

## Chapter IX

# Exploring the Vision of "Anytime, Anywhere" in the Context of Mobile Work

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*This chapter explores the vision of "anytime, anywhere" in the context of mobile work. The exploration is done empirically. Using qualitative research methods, we studied to what extent the work tasks they do are dependent on time and place. We analyzed the data using a 2x2 matrix, with the two axis "time" and "space," which both have the categories "dependent" and "independent." One of the four situations is "anytime, any where," while the other three are dependent on time, place, or booth. We found instances of work in all four categories. Some traveling seems very difficult to escape, simply because there are places that staff need to visit physically to do their job. For example, to repair a telephone pole you need to go there. We also found there are time frames that staff cannot escape. For example, rebooting parts of the telephone network has to be done at night. Lastly, there are work tasks that seem pretty much independent of time and space, e.g., scheduling and rescheduling of activities. Accordingly, the vision of "anytime, anywhere" is not easy to realize in the case of the mobile workers we studied.*

### A PARADOX?

The adoption of internet technologies, mobile phones, etc., have increased and in a sense made the world smaller. Compared to ten years ago, it is today much easier to communicate with remotes sites, and the frequency of communication in many organizations has increased accordingly. Some people have even talked about "the global village." (Preece, 1994).

A parallel trend is that people travel more than they used to do. According to predictions, this trend will sustain, and even increase. For example, the national road

agency of Sweden reports the number of flights will increase by a factor four the next ten years. How can it be that the global village is so mobile? If people can interaction independent of time and space, why then do they spend more and more time traveling? Is not that a paradox?

Reviewing the literature on the topic, we find no research that has explored this seemingly paradox. Authors are either concerned with remote interaction (e.g., Ellis et al. 1991, Brave, Ishii & Dahley 1998, McDaniel 1996, Kuzuoka 1992, and, Tang & Minneman, 1991) *or* mobility (e.g., Luff & Heath 1998, Bejerano & Cidon 1998, and, Porta, et al. 1996). Furthermore, research on mobility has mainly dealt with technology issues, e.g., limited battery life, unreliable network connections, varying channel coding and characteristics, volatile access points, risk of data loss, portability and location discovery (e.g., Bhagwat, Satish & Tripathi 1994, Dearle 1998, Francis 1997, and, Varshney 1999). Accordingly, no research so far has explored the relation between, on one hand “the global village,” with its idea that distance plays no role, and on the other hand the trend of increased mobility. How do the two trends hang together?

In order to investigate the question empirically, we conducted an empirical study of mobile telecommunication engineers in a Swedish company. Using qualitative research methods, we studied to what extent the work tasks they do are dependent on time and place. We analyzed the data using a 2x2 matrix, with the two axis “time” and “space,” which both have the categories “dependent” and “independent.” One of the four situations is “anytime, any where,” while the other three are dependent on time, place, or booth.

We found instances of work in all four categories. Some traveling seems very difficult to escape, simply because there are places that staff need to visit physically to do their job. For example, to repair a telephone pole you need to go there. We also found there are time frames that staff cannot escape. For example, rebooting parts of the telephone network has to be done at night. Lastly, there are work tasks that seem pretty much independent of time and space, e.g., scheduling and rescheduling of activities. Accordingly, the vision of “anytime, anywhere” is not easy to realize in the case of the mobile workers we studied.

The rest of the paper is structured as follows: Section 2 contains a background describing the two trends of the evolving *global village*, i.e. anytime, anywhere distributed and co-located work and *mobility* as work on the move. Section 3 presents the theoretical framework. In section four (4) we introduce the empirical study, i.e. mobile service work at Telia Nära. Section 4 presents the main results from the study. We do so by taking Ellis *et al.* (1991) dimensions of time and place and then draw upon a model of dependencies and independencies of those two dimensions when it comes to the case of the mobile service technicians at Telia Nära. So, in this section the vision of anytime, anywhere is contrasted to its opposites, e.g. particular time, particular place dependent work. Finally, in section 6 we conclude the paper.

## **BACKGROUND: THE GLOBAL VILLAGE AND MOBILITY**

In this section, we describe in more detail the vision of “any time, any where” and the trend of mobility.

