



Snow, buses, and mobile data services in the information age

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ABSTRACT

This paper examines the situation of non-use of mobile data and voice services. The observed behavior is at odds with positivist socio-economic theories and commonsensical understanding of the possibilities brought about by the ubiquitous information and communications technology environment. Using a multi-method and theoretical framework designed to combine positivist and interpretative approaches, we attempt at developing new insights into the inter-related roles of ICT and consumer behavior in real-life situations. The findings challenge the commonsensical rhetoric on the advancement of Information Society and provide insights for the design of useful information and communication services.

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1. Introduction

Mobile ICT, which can support anytime-anyplace computing using portable devices and wireless networks, has emerged as an important constituent of modern Information Society. Ubiquitous access to information and applications is commonly seen as catering for greater flexibility and control in daily organizing of citizens (Council of the European Union, 2002), while socio-economic theories on rational behavior predict such service use (Crossan et al., 2005).

In this paper we report on impartiality of predictions based on common rhetoric of the advancement of Information Society and a-priori positivist theory. The analysis involves a confrontation of the positivist thinking on rational socio-economic behavior in specific circumstances with direct observation of non-use behavior. Specifically, we build a case study in order to interpret the behavior of people at a bus stop in the Danish capital city during one of the days when the city's public transport services were disrupted due to a strike. While bus arrival time information was available to the waiting passengers over a number of media channels, including mobile cellular data, a very low usage of cellular data and voice services was observed.

Using a multi-method technique and following the methodological logic proposed by Lee (1991), we attempt to re-formulate the positivist understanding of consumer behavior related to the uses of ICT services. Specifically, we argue that fresh insights are needed on the learning mechanisms associated with novel technology and service adoption decisions. We use “new” extant theories on consumer practices, sense-making, and infrastructural development to explain the “confusing” observed behavior in a new light.

This paper is organized as follows. First, we introduce socio-economic rhetoric on the advancement of Information Society, a rich case description, and the positivist theory on the behavioral and communicative aspects of organizing in crisis

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situations. By applying hypothetico-deductive logic on the common socio-economic rhetoric, we make predictions on rational behavior of citizens in specific circumstances of uncertainty and time pressure. Next, the predictions are confronted with the collected field data and interpretations. The found discrepancy between the initial propositions and the subsequent interpretations is used to re-formulate the interpretations in the light of “new” extant theories on consumer behavior, social learning, and sense-making, thus resolving the initial “confusing” interpretation. Finally, new theoretical propositions are made, and contribution to management practice is discussed.

2. Research methods

Research dealing with complex phenomena or relationships, such as the development and uses of cellular mobile services in the Information Society, requires a scholar to understand the complexities of the local and global contexts, in which the citizen–technology–society interaction takes place. A task of reconciling the positivist global rhetoric with the interpretation of the observed local behavior implies the use of multi-method for “continuous dialectical tracking between the most local of local detail and the most global of global structure in such a way as to bring them into simultaneous view” (Geertz, 1983, p. 69, quoted in Lee, 1991).

In this work, we use a multi-method approach in seeking to resolve the apparent absurdities in the researcher’s initial interpretations of the concrete behaviors in a social setting (Lee, 1991, p. 350). The setup of this paper is based on the framework proposed by Lee (1991) and consequently applied by Kumar et al. (1998). The framework integrates the positivist and interpretative approaches and consists of three levels of understanding (Lee, 1991, p. 365):

- (1) The subjective understanding, which consists of the everyday meanings and everyday common sense with which the observed human subjects see themselves and the world around them;
- (2) The interpretative understanding, which consists of the researcher’s interpretation of the subjective understanding, developed with the help of such methods as participant-observation and hermeneutics, and
- (3) The positivist understanding, which consists of theoretical propositions, manipulated according to the rules of hypothetico-deductive logic.

This paper starts with the hypothetico-deductive logic of inquiry. The first step in this logic employs the global rhetoric on the advancement of Information Society (Castells, 1996) and the theory of organizational improvisation (Crossan et al., 2005) as a starting point for identifying a set of propositions about the usage of cellular mobile data services by the general population in a crisis situation (characterized by high level of uncertainty and time pressure). Next, the propositions are tested against the findings of interpretative case study, in which we attempt to interpret the subjective meanings held by a human subject that may have contributed to their observed behavior. Finally, extant theories on sense-making (Weick, 1993), consumer behavior (Shove and Pantzar, 2005), and infrastructural development (Star, 1999) were used to re-interpret the subjective meanings, thus resolving the original “confusing” behavior and allowing to suggest “the rules for proper and predictable conduct” (Lee, 1991, p. 350) as a valid contribution to strategy studies.

Multi-method was used for guiding the data collection (Sawyer, 2001, p. 169). Inquiries were made to the Greater Copenhagen Transportation Authority (HUR)¹ in order to obtain the 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. A web-based survey on the use of mobile phones in specific situations has been conducted, followed by post-survey email interviews. Data collection was complemented by secondary sources, such as newspaper publications and company annual reports.

