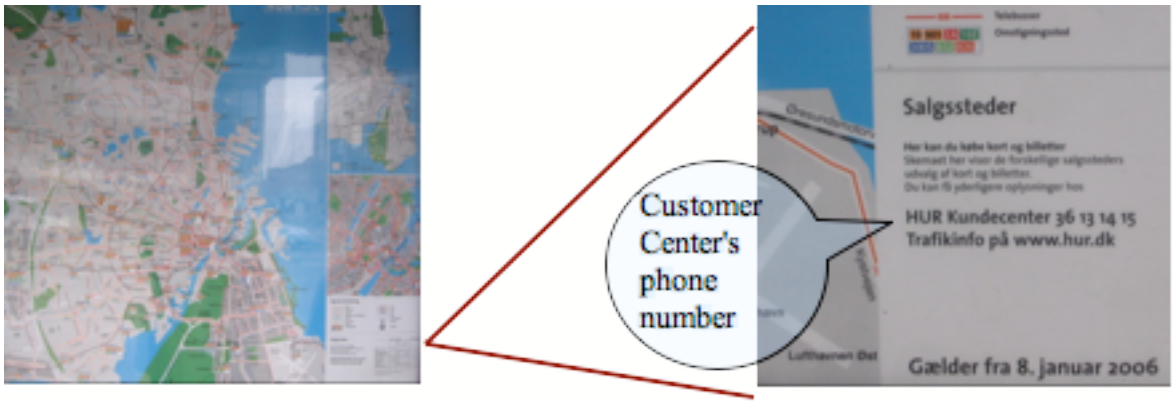

Figure 3: Bus stop, line 4A: HUR transportation map and the Customer Center phone number

Ex-post data obtained from HUR indicate that the number of phone calls to the HUR Customer Center on January 20 was threefold, compared to the usual daily load of 1.700-1.800 (see Table 6). This means that people were indeed using the traditional and socially well accepted technology (Jessup & Daniel, 2002) to get access to the information. Unfortunately, not anyone from my stop, though. And, obviously, incommensurably with the 200.000 reportedly affected by the strike passengers (Nivaro & Agger, 2006).

Table 6. HUR media channel statistics during 2006 winter strike days. Sources: (HUR, 2006b).

Strike days	Bus lines on strike	Of those A-lines (real-time WAP)	# of paid-for inquiries on wap.hur.dk	# of calls to the call centre	WAP / calls (%)
Jan. 20	14	2	232	5.461	4,24
Jan. 25	14	2	227	7.720	2,94
Jan. 26	21	3	173	6.453	2,68
Jan. 30	1	1	134	2.872	4,66
Feb. 13	27	0	159	3.616	4,39
Feb. 14	27	0	134	3.387	3,95
Feb. 20	14	0	74	3.261	2,26

4.2.3. Short Messages (SMS)

While waiting for the bus, I remembered seeing HUR's ads on buses about the advanced information services I can get by sending premium-priced (this was in small text, of course) SMS to a specific number. Too bad, I did not remember what exactly I had to send and to which number. I looked at the various information posters at the bus stop – there was a map of city public transportation lines, several timetables, and some other information (see Figure 2 and Figure 3). No mentioning of SMS services. In ex-post inquiry to HUR, we found out that the only place where information on how to make SMS inquiries on bus schedules is HUR's web site (HUR, 2006a).

4.2.4. WAP – cellular mobile data services

HUR hosts own WAP portal at wap.hur.dk. Looking at the services HUR is offering over WAP to cellular mobile subscribers, one must admit it is an easy way to find out traffic information on any of HUR's bus lines[5]. From more than a dozen of cellular service providers in Denmark, most offer data services and data access portals with little variance in type of services offered. Two of the three largest service providers – Sonofon[6] (of Telenor) and Telia[7] (of Telia-Sonera) – have HUR Traffic service embedded in their WAP portals[8], accessible by clicking "online" button on subscribers' handsets. Table 7 presents the procedure for obtaining information which, should it have been followed on January 20, would make the person aware of the fact that line 4A was closed that date.

[5] However, at the moment only timetables for A-lines are being updated in real-time for the WAP portal.

[6] www.sonofon.dk.