## “Anytime, anywhere”

Kleinrock (1996, 1998) claims advanced wireless technologies, the Internet, global positioning systems, portable and distributed computing, etc., will realize the vision of “anytime, anywhere”. We can today see the first signs of this vision. For example, telework is now possible, remote organizations can be engaged in close cooperation, and people can form communities on the Internet. The world has become a global village, some claims (Preece, 1994, Castells, 1996), where you can interact with anybody independent of time and space.

The vision of “any time, any where” describes a situation where people can do tasks wherever they want and without any consideration of time. Related to the vision is the 2x2 matrix often used in the field of CSCW to denote different kinds of computer supported collaboration (e.g., Johansen 1988, Baecker et al 1993). This model has the dimensions of time and place, which each can be same or different. It says computer-supported collaboration can take place as follows:

- Same time, same place, e.g., an electronic whiteboard supporting a brainstorming meeting.
- Same time, different place, e.g., a vide conferencing system supporting remote interaction.
- Different time, same place, e.g., a system supporting coordination of tasks between shift workers.
- Different time, different place, e.g., an email system supporting asynchronous exchange of messages between people in different locations.

The model is shown in the figure below.

The vision of “any time, any where” is tasks that can be done independent of time and place, i.e., in *any* of the four scenarios. The does not say anything about where or when the tasks should be done, only that they should not be restricted by these dimensions.

It is interesting to notice that the model does not take into consideration *mobility*. It assumes that people are either in the same place, or in a different place, and whether or not they are mobile does not seem to make a difference.

## Mobility

Both work and leisure activities are becoming increasingly mobile. One reason is that emergence of service work as the dominating profession in the post-industrial society. Service work very often takes place at the client, therefore it is often mobile. Another reason is the increased importance of coopera-

Figure 1. The model shows different scenarios for groupware (Ellis et al. 1991)



tion in and between organizations. Some cooperation can take place remotely, but people also need to meet physically. A third important reason for increased mobility is the extensive adoption of mobile phones. Mobile phones enable people to be mobile and yet accessible. As people have become accessible independent of place, new ways of working have emerged in many organizations. To describe the mobile worker, new concepts have been coined. Some examples are “road warriors” and “nomads” (Dahlbom, 1998), thus distinguishes mobile workers as *moving* from terms as distributed and co-located..

In the past, people traveled because they had no choice. If you wanted to do business or talk to remote friends you had to meet them face-to-face. However, transportation costs prohibited certain meetings and activities. A long series of technological developments æ including the pony express, railroads, automobiles, and the telephone æ have aimed at lowering the costs associated with transaction and conversation. Computer-mediated communications are the most recent development in that progression. Even so, people still travel and still meet in person.

So, why do people want to meet each other? One possible answer is *the social need* of personal contact. The salesperson goes to the customer, shakes hands, and looks at the facilities. Workers in different groups travel to the staff meetings of their colleagues to establish rapport. Friends get together for dinner. In all these situations the requirement for movement is rooted in the desire to meet, take the measure of, and enjoy the company of others.

Another possible answer is *interactivity*. Important parts of human interaction is nonverbal communication, such as body language. There are certain situations where the give and take goes beyond words. The personnel evaluation meeting in business, the town meeting in government, and the family meeting to decide on a vacation destination are all common examples of the need for interactivity.

A third answer, which is more practical is that people are often mobile because they *have to*, i.e., because you need to be at some place a particular time to do something. For example, you may have to go to the stadium to watch the football game. Places you do not have to visit physically may be dependent of time, e.g., a telephone hotline that is opened day-time only, but they can also be independent of time, e.g., a grocery opened 24 hours a day. However, you still need to go there.

Mobility is an aspect of many jobs, but it comes in different forms and in different amounts. There are some people who move around most of the time, and do so by necessity of their work. Examples include service technicians travelling to mend systems at customers’ sites or remote company sites, home care staff who work in the homes of elderly and handicapped people, and travelling salespeople.

For others, mobility is temporal. It may be compulsory, but is often voluntary. Examples of compulsory temporary mobility include businessmen travelling to negotiations with customers, politicians travelling to meetings, sales people travelling to fairs, consultants doing work at customers’ sites, researchers going to conferences. Examples of voluntary temporary mobility include people doing part of their work from home, from their summerhouse, etc. Many categories of people do that, including consultants, teachers, university professors, but also database managers and operators.

Figure 2. The theoretical framework of the study.