The survey was conducted using an online Internet survey management tool. An invitation to participate in the survey and the actual web link (URL) to the survey were placed on the e-campus portal of the Copenhagen Business School (CBS), a school with more than 15,000 of students and staff. The survey ad invited participants who had experienced public transportation disruptions during the winter strikes, and also solicited participation from users of mobile cellular phones in general. Access to the survey was not limited to those affiliated with the school. Visitors of CBS e-campus were allowed to forward the survey’s URL to anyone. The survey was open between May and June 2006, two months after the last public transportation services’ strike in the series of “winter strikes”.

The survey comprised both fixed-response and open-ended questions, aimed at gathering information on citizens’ patterns and preferences in the uses of public transport and related information services over different media channels, including these of cellular mobile telephony.

The survey generated more than 900 responses where nearly 50% of the respondents reported to have been affected by the strike, provided insights on the use-aspect of mobile data services.

The placement of the survey advertisement obviously had an effect on the sample – 92% of the respondents reported to be students. Data entries for some questions were missing, and therefore the total number of the respondents for separate questions varied between 957 and 667 for general questions. Of the total 664 respondents who identified their gender, 38% were

¹ The corporate name has recently been changed to Movia (<http://www.movia.dk>).

male, and 62% were female. Of the 313 respondents that reported to have been affected by the winter strikes, all answered the consequent conditional question on the use of cellular mobile phone during the strike for obtaining traffic information.

Given the uneven distribution of male and female respondents, we conducted an exploratory analysis on gender differences in the uses of mobile Internet services. Overall, of the total 667 respondents, 5% reported to use mobile Internet services regularly, while 63% to never use them, and 15% not to use them anymore (Table 5). Males are more likely than females to use mobile Internet services regularly and less likely not to use those services at all (Table 5). The break-up of the mobile Internet services uses, however, shows no significant differences between the male and female users (Table 6), neither does the actual use of cellular mobile phones in situations of uncertainty (Table 7).

Among other than survey sources of evidence used were direct observation, statistical records on data and phone usage, interviews, personal experience, and newspaper and company publications.

3. A positivist view on the advancement of danish information society and the use of mobile data services

3.1. The global rhetoric on danish information society

The recent statistics on Internet and mobile communications use in Denmark show high diffusion rates of both these technologies. The number of data-enabled cellular mobile subscriptions at the end of 2004 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 purposes for the use of the Internet by the residents of Denmark (Fomin and Blechar, 2005), a country that has been topping various Information Society Readiness list for years (ITU, 2003; The WorldPaper, 2003a, 2003b).

It is on this sound foundation of advanced Information Society that the mobile communications sector in Denmark and elsewhere is embracing the third generation (3G) of technology. 3G is intended for mobile telephone devices, which inherit voice service functionality from 2G devices, but additionally offer *mobile data services*, such as video-calls, multimedia messaging system (MMS), short messaging system (SMS), Internet connectivity, email connectivity, games, ringtones and music downloads, commercial applications, and other (Lu et al., 2005; Takeishi and Lee, 2005).

The ubiquitous availability of and access to ICT services is not only a topic of the official EU rhetoric on the Information Society (Council of the European Union, 2002). An increasing number of diverse organizations are making substantial investments in this new area (Lu et al., 2005). Copenhagen City's public transportation authority is one of them, having high expectations for consumers to embrace the mobile data services as a new ubiquitous real-time traffic information service.

3.2. Public transport services in the information society age

Copenhagen City's public transportation authority (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 1). 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).

HUR 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 a few (Table 2).

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

According to HUR (2006b), the actual use of WAP portal, where the bus timetables are offered in real-time, is some 10 times lower than originally expected. In the month of May 2006, HUR management was discussing a possibility to abandon the nominal fee of DKK 1.50 (20 eurocents) 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, 2006b).

Table 1
Top 10 bus lines in terms of passenger traffic

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

Source: HUR (2006c).

Table 2

HUR service information offered through different media channels

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

Source: HUR (2006a).

Table 3

HUR media channel statistics during the months of January and February 2006

	# of calls to the call centre	# of visitors at http://www.hur.dk	# of premium-priced requests at wap.hur.dk	# of premium-priced SMS requests
January '06	70,220	14,251	3949	1221
February '06	48,728	12,664	2895	1294

Sources: HUR (2006a).

Table 4

HUR media channel statistics during 2006 winter strike days

Strike days	Bus lines on strike	Of those A-lines (covered by real-time WAP time tables)	# of paid-for inquiries on wap.hur.dk	# of calls to the call centre	WAP/calls (%)
Jan. 20	14	2	232	5461	4.24
Jan. 25	14	2	227	7720	2.94
Jan. 26	21	3	173	6453	2.68
Jan. 30	1	1	134	2872	4.66
Feb. 13	27	0	159	3616	4.39
Feb. 14	27	0	134	3387	3.95
Feb. 20	14	0	74	3261	2.26

Sources: HUR (2006a).