[7] www.telia.dk.

[8] For other service providers' subscribers, access to HUR's portal is as easy as entering "wap.hur.dk" in the mobile handset's Internet (WAP) browser.

Table 7: Traffic information inquiry via HUR's WAP-site

Action	Wait time after the action (sec)	Choices available
Accessing Main menu (by pressing "Online" button on the mobile handset)	17	7th choice in the menu: "Traffic"
Choosing "Traffic" from the main menu	6	3rd choice: "HUR". Possible actions offered: -Enter the stop name or number -Enter the bus line number -Choose a bus line (a list of groups of lines provided
Choosing "Choose a bus line", selecting group "1-32"	8	4th choice: "4A"
Choosing "4A"		The user is offered two choices: "OK" and "Cancel". I have to read through the text under the choices. The text warns that a fee of DKK 1,50 will be charged if I choose "OK".
Agreeing on the DKK 1,50 fee	15	Choice of the two directions for the line. In no time, a list of all the stops on the line is displayed
Choosing the stop name	5	A list of the next 10 departures from the bus stop of my choice.
Total:	51	

Only 51 seconds of wait time for the low bandwidth GPRS connection, plus my interfacing with the mobile handset, plus the awareness of the fact that DKK[9] 1,50 will be added to my bill – an easy and affordable way to find out about the arrival time for the next bus. In the ex-post inquiry to HUR, it was confirmed that during the strike days HUR's WAP portal was providing information on the cancellation of all A-lines (1A through 6A).

5. Lessons learned

Why have I (and some 20 more people) waited for that bus, which never came? There is probably no simple and comprehensive answer to this question. However, I suggest that there are three lessons one can learn from this anecdote.

5.1. Lesson 1: awareness of availability of services

An obvious lesson we learn from the case study is that people at the bus stop were not aware of the strike. More so, they apparently were not aware of the fact, that their mobile handsets could be used as a tool to access the needed information through several media channels.

[9] The amount of DKK 1.50 approximately equals 0,20 €.

Drawing on ethnographical approach to studies of infrastructure, we can conclude that mobile data services were not part of the waiting passengers "own version of modernity" (Edwards, 2003, p.28). As Star (1999, p.380) points out, an infrastructure is "fundamentally a relational concept, becoming a real infrastructure in relation to organized practices." In consequence, "infrastructure appears only as a relational property, not a thing stripped of use" (Star & Ruhleder, 1996, p.113). The troubled passengers could not think of mobile data services in the situation where information afforded by those services would allow the passengers to regain control over the situation. This means than data services were simply not a part of the modernity structure they had in their minds (Weick, 1993, p.640).
To pay justice to HUR's efforts in developing advanced data services, quite advanced ICT infrastructure was there, providing services "stripped of use". It is the passengers, who were not "modern" enough to take advantage of the services (Edwards, 2003). Because infrastructures and services they provide are learned as part of membership, we can speculate that HUR's efforts in promoting the services and educating the citizens on the use of those services was insufficient. HUR reported that they have had two ad campaigns for their WAP portal services during November-December 2005 (HUR, 2006a). The campaigns, however, where limited to the information printed on the timetable booklets available in buses (see

Figure 4), and posted on HUR's web site. No information on availability of WAP services could be found at bus stops. This should not come as a surprise, given that the budget for campaign was limited to DKK[10] 300.000.

[10] The amount of DKK 300.000 approximately equals 40.000 €.

Figure 4: HUR leaflet available in a bus: the cover and back pages, and the WAP portal's address.

Advertisement of availability of "embedded" HUR portal through two major cellular telephony service providers is left to those service providers' discretion. Cellular mobile telephony service providers see the continuing growth of voice traffic, while data revenues are less than 3 per cent of the voice revenues (Fomin & Gao, 2005). In the highly product-differentiated market, voice is still the main driver for service providers, and the main communication media for the users. Under those circumstances, priorities are probably not set on increasing awareness of specific data services. I must admit here, I have never received any ad leaflet from my service provider on services they list on their WAP portal.