		<b>Place</b>	
		<b>Independent</b>	<b>Dependent</b>
<b>Time</b>	<b>Independent</b>	<b>1. Anytime, anywhere:</b> Tasks that can be done independent of time and place. They can be done anytime, anywhere.	<b>2. Anytime, particular place:</b> Tasks that need to be done within on a particular place but can be done whenever.
	<b>Dependent</b>	<b>3. Particular time, any place:</b> Tasks that can be done independent of place but at a certain time or in a certain order.	<b>4. Particular time, particular place:</b> Tasks that must be done on a particular place and on a particular time.

### Theoretical framework

In order to explore the vision of “any time, any place” in the context of mobility, we found it necessary to develop a conceptual framework to guide the study, and in particular to analyze the empirical data. The model we have used is shown in figure 2.

The framework above makes it possible to analyze the relation between a particular task and the dimensions of time and space. One of the four scenarios of the model is “any time, anywhere” (4), while the other three are dependent on time, place, or booth.

The first frame (1) concerns the vision of future work, i.e. to be able to work anytime, anywhere. That means that tasks can be done independent on time, whenever the worker feels like doing it and from whatever location suitable.

The second frame (2) concerns the limit of the second part of the vision of future work, i.e. to be able to work anywhere. Here this means that some work can be done anytime, although there is no way that the work can be done at any other location. That means that tasks must be done on a specific place whether the worker feels like doing it there or not.

The third frame (3) concerns the limits of the first part of the vision of future work, i.e. to be able to work anytime. That means that tasks must be done in a certain order or on a specific time whether the worker feels like doing it or not. On the other hand, there is no restriction whether the technician handles those things from his car, from home or from the customer site.

The fourth and final frame (4) concerns the opposite to the vision of future work, i.e. to be able to work anytime, anywhere. That means that some tasks needs to be done in certain places and on or within a certain period of time. Examples of such work is when larger breakdowns occurs in the telephone systems, like after a storm when trees have fallen down and destroyed cables drawn between telephone poles in the air.

## EMPIRICAL STUDY

We now wish to direct the attention to the results of the empirical research of this paper. The research issue we have explored is the relation between the vision of “any time, any where” and mobility. Let us start the section by describing the research methods involved.

### Method

We used ethnographic techniques to collect data, i.e., participant observation and qualitative interviewing. Hammersley and Atkinson (1995) describe ethnography as follows:

“In its most characteristic form it involves the ethnographer participating, overtly or covertly, in people’s daily lives for an extended period of time, watching what happens, listening to what is said, asking questions - in fact, collecting whatever data are available to through light on the issues that are the focus of the research.”

The objective of ethnography is to “present a portrayal of life as seen and understood by those who live and work within the domain concern” (Hughes *et al.* 1993). We made participant observation of mobile service workers for approximately 40 hours. We also conducted five qualitative interviews (Mason, 1989) with staff and their manager. The interviews lasted for 60 to 90 minutes. The empirical data was analyzed using the theoretical framework shown in figure 2 above.

### Research site

Telia Nära is part of Telia, the government owned telephone operator in Sweden. The study focuses on the service part of Telia Nära in Umeå, Sweden. The service technicians travel to customers scattered over a vast area (some customers are located more than 300 km from the Station), fixing problems like cable breakdowns, overhearing on the lines, etc.

The service section has recently gone through a reorganization including providing the technicians with advanced computer and telecommunication technology, and introducing a new economic incentives system. The new computers make staff completely mobile; any information they need can be accessed from the car, even administrative tasks that they previously had to do in the office. Similarly, anybody who wants to pass information to them, by telephone or computer, can reach them in their cars.

The engineers we studied used the following technology:

- (1) The *car systems* with terminals at all times connected to the Service call center downtown over a radio LAN. The cars have systems to support scheduling of activities, putting work on waiting lists, search the telephone network for errors, getting in contact with the other cars, redirecting missions to free cars if something unexpected occurs, etc. The technicians can, for example, search for errors over the telephone network from the customer’s site. The new IT also makes it possible to plan the route for the day at home and reschedule it during the day. It can also be used to order parts needed to be changed at the customer’s site and plan a route for the day in a optimal manner.

- (2) The *cellular phones* receiving SMS-messages (short message service) from the Station, telling of breakdowns in the telephone network. The SMS message contains the customer's telephone number, so the technician knows where the customer is located. It also contains information about what kind of problem there is from the description given by the customer. The SMS-system is connected to the mobile car system, so the short description using SMS given over the cellular phones can be further investigated by consulting the car system.
- (3) The *Station systems* necessary to receive calls from phone customers needing help, scheduling of those, and resource allocation among the cars, i.e. where to send which car.