Table 5Uses of mobile Internet services^a

	Response percent (total)	Response percent (total), male	Response percent (total), female
I use them often/regularly	5% (35)	10% (25)	2% (10)
I use them now and then	17% (116)	28% (70)	11% (46)
I tried, but do not use anymore	15% (99)	16% (41)	14% (58)
I never use them	63% (417)	46% (115)	73% (301)

^a Answers to the question "Do you ever use mobile Internet services on your phone/PDA?".**Table 6**Specific uses of mobile Internet services^a

	Response percent (total)	Response percent (total), male	Response percent (total), female
To read/watch daily news	56% (84)	64% (59)	44% (23)
To download or play games	11% (17)	11% (9)	13% (6)
To download ringtones, themes, music, etc.	27% (40)	20% (18)	38% (20)
To obtain traffic information, driving directions, maps, etc.	48% (73)	46% (42)	51% (27)
To check/send email	40% (60)	44% (40)	32% (17)

^a Answers to the question "What do you mostly use mobile (Internet) services for? [mark several if applicable]".

Despite the significance of A-lines, provision of real-time schedules over WAP is rather a political or technocrat solution at the moment – 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

Table 7

Actual use of cellular mobile phones in situation of uncertainty*

	Response percent (total)	Response percent (total), male	Response percent (total), female
I used my mobile phone to call public transportation customer centre	5% (17)	7% (6)	1% (3)
I used my mobile phone to inform /seek information from my friends/ colleagues	21% (65)	8% (7)	5% (10)
I used my mobile phone (or PDA) to access departure timetables through mobile Internet or SMS services	4% (11)	20% (18)	21% (45)
All/most of the above	3% (10)	3% (3)	3% (6)
I did not use my mobile phone	67% (210)	63% (58)	70% (146)

* Answers to the question "You answered that you were affected by the bus strikes in January–February 2006. During the strike days did you use mobile phone to find out about the traffic situation?".

for HUR and providing training to some 4000 bus drivers can be coped with successfully, HUR will be rolling out the real-time WAP scheduling for all lines in the near future (HUR, 2006b).

Among the services provided by HUR, phone call inquiries appear to be the preferred way for obtaining traffic information by citizens (Table 3). On average, customer centre receives 1700–1800 calls per day (HUR, 2006a). The number of visitors at <http://www.hur.dk> in 2005 varied between 8000 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. The 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 3).

All in all, while the traffic information provision itself is the secondary market for the transportation authority, WAP and SMS mobile data services can't even be called a secondary media channel choice for the passengers. Being at the consumption junction with more than half a dozen options, passengers' preferred media channel for obtaining traffic information obviously isn't that of mobile data. At least as long as the older technologies deliver well.

However, should a disruption in public transportation take place, an "out of control" situation will be encountered, when citizens would not be able to rely on the traditional "fixed" media channels (such as printed timetables) in organizing their daily routines. Such "crisis" situations would ideally justify the official EU rhetoric on the need for ubiquitous data services (Council of the European Union, 2002). More so, the need for access to information in crisis situations (and hence the likelihood of using all available communication services to obtain the sought for information) is predicted by organizational theories dealing with performance under conditions of uncertainty and time pressure (Weick, 1993).

3.3. Organizational theory on time and improvisation

In a highly dynamic contemporary environment, time is a scarce resource. In private and business lives, we are often "competing against time" (Stalk and Hout, 1990). The function of public transport, or at least an important one, is to help us in this daily competition – public transportation aims at shortening the time citizens spend traveling from any point A to any point B in the web of the city transportation lines. To be effective, public transport must provide scheduled, timely, and reliable transportation service. In other words, a ride on a city bus is supposed to be a routine, and an enjoyable one.

By submitting to the transportation service, we are binding ourselves to a script which becomes a dispatcher of our future activity (Latour, 1995, p. 296). The script offloads our cognitive load (the enjoyable part of the ride). As long as the script dispatches roles, appointments, and performances in a space and time trajectory as planned, we feel in control of our daily routine. However, should time constraint or uncertainty be introduced to what was supposed to be an enjoyable routine, planning must give way to improvisation (Crossan et al., 2005, p. 132–33).

Organizational theory postulates that *improvisation* is one way to effectively manage challenges pertaining to time constraints and uncertainty (Crossan et al., 2005, p. 130). Much of the doing of organizing is either a matter of running through a script or an instant of improvisation (Mangham and Pye, 1991, p. 36). It can be said that the role of the public transport service is to maximize opportunities for both the "planning" and the "improvisation" aspects of citizens' organizing. Should a citizen find himself "off the script", in a situation of uncertainty or time pressure, the control-rationale-inspired public transportation service provider will attempt at making the citizens' improvisation (i.e., developing a new script) *effective* (Crossan et al., 2005, p. 134) by providing traffic timetable information over a variety of media channels (Table 2) and thus reducing the level of uncertainty about the environment. Availability of a variety of media channels for information access is an important factor in private control rationale. According to Crossan et al. (2005, p. 137), the greater the available level of real-time information and communication is, the more successful the process of coordinating unexpected events through improvisation will be, thus the more citizens will be in control of their daily routines.