5.2. Lesson 2: complexity of the service?

The example of HUR's WAP service illustrates an inherently complex setup, where availability of the service is constrained by several variables: (1) a public-private partnership between HUR and third-party service providers; (2) political decisions on budget allocations for the promotion of HUR's WAP portal, as well as for the development of new services; (3) technology constrains, such as availability of WAP-enabled phones; (4) residual social behavior associated with the use of mobile phones, which is a reflection of "modernity", where (5) using mobile phones for making phone calls is still the dominant behavior, and not the access to data services.

Developing advanced data services and making sure that they are known and accessible by

the intended user population requires not only appropriate technology to support the service offering, but the adequate institutional and social factors to be aligned with the technological capability (Fomin & Blechar, 2005; Geels, 2002). Using the jargon of social learning approach to organizational studies, this means that in order for the data services to be used in the situation we observed, currently dominant cognitive frames must be amended to foster sought-for behavior. The observed interaction loop between the cognitive, environment, and behavior (Davis & Luthans, 1980, p.285), could be characterized as follows:

"Bus delay -> Ask somebody for the meaning -> Use mobile phone".

Instead, a new structure must be instantiated (Weick, 1993), such as e.g.,:

"Bus delay -> Get real-time timetable to recreate the meaning -> Use mobile phone".

This is likely to take time, before citizens of Information Society will use mobile data services as intuitively, as they use voice services today (Edwards, 2003).

As anecdotal as it can be, a low-tech media channel available – the electronic display on a bus stop – was not displaying anything on the day of strike. This simple indicator of unavailability of service (as intended by the transportation agency) was not interpreted adequately by the citizens. This illustrates that even simple technological solutions with very rigid functionality leave space for "interpretive flexibility" (Bijker, 1995), leading to contradictory outcomes in the technology-social interaction (Jessup & Daniel, 2002).

5.3. Lesson 3: catching the consumer

The slow adoption of mobile data services in Europe emphasizes the criticality of what Silverstone and Mansell (1996, p.222) called "finding and catching the consumer" under the conditions of the uncertainty of demand for new ICT services (Fomin & Gao, 2005).

The ultimate measure for success of developing advanced information services must be not the availability of Internet-enabled handsets and statistics on mobile data traffic, but the extent to which people are aware about the availability of relevant services (Jessup & Daniel, 2002), are using the services (Silverstone & Mansell, 1996, p.223), and the percentage of population using the services (Daniel & Wilson, 2003, p.285).

Instead of casting a wide net of advanced data services in an attempt to catch "a consumer", situation- and technology-related behaviors and attitudes can be modeled and studied through real-life observations. This approach increases the likelihood that services targeting "the consumer" can be developed (Fulk, 1993, p.923), thus fostering the developemt *and* usage of situation-specific services.

While our situation-specific case analysis clearly indicates that there were all technical means for accessing data services, and that there is growing trend of usage of mobile data services in Denmark, the process of creating citizens' awareness of available services and their actual use still has a space for improvement. And snow, as rare as it is in Denmark, may be the missing catalyst for the faster advancement of Information Society.

6. Limitations and further research

In this case study we attempted to study behavior patterns with respect to usage of advanced mobile data services in specific contextual conditions (Davis & Luthans, 1980, p.287). While direct observation of social behavior is an important method for assessing

advancement of Information Society's development, our study is limited to a single observation, which limits the generalizability of findings.

Despite the limitations, a simple linear regression analysis of data with strike as a dummy variable showed that 19.7% of the variance in premium-paid WAP inquiries was accounted for (constant 109,82, B1 = 52,03, df=57, t=3.74, p<0,001). This result is motivating to further the research, by e.g., surveying Danish citizens on their preferred media channels for obtaining information in crisis situations (Althaus, 2002), and thus gaining better understanding on how the modern ICT infrastructure is perceived as "useful".

Finally, the adopted framework addresses the issue of "user-free" design rationale of ICT infrastructure (Flak et al., 2005). We followed the call to shift the research focus from "situation-free people with broad trait adjectives to analyzing the specific interactions between conditions and the cognitions and behaviors of interest" (Davis & Luthans, 1980, p.287). Studying organizational behavior *in situ* bears a promise of better understanding of the person-behavior-environment dynamic, which must be a preferred rationale for driving the design of services in the Information Society, rather than the currently dominant political one (Brey, 2003; Lines, 2005).

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