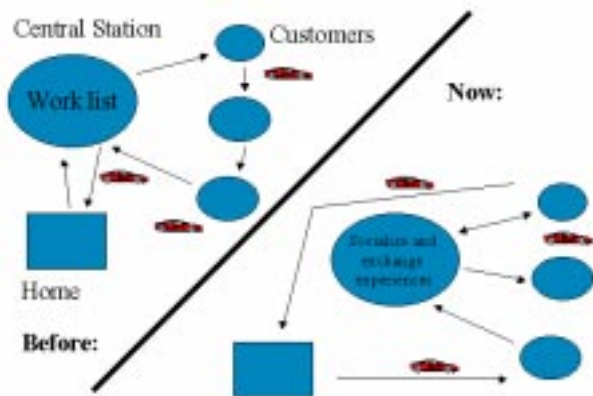
The pictures show the interior of a service car with the mobile system installed.

The new technology has increased the possibilities to work from anywhere so as to reduce the travelling and make the technicians more free to decide upon *how*, *where* and *when* to carry out their work. They can check the work assignments from home in the morning and plan the route for the day, or schedule a whole week. They also receive new assignments, additional information, and changes continuously during the day. Even though their work is very practical previous research has shown that it is also very knowledge intensive (Lindgren & Wiberg, 2000).

Compared to how work was done before the reorganization, the mobility patterns, e.g. how they are geographically switching locations during a typical workday, of the workforce can be viewed as follows:

Before the reorganization the home base had played an important role as coordinator. For example, here staff got their list of what to do (and

Figure 3. The figure shows the alter from how work was conducted and organized before into the current work situation.



where, and in what order) during the day. The work list at the home base set the route for the day. From the morning when the technician checks in at the station and throughout the day it is just about carrying out the tasks on the list in the order they appear to him or her.

Today, the situation is very different, as staff can carry out all important tasks in the field, thus there is no direct importance of the home base anymore. Although, the home base still has a social value. Every day the technicians meet at the station to socialize, exchange experiences, and talk about problems they have faced since the last time they got together there. For the newcomers this is important since that is somewhat the only opportunity for them to get to know their colleagues. If it wasn't for the meetings at the station they would never meet their colleagues, less know anything about them. Thus, the meetings at the station are important for establishing such contacts. Since the passenger seat in the service car is occupied by all different kinds of technology (e.g. laptop computers, mobile phones, portable printers, etc) and the technical support for virtual communication among the staff is rather poor (e.g. mediated by mobile phones and SMS-messages) the meetings at the station serves as an important communication bridge between the technicians.

## RESULTS

In this section we report the results of the empirical study according to the theoretical framework described above. We do so by going through our empirical material and places it into the four different areas of "anytime, anywhere", "anytime, particular place", "particular time, anywhere" and "particular time, particular place" according to the model.

### **Anytime, anywhere**

The first area (1) concerns the vision of future work, i.e. to be able to work anytime, anywhere. That means that tasks can be done independent on time, whenever the worker feels like doing it and from whatever location suitable.

In the case study described above this frame was implemented by functions built-in in the information system making it possible for the technicians to schedule their work day, their work tasks and the priorities of work throughout the day. No matter when and no matter where. If a technician choose not to schedule the workday the system will automatically set the agenda for the day according to the proposed priorities of descriptions of different kinds of work tasks built-in in the system.

However, the technicians had no mobile support for remembering door codes, error messages, etc, so they are thus dependent on the printer in the car. The technicians need to take a print out to remember all information needed about the problem in order to help the client. The car is their "on-line, on-wheel homebase". The mobile workers can schedule the day from home (or the car, or anywhere) by use of SMS and the car system, but they are still dependent upon the location and accessibility of the CAR! They cannot tell the colleagues where or when they will operate without doing the scheduling within the car system. The technicians are also very much dependent on remembering to send SMS when they get off duty. Otherwise they will continue to receive tasks since none of the colleagues knows that



a particular colleague is off duty and they never meet in real life, except if they meet during a break at the central station downtown.