An important concept in improvisation theory is learning. Real-time information and communication facilitate the improvisation process, which in turn enables the learning process on the consequences of prior action (Crossan et al., 2005, p. 137). Learning on prior success and failures in organizing, in turn, will result in more effective organizing (planned or improvised) in the future (Davis and Luthans, 1980; Weick, 1993). Thus, accumulated knowledge (non-human repositories) and skills

(human cognitive repositories) through prior experiences will “better prepare individuals and groups to effectively improvise” (Crossan et al., 2005, p. 138) when organizing their tasks.

Using hypothetico-deductive logic, and building on the global rhetoric on the advancement of Information Society and the theory of organizational improvisation as outlined above, we can make the following propositions:

- (1) In situations when public transportation services are disrupted, bringing about uncertainty and increasing time pressure for citizens, the citizens will cope with the situation by shifting from planned to improvisational mode of organizing their travel routine.
- (2) Given the wide variety of “anytime, anywhere” available timetable information, including real-time timetables available over cellular mobile voice or data services, and the all-supportive environment for using such services, the citizens will likely use available means of communication to obtain the sought-for information in order to reduce the uncertainty, and thus retain their control over the daily routine.
- (3) Given the role of learning in “better preparing individuals and groups” to cope with time management organizing, both success and failure in using cellular mobile services in prior situations will positively affect citizens’ capability to use those services in future, thus driving the adoption of the service.

In the following section, these propositions are tested against the findings of an interpretative case study.

4. An interpretation: snow, buses and mobile data services

It was just another winter day in the capital city of Copenhagen in Denmark. What was making this day different was a snow. Snow which had been falling for a third day in a row, and which, apparently, city authorities were not well prepared to cope with. While the reason for being unprepared 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 and Agger, 2006).

The author 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 was at a busy traffic intersection with several other bus and train lines. The time interval for 4A is 5–7 min throughout the day – this was clearly stated on the timetable displayed at the stop. After waiting for some 10 min, the author started to pay attention to what was going on around, trying to make sense of the situation.

4.1. Direct observation

4.1.1. Observation 1: Patience, no group improvisation

The first important observation was that the author was not alone. There were at least 10 other people at the same stop, and the number was increasing over time. In organizational studies jargon, this was a “temporary group in the early stages of its history” (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, which normally would indicate the number of minutes until the next bus’ arrival. The display was dead. This caused people to turn away and continue looking for a bus. 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. Everyone seemed to be on one’s own, not attempting to invoke a group response to the encountered situation.

4.1.2. Observation 2: The two types of uncertainty

Some, though not many people, made phone calls. A few were typing short messages. From the facial expressions of those talking one could guess 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. Organizational studies postulate that in situations when routine is giving way to uncertainty, people attempt at re-creating the meaning by communicating with others (Weick, 1993). While it may be natural for strangers on a bus stop in the Nordic country not to interact with each other, using a mobile phone as a communication channel to seek meaning from the outside appeared to be an acceptable way of dealing with uncertainty. Interestingly, by calling somebody to tell they were late, people were reducing not their own, but somebody else’s uncertainty.

4.1.3. Observation 3: Physical escape as improvisation

As people were starting to lose patience, they’d either waived to a passing taxi, or walked away from the stop. This behavior in organization studies is explained as follows: when people are unable to negotiate strangeness through a meaning-seeking interaction, their subjective interpretations and meanings destroy rather than construct each other, and they seek escape by physical means (Weick, 1993, p. 645). After some 40 min of waiting at the bus stop and not being able to concep-

tualize the situation as familiar, as one where the meaning can be re-created by drawing on e.g., information services available through voice- and data-enabled cellular mobile phone, the author finally decided to abandon his planned “script” and improvised by walking away, too.

4.2. Redefining the subjective understanding

When finally in the office, shortly after the bus waiting experience, the first thing the author did was to ask his colleagues whether they knew the reason for public transport service disruption. “There is a strike”, was the answer. The answer struck by its simplicity, and by the fact that most likely the needed traffic information could have been found earlier, while at the bus stop, by the means of what is acknowledged to be a ubiquitous technology – cellular mobile telephony. The direct observation of the people at the bus stop allowed the author to create an interpretative understanding of citizens’ behavior. This understanding had one “absurdity” (Lee, 1991, p. 350) – “why haven’t I used my mobile phone to find out about the bus delay? Why haven’t the others?” To answer this question, we had to refer back to the subjective understanding of the people at the bus stop. Using a hermeneutical circle the “sensitivity of what initially appeared to be ‘apparent absurdity’” had to be verified (Lee, 1991, p. 352).

Realizing that a single case of observation may not necessarily represent the actual situation vis-à-vis the use of mobile data services, the needed statistical evidence was gathered, which confirmed that the observed behavior was not anecdotal (Table 4). Neither was the observed and now statistically confirmed behavior in line with the official rhetoric on the advancement of Information Society or the deduced predictions on the use of cellular mobile services under conditions of uncertainty. In order to avoid a methodological error of “ethnocentrism” by mistakenly applying own subjective meaning to the interpretative understanding, it had to be verified whether the predicted use of cellular mobile services was “rational” with respect to the subjective meanings attributed to the observed people (Lee, 1991, p. 352). In other words, it had to be verified whether mobile data services provided by the transportation authority were an easy and/or the best way to rid the waiting passengers of the uncertainty.

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.² 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 – Sonofon³ (of Telenor) and Telia⁴ (of Telia-Sonera) – have HUR Traffic service embedded in their WAP portals,⁵ accessible by clicking the “online” button on the subscribers’ handsets. The procedure for obtaining information which, should it have been followed on the day of strike, would have made the person aware of the fact that line 4A was closed on that date in less than a minute. 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). After all, the mobile data services available were a perfect panacea to the unease about uncertainty and confusion among public transport passengers. Why haven’t they used the services?

The discrepancy between the number of the affected passengers (ca. 200,000 on the day when the observation took place (Nivaro and Agger, 2006)), the number of phone calls to the customer centre, and the number of mobile data inquiries necessitated us to redefine the subjective understanding – discovering how the observed people perceived themselves and the surrounding environment on the day of strike. A survey technique was used to find out about the preferred media channels of Danish citizens for accessing information in crisis situations (Althaus, 2002).

4.3. Survey data analysis

The survey data confirmed the findings of *in situ* observation and media use statistics from HUR – the absolute majority of people affected by the strike *did not use* their mobile phones to find out the reasons for the transportation disruption (see Table 7). This behavior could be accounted for by a more general consumer attitude towards the traffic information services – are people used to check for traffic information at all?

4.3.1. Observation 4: People do use traffic information services

Regardless of the strike experience, 726 reported to travel regularly in public transport (including 1 day per week), while 315 and 383 respondents (a total of 698) reported to be traveling 2–4 and 5–7 days a week, respectively. Of those traveling regularly, 643 (88.6%) would change a transport on their regular route at least once.

Sixty percent of the 860 respondents reported to sometimes (440) or always (51) check for traffic information prior to traveling on their regular routes, while only 40% reported to never do so. The next reason to look for non-use of mobile data services may be in the established patterns of how people check for traffic information (updates).

² However, at the moment only timetables for A-lines are being updated in real-time for the WAP portal.

³ <http://www.sonofon.dk>.

⁴ <http://www.telia.dk>.

⁵ 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.

4.3.2. Observation 5: Internet, but not mobile Internet

Organizational theory postulates that prior success or failure experience with specific tasks contributes to the learning process, thus improving the knowledge and skills base for future action. Thus, the observed non-use of useful services cannot be classified as “absurdity” if citizens did not have prior experience with accessing timetable information through different communication channels. This appeared not to be the case.

744 respondents ranked their preferred information channel for checking public transport information on regular days (Table 8), while 667 provided rankings for the media channel choice in situations of uncertainty, when public transport services are disrupted (Table 9).

The data shows that the preferred media channels for obtaining transport information on a regular basis are Internet web pages (32%) and printed time tables at the transportation stops (24%), while using mobile Internet to access the information is ranked as choices #1 and #2 by 5% and 14%, respectively, with the heaviest load of votes making it choice #7 out of 8 (Table 8).

In situations of uncertainty, the preference of media channels does not change substantially (Table 9). Telephony related channels, with the exception of voice calls, are consistently positioned among the least likely choices.

However, when the choice of media channel has to be made on the go, away from home or office, mobile data services have much stronger position – SMS inquiry rated choices #2 and #3 by 26% and 25% of respondents, respectively, and mobile Internet service as choice #1 by 24% (Table 10). Yet, 34% of the respondents rated mobile Internet services as their last choice – second only to 39% choice #1 “ask somebody else waiting at the same stop”.

Table 8
Regular uses of traffic information services (specific)^{*}

Media choice	1	2	3	4	5	6	7	8	Avg.
Printed timetables announcements or electronic displays at transportation stops/stations	25% (183)	22% (167)	8% (62)	6% (46)	4% (30)	6% (48)	10% (75)	18% (133)	3.92
Other people at the stop/station	6% (45)	15% (109)	21% (158)	14% (104)	13% (94)	13% (99)	12% (90)	6% (45)	4.31
Text TV	7% (52)	10% (75)	15% (115)	19% (141)	15% (110)	13% (97)	10% (76)	10% (78)	4.57
Information services on the Internet (e.g. http://www.hur.dk http://www.bluecow.dk http://www.rejseplanen.dk or similar) accessible through Internet at home or in the office	32% (240)	15% (108)	10% (72)	7% (55)	6% (46)	6% (41)	10% (72)	15% (110)	3.70
Phone call inquiry to the public transport service customer centre (e.g. HUR)	9% (64)	9% (70)	12% (86)	17% (125)	17% (130)	15% (109)	11% (82)	10% (78)	4.66
SMS inquiry to the public transport automatic service “SMS next bus”	6% (42)	9% (65)	13% (96)	12% (90)	17% (124)	20% (152)	15% (113)	8% (62)	4.89
Information services on the Internet/WAP (e.g. wap.hur.dk http://www.hur.dk or similar) accessible by my mobile phone or PDA	5% (35)	14% (105)	11% (85)	13% (98)	14% (104)	15% (110)	19% (141)	9% (66)	4.82
BlueCow or LinjeInfo traffic information subscription services	11% (83)	6% (45)	9% (70)	11% (85)	14% (106)	12% (88)	13% (95)	23% (172)	5.14
Total respondents: 744									

^{*} Answers to the question “What is your primary/preferred information channel for checking public transport information? [please make ranking of your choices (1–8) in the alternatives below]”.