### **Anytime, particular place**

The second frame (2) concerns the limit of the second part of the vision of future work, i.e. to be able to work anywhere. Here this means that some work can be done anytime, although there is no way that the work can be done at any other location. That means that tasks must be done on a specific place whether the worker feels like doing it there or not.

In the case study described above the technicians are dependent upon the location of the client. They have to do the work at the problem site. They cannot actually stop and do it "anytime, anywhere". They cannot actually ask the client to fix their problems by themselves since not all people got the technical skills or the right tools to do it. So, as long as the client is stationary the mobile worker will be too in a sense.

They are also place dependent upon the location of the next job, the way to go there, and the co-operation with the colleagues, since they are asking the technician to do the work which is closest to the primary position of the technician. However, within the time frame of 24 hours as a goal stated by Telia the technicians are free to choose when to go and visit the client.

The mobile workers are also, on a social level, dependent on the location of the central station since it is important for them that the station is in the neighborhood so they can go there everyday and exchange experiences and talk about different problems that they run into.

The mobile workers are also very much dependent upon the location of their colleagues. Often problems is of a kind that a single worker cannot handle so they need to co-operate. However, since the passenger seat is occupied the mobile workers needs to work around that problem by having instant contact over the phone and continuously look over that they not are to far from eachother.

### **Particular time, anywhere**

The third frame (3) concerns the limits of the first part of the vision of future work, i.e. to be able to work anytime. That means that tasks must be done in a certain order or on a specific time whether the worker feels like doing it or not. On the other hand, there is no restriction whether the technician handles those things from his car, from home or from the customer site.

In the case study described above this frame was implemented by functions built-in in the information system making it possible for the technicians to conduct their work independent of the physical location. Typical tasks according to this is error-searches of the network and work reports to the central station. But, they have to do it from the car system, they cannot do an error search from the mobile phone. The mobile workers must report their finished tasks (and those in need of further work) from the car over the radio-LAN back to the central station. This information is used as background information for the proposal on which technician should do what kinds of tasks (a kind of knowledge management, i.e. to get the right man to the right place at the right time). So, they are in one sense dependent upon the location of the car.

Further, the technicians are in one sense independent of the place of the central station since they nowadays goes directly from home to client and place independent in the sense of being able to do some of the work at the customers site instead of going to the station.

Finally, the technicians are dependent upon having keys to different customers houses, thus dependent on door codes or if the customers are at home so they can access the physical problem. However, this information is place independent. The only thing of important is to receive the information, the location is of no importance.

### **Particular time, particular place**

The fourth and final frame (4) concerns the opposite to the vision of future work, i.e. to be able to work anytime, anywhere. That means that some tasks needs to be done in certain places and on or within a certain period of time. Examples of such work is when larger breakdowns occurs in the telephone systems, like after a storm when trees have fallen down and destroyed cables drawn between telephone poles in the air.

In the case study described above the technicians are dependent upon the error list sent to him/her by SMS and the organizational goal to correct those errors within 24 hours. The central station sends out the tasks to the workers. Thus they are dependent on the time the task is given to them, the location off the fault to correct, etc. However, they are free to reschedule their task within that 24 hours time frame. The technicians are also dependent on the schedule of some of their clients. When they are doing jobs like installing a new telephone connecting, etc. they often need to discuss details with the client, like where to set montage the contacts, which contacts that should be connected to a specific number (if there are several lines), if there should be overhearing between phones in the house, (which some people like so they can have minor teleconferences by using multiple phones in the house) etc.

Another interesting thing is that the staff at the central station downtown can still do error checks of the network so the mobile workers are very much dependent on the workers at the station in the sense that the staff at the station have the possibility to perform tasks while the mobile workers are on the move. This is a coordination and responsibility problem which also relates to, and conflicts, the organizational goal of providing service to the customer as fast as possible. It creates conflicts needed to be solved between the mobile and stationary workers. This, we think, is important to consider when building new business model for knowledge intensive firms where mobility is an important factor. For a more detailed analysis of these requirements see Lindgren & Wiberg (2000).

Further, the technicians are also dependent on the memory size in the mobile phone. They need to schedule the first five SMS received otherwise they will be lost (i.e. they will disappear from the memory in the phone but they are stored in the car) and then continue to schedule the tasks as they are sent to them. This is somewhat both a time and place dependency, i.e. they need to schedule the tasks before they disappear and they need to schedule those in the car. They are also dependent on being in range for the phone so they are aware of new tasks that has been given to them. Otherwise they will not notice that before they get into the car and goes to the first client in the morning. Thus, considering the range of the mobile phone as a limit

of the physical location which the technicians are dependent on this "radio location" is an obstacle for the workers. However, these things are technical problems and no significant obstacle related to the nature of their job.