Table 9
Media channel preferences during transportation service disruptions (imagined, selected data)^{*}

Media choice	1	2	3	4	5	6	7	8	Avg.
TV news broadcasts prior to travelling	20% (136)	13% (90)	14% (92)	13% (87)	9% (61)	8% (51)	12% (81)	10% (69)	4.00
Text TV prior to travelling	7% (50)	18% (117)	14% (95)	16% (108)	12% (77)	15% (99)	11% (72)	7% (49)	4.31
Information services on the Internet (e.g. http://www.hur.dk http://www.bluecow.dk http://www.rejseplanen.dk or similar) accessible at home or office prior to travelling	25% (166)	12% (79)	9% (61)	17% (113)	11% (76)	7% (49)	6% (40)	12% (83)	3.86
Information services on the Internet/WAP (e.g. wap.hur.dk http://www.hur.dk or similar) accessible by my mobile phone or PDA	7% (49)	12% (81)	10% (70)	11% (72)	18% (123)	14% (95)	10% (68)	16% (109)	4.86
Printed timetables announcements or electronic displays at transportation stops/stations	10% (69)	10% (70)	15% (99)	13% (85)	15% (102)	18% (117)	8% (53)	11% (72)	4.51
Phone call inquiry to the public transport service customer centre (e.g. HUR)	9% (61)	11% (71)	9% (58)	7% (50)	10% (70)	14% (95)	25% (170)	14% (92)	5.13
SMS inquiry to the public transport automatic service “SMS next bus”	11% (72)	12% (78)	7% (49)	8% (53)	9% (62)	12% (82)	18% (122)	22% (149)	5.15
Total respondents: 667									

^{*} Answers to the question “In situations similar to the winter bus strike when there are delays and cancellations of public transport service how would you prefer to obtain traffic information to schedule your day? [please make ranking of your choices (1–8) in the alternatives below]”.

Table 10
Media channel preferences in situations of uncertainty (imagined)*

Media choice	1	2	3	4	5	6	Avg.
I wouldn't bother to find out	29% (207)	16% (116)	14% (102)	9% (66)	7% (50)	24% (167)	3.19
I would ask somebody else waiting at the same stop	39% (278)	20% (141)	9% (63)	7% (49)	11% (80)	14% (97)	2.72
I would call or SMS some of my friends/colleagues and ask them	12% (83)	26% (183)	25% (178)	14% (99)	13% (93)	10% (72)	3.21
I would call the transportation customer centre (e.g. HUR)	16% (114)	12% (87)	19% (135)	27% (193)	13% (89)	13% (90)	3.46
I would send an SMS to the public transport service "SMS next bus" to find out	18% (125)	12% (84)	13% (90)	16% (112)	28% (196)	14% (101)	3.67
I would use my mobile phone/PDA to check online timetables (e.g. wap.hur.dk www.hur.dk www.bluecow.dk or similar)	24% (170)	10% (69)	9% (63)	10% (69)	14% (97)	34% (240)	3.81
Total respondents: 708							

* Answers to the question "Imagine the following situation: You are at a transportation stop waiting for apparently delayed transport. You don't know either the reason for the delay or how long the delay will be. Would you try to find out the reasons for the delay and the likely wait time?".

Such polarization of opinions may be explained by the attitude towards the pricing for mobile data services. While the usefulness of those services is recognized, over 70% of the respondents consider the per-request fee of DKK 1.50 (20 euro-cents) charged by HUR for providing the service over SMS or WAP to be unreasonably high.

4.3.3. Observation 6: The broken "learning cycle"

Having established that citizens were aware of the available services, it is difficult to accept that people did not use mobile data serviced because of the unwillingness to spare 20 cents for information which would help them avoid endless waiting for the bus during a cold winter day. Least reasonable seems the possibility that, should have the saving rational prevailed once, people would hesitate sparing 20 cents if once again faced with the prospect of freezing in endless expectation of the bus' arrival. In other words, it is easy to accept the postulate of organizational theory on the effect of learning on subsequent actions.

However, HUR media channel statistics indicate that the "learning cycle" was disrupted (Table 4) – there was no increase in the use of mobile data services over the seven strike days in two consequent months. In other words, something went wrong in the process of learning associated with technology and the possibilities it affords. In other words, there was no link established between the non-human memory represented by the available timetable information, and the human memory represented by the skills needed to retrieve this information (Crossan et al., 2005, p. 138).

The quote from the post-survey interview below demonstrates this point very well:

Q: "Were you aware of different media channels available for accessing traffic information [during the strike]?"

A: "I knew there was a strike, I knew which buses were on strike from Text TV. Calling the HUR-helpdesk is futile since I [already] knew [that there was a strike]. . . [With regards to] WAP, [I'm] not that interested, [unless] HUR promoted it more and gave instructions, cheap use, and configuration, and I was sure the information was updated... [With regard to SMS,] my impression was that the SMS service [didn't provide] . . . the needed dynamic [real-time]-updated information."

Q: "If you hadn't been using mobile data services prior to strike, has the strike's experience affected your mobile data services use behavior?"

A: "Not really, but HUR and other service providers need to understand that they have to teach people to use these services."

Through the hermeneutical analysis, we seem to have finally arrived at what can be the key to resolving the initial inconsistency between the subjective and interpretative understandings. The non-use behavior of people does not strike anymore as confusing, if we know that they lack specific knowledge or skills on the uses of the service, even if they are at the same time aware about the existence of the service and the potential usefulness of it to resolving their organizational problems.

Based on the new subjective understanding, new interpretative and positivist understandings can be formed.

5. Implications for theory development

Organizational theory and official rhetoric on the advancement of Information Society postulate that citizens must be in control of their daily routines, and when there are "out of control" situations, the matching of improvisational organizing with the proliferation of ubiquitous information services will allow the citizens to retain the control at once or make improvisation efficient. In this paper we attempted to demonstrate that the predicted behavior does not necessarily take place as theorized.

Specifically, through our interpretative case study, we found that theoretical predictions (2) and (3) (see section "Organizational Theory on Time and Improvisation") could not be validated. Theoretical postulates that knowledge about availability and usefulness of services leads to the decision to use these services, and that prior use experience (either

successful or not) through the learning feedback loop positively affects (the effectiveness of) subsequent service use were at odds with empirical evidence. Therefore, new theoretically motivated explanations were needed on the learning mechanisms to describe how a link between the pool of available services (non-human memory repository) and the effective use of these services (human memory and skills) in specific situations can be established.

5.1. How to explain the non-use behavior?

We have arrived at a conclusion that the missing link between the non-human organizational memory (containing solutions to a variety of problems) and the human cognitive memory (containing knowledge on where and how to retrieve the needed information and apply it to problem solving) presented the stumbling block in testing predictions based on a-priori theory.

Our study confirms that while service providers may strive to have the needed link established, having it actually accomplished may need some tinkering.

The “average” transportation stop in the city of Copenhagen – the immediate environment for people waiting for a transport – does have information posters with information on how to obtain up-to-date traffic information through at least several of half a dozen available media channels. The actual response of an “average” citizen, however, may differ from that “projected” by the service providers’ information retrieval method. A quote from a post-survey interview demonstrates this point:

“When I got to the train station, I checked information display on train departure and arrival board. But, unfortunately, it was totally blank. So, I asked two other passengers at the station if they knew when the next train is coming. But, unfortunately, they were waiting endlessly for the train to show up. So, I decided to wait but while waiting, those passengers that have been waiting before my arrival started to leave one after the other. I also returned home after waiting for more than an hour. I could not call [transport service customer centre] or send SMS to access information on the next train arrival because I didn’t have the [service phone] numbers.”

Two bodies of literature appear to be promising aides in reformulating the positivist understanding. First, a micro-perspective on infrastructure development (Star, 1999) postulates that the way infrastructural services and products are used is affected by everyday interactions of citizens with the immediate environment. Second, consumer research suggests that consumer behavior is always homegrown, peoples’ behavior always being rooted in historical and geographical contexts (Shove and Pantzar, 2005), and hence the immediate environment their daily routines take place in.

Drawing on ethnographical approach to studies of infrastructure, we can conclude that mobile data services are not yet a 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 terms of mobile data services use, this means that availability of services alone does not contribute to their use – the use aspect must be learned. Further, beyond the learning as knowing, there must be learning that creates certain associations or use rules in the minds of people (Weick, 1993, p. 640). The survey data report that the dominant traffic information access rules for the passengers are “check the Internet at home prior to travel” and “check the printed time tables at the stop”. Through the learning process, new cognitive rules can be established, such as “when on the go, use mobile handset to get real-time traffic information”.

The learning does not have to be directed to the novel services per se. In their studies of inventions and reinventions, Shove and Pantzar (2005, p. 43) show the importance of learning the *new combination* of the *old known* stuff: new practices arise “through the active and ongoing integration of images, artifacts and forms of competence, a process in which both consumers and producers are involved.” In our case study, neither the traffic information, nor the mobile Internet services, nor the practice of checking for traffic information are new to the consumer. Neither of technologies or forms of competence, when taken separately, can be characterized as immature either. But it looks apparent that traffic information services must be re-learned, or “reinvented” by re-shuffling the relationship between the stuff (the mobile phones, the time tables), the practice (talking on the phone, checking for traffic information), and the images (phone as a voice communication device, fixed Internet or printed time tables as the source of information). This echoes Weickian sense-making theory, postulating the importance of “cognitive structures” associated with the “normal” behavior in minds of people (Weick, 1993) in guiding their action.