They are also dependent upon the physical terrain, i.e. the geography. The workers do not want to sit in their cars the whole day just driving around doing nothing since the driving activity makes it impossible to do other kinds of work. They are thus dependent on the way we function as a human beings. Humans cannot do several things simultaneously, like driving a car and fully operate a laptop computer at the same time. However, in this paper we neglect such aspects of humans such as motivation, moods, strength and other human capabilities. We do so because the technicians studied had no such problems hindering them to perform their jobs in a proper manner. Nor do we think that those factors are of any greater importance for service engineers than for other people.

## DISCUSSION

This paper has shown some limitations to the vision of anytime, anywhere work. Time and place are indeed very old ways for understanding context and it seems like they are useful even for bringing light on the phenomena of the two parallel trends of the global village and mobility.

The paper has shown that work have moments, e.g. *time frames*, which are not negotiable so the work is dependent upon those.

The paper has also shown that work have *places* of non negotiable importance, e.g. you cannot reframe the earth by putting away distance nor go backwards in time, although computers are often described as being able to bridge those gaps in time and space. As seen above, there is not much service work possible to perform "anytime, anywhere".

But, as this paper has shown, these two trends in the technological development, of enhancing the global village and its mobile users, makes people able to become semi-virtual e.g. to, at the same time, have face-to-face mobile meetings and remote on-line colleagues.

Kleinrock (1998) has argued the vision of mobility as being able to work "anytime, anywhere". However, from the analysis of the empirical study presented above, we argue that there are several limits to that vision. In fact, this paper has argued that the concept of "anytime, anywhere" belongs to another trend, i.e. the trend towards a global village, which is something altogether different from the trend of mobility. However, as the analysis has shown above those two trends comes together in practice.

Beside the results presented due to the time and space model drawn upon above the empirical study showed many practical limitations due to the vision of mobility as "anytime, anywhere". Just to mention a few:

First of all, 'Anytime, anywhere' does not by necessity mean 'every time, everywhere'. The ideal mobile situation is not to work continually without any stops. As described above, after the reorganization at Telia Nära, this was solved by the technicians themselves in that they always meet in the morning and throughout the day to get some breaks and socialize. We find this a very important factor when it comes to service work. It is important to be alert and service minded when working

close to the client and the breaks, we believe, facilitates that.

Secondly, true mobility goes beyond mobile support for ‘here and now’. Support is also needed for the place to go and the place left behind as well as to make plans for the future or backtracking earlier events.

Third, the mobile worker is in one sense a ‘stationary worker’: The technicians always have to stop the car to perform any real work since the nature of this kind of service job is quite physical oriented, like installing switches or repairing breakdowns. They have to operate a ‘mobile’ stationary computer and, as the more technical parts of the analysis above shows, they are actually stationed in the cars (just as any other office job) since, as the pictures of the car interior shows, they need to do all “office” work from the car like schedule work, reporting jobs, etc, by use of the car system and the mobile printer in the car.

To sum up: As seen in the analysis above there are just tiny parts of service work possible to perform “anytime, anywhere”. Most of the work is dependent on spatial factors such as location of breakdown in the telephone network system, the location of the client, etc or time related dependencies such as fixing problems within 24 hours or co-ordinate schedules to co-operate around larger problems. We found there are:

- *travelling* that seems difficult to remove, thus places that people have to visit physically, e.g., telephone poles, customers houses, not all customers are mobile, network routers, locations where new cables needs to be drawn, etc.
- *time frames* which seem very difficult for staff not to do certain tasks within, e.g., customer service within 24 hours, rebooting parts of the telephone network has to be done at night, etc...
- *tasks* that do not seem to be restricted by time and place, e.g. scheduling and rescheduling of the activities over the day, co-ordinations of activities between the technicians, experiences and knowledge sharing among the technicians, etc. although important for them since they are alone in their cars most of the day.

So, finally we conclude this paper arguing that the practical limitations of “any time, anywhere” make it impossible for the mobile service engineers to conduct work “any time, anywhere”.

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