Thus, to complete the iterative cycle of theory testing (Lee, 1991), new theory predictions must be formulated. The new positivist understanding must be coherent with these of the other two levels of understanding – subjective and interpretative, redefined in the course of interpretative study:

- (1a) In situations when public transportation services are disrupted, bringing about uncertainty and increasing time pressure for citizens, citizens will cope with the situation by shifting from planned to improvisational mode of organizing their travel routine.
- (2a) *Despite* the wide variety of “anytime, anywhere” available timetable information, including real-time timetables available over cellular mobile voice or data services, and the all-supportive environment for using such services, in order to reduce the uncertainty people will seek information through those means of communication, which are associated with the normal behavior in the minds of people.

- (3a) The citizens' capability to use services at ever increasing rate will not be determined by a simple linear increase of memory (both non-human service offering repository and human cognitive skills) due to learning feedback loop from prior successful or not experiences with the service, but by a successful integration of images associated with technology (e.g., seeing cellular mobile phone as voice communication device vs. mobile Internet terminal) and consumer practice (seeing transportation service provider as both transportation and mobile information service provider; willing to pay a small fee for information which normally is available for free, etc.).

The new positivist understanding of the mobile telephony services use or non-use behavior does not present a novel theory, as it builds on extant theories. However, it offers valuable insights for practice – service development based on the new understanding of the learning process bears a promise of bringing about more use decisions by consumers.

6. Implications for practice

It is consumer preferences, intentions, and the technology promoters' strategies which determine the developmental trajectory of innovation (Gao, 2005; Lu et al., 2005; Lynn et al., 1996; Lyytinen and Fomin, 2002; Schot, 2003). While in the realm of cellular mobile, retrospectively, it looks like *use* practice had always played a visible role in determining the killer applications (Kivimäki and Fomin, 2001), user-driven innovation cannot take place without technology developers' efforts. To pay justice to HUR's efforts in developing mobile data services, one must admit that quite advanced services were put in place, albeit "stripped of use" (Star and Ruhleder, 1996, p. 113). The passengers were not "modern" enough to take advantage of the services (Edwards, 2003) simply because they hadn't yet acquired the associated consumer practices (Shove and Pantzar, 2005).

Because infrastructures and services they provide are learned as part of membership (Star, 1999), we can speculate that HUR's efforts in promoting the services and educating people 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, 2006b). The campaigns, however, were limited to the information printed on the timetable booklets available in buses, and posted on HUR's web site. No information on availability of WAP services could be found at the bus stops. This should not come as a surprise, given that the budget for the campaign was limited to DKK⁶ 300,000.

Advertisement of availability of "embedded" HUR portal through two major cellular telephony service providers is left to the service providers' discretion. Cellular mobile telephony service providers see the continuing growth of voice traffic, while data revenues are less than 3% of the voice revenues (Fomin and 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.

While our situation-specific case analysis clearly indicates that there were all technical means and incentives for accessing and using mobile data services, and that there is a growing trend of usage of mobile data services in Denmark, the process of creating citizens' awareness of the 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.

7. Conclusions

The objective of this paper was to examine the reasons for non-use behavior in a situation when the use could be beneficial and there are all-favorable conditions for service use.

In conducting this work we followed the methodological logic proposed by Lee (1991) and subsequently exemplified by Kumar et al. (1998). Following this logic, the first step was to formulate propositions based on the global rhetoric of the advancement of Information Society and socio-economic theory on organizing and improvisation. These propositions were confronted with direct observation. Having confronted the a-priori theory with rich case data, the a-priori theory was found to be inadequate for explaining the observed behavior. This motivated us to develop a new interpretation and new theoretical explanations for the case based on "new" extant theories.

We believe this work has an important contribution to both theory development and management practice. Contribution to both domains centers around two issues. First, the use of multi-method – an under-explored practice in the IS research domain (Lee, 1991; Sawyer, 2001) and, second, challenging the official and commonsensical rhetoric on the advancement of Information Society (Jessup and Robey, 2002) and the design of *useful* information and communication services (Cushman and Klecun, 2006). Thus, the overall goal of this work was "developing better insights into, and more useful theories of, the inter-related roles of ICT's uses, and the formal and informal social organizations into which they are embedded" (Sawyer, 2001, p. 180).

Empirical and theoretical findings in this paper suggest that due to the complex nature of modern ICT environment, and the complex interactions between the use environment and the products, different modalities of a service or product design and use cannot be predicted by traditional socio-economic theories. However, due to the specifics of infrastructure service development where new products and services, as well as associated consumer behaviors, are dependent on the available

⁶ The amount of DKK 300 000 approximately equals 40 000 €.

technology installed base and previous patterns of use, user interests and perceptions can be obtained from real-life situations of user-technology-environment interactions for existing products and services. A novel service design approach based on real users engagement as opposed to socio-economic rationale and commonsensical rhetoric should bring about better results (Cushman and Klecun, 2006; Dillon, 2000; Jessup and Robey, 2002; Lamb and Kling, 2003).

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