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MOBILITY AND SOCIAL SPATIALITY
OR: FINDING A SPACE FOR THE "MOBILE-WORKPLACE"?

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Abstract
This paper takes a deeper look into the social similarities and differences of the mobile workplace. A shift has occurred in which the stability of work and work activities no longer can rely on physical confinements of the workplace or the proximity to ones colleagues. Work has become distributed and conducted through and during mobility. Access to colleagues' through mobile phones and computer-mediated communication has compressed geographical distance. There have been several attempts, in application oriented Information-Technology research, to explain and model this change by focusing on the characteristics of mobility. We argue a weakness in these attempts since distinctive factors from a stationary work setting have been converted into a "semi-mobile" context. In order to understand the mobile workplace one can start by looking at the spatiality that sustains a stability of the workplace and the environment in which the movement occurs, rather than distinctive features of physical movement. Regional topologies are stable by associating the spatiality to the notion of the place. Place is (geographical) space invested with understanding. Networks on the other hand fixate the relations between nodes and places of interaction. We find that mobility do not threaten "the social". Instead mobility acts as a central activity to maintain a sense of shared social similarity. We introduce two empirical cases, where the objects of our studies conduct ongoing mobile work in a road setting. It is not a fact of movement between different physical places, seeing that the continuous movement could be understood as the main activity itself. Still the participants actively attend to collaborative activities and relate to each other as members of a social space, a workplace. It is the movement of the participants that illustrates these social similarities and differences, i.e. relations to; colleagues, roadsides, road-users, and people far remote, instead of pre-defined physical and social places. While conducting this ongoing movement, participants continuously relate themselves and others to the physical environment. The social space in *where* the "mobile-workplace" retrieves its shape is problematic. It is the local adaptation and shifts of relations, locations and place that makes the mobile workplace stable - much like a fluid object but again, as such it is not detached from the Euclidian topology neither is it a network but it consist through linking relations – could it be a mixture of all three topologies.

Keywords
Mobile IT-use, social spatiality, environment, empirical fieldwork, mobility, marking, locations

Questions of the mobile-workplace
Scholars in science and technology studies (STS) are often occupied with the workings and development of objects. Even though we share many similarities with this objective, our focus is somewhat different since we strive to identify the outlines of objects and their "workings" prior to their "existence". We seek to study the cross section between technical and social in order to develop new objects, i.e. new tools to support current work practice. This process is growing within STS and the field of Computer Supported Co-operative Work (CSCW) where ethnographic research or similar qualitative methods have become renowned when studying the disregarded realms of everyday practice. Mostly because it enables the researcher to come close to the activities that are everyday practice. Activities that otherwise might be taken for granted, by users as well as researchers.

The key to the majority of these studies has been workplaces with the objective to increase the "workings" of the place – so called "workplace-studies". Up to recently, the object of studies in CSCW

has mainly been centers of coordination, where collaboration is crucial and the updates of current state of work need to be made in real time [Normark, 2002]. The "workings" of large interactive systems and computer-mediated communication have been observed, and improvements have been suggested. However, the success of such studies have heavily relied on well-established understandings of the goals and "workings" of the structure of workplace itself – the social character of work [Hughes et al 1994]. The issues become more problematic when the structure (or rather the spatiality) of social similarities and differences shift and the notion of the workplace becomes an enigma, i.e. when work-practice becomes mobile and the work setting is further enhanced.

We introduce two case studies where the participants perform collaborative work in a truly mobile and vast setting, namely the roads. Bus-drivers and the road inspectors have been selected when gathering the empirical data. At a glance their work could be seen as highly individual, but when digging deeper into their working-tasks another view emerge. Even if they work alone in their vehicles, each in a separate geographical area, a high level of collaborative activities takes place to perform their tasks. Beside the situated co-ordination with other road-users these workgroups engage in a simultaneous co-ordination revolving around the collaboration within their own workgroup. The researchers have participated in the daily tasks of the mobile workers, and gathered data by extensive field notes. In both cases we have been following them in their vehicles, but also during breaks and meetings with colleagues. The focus of the studies has been the co-ordination and collaboration between members of a social space while distributed and mobile, and the "shared sense" of the "workplace" that enable the co-ordination. The two settings have initially been explored as two separate research projects. When summing up, we discovered several similarities in their use of places and the notion of their "mobile-workplace".

This paper explores the use of locations, in an environment in which one travels through, as a collaborative resource in mobile work. We adopt a spatial description of social similarities that constitute their own and colleagues' work-tasks, and formal and informal descriptions of relations. We identify how various locations are created and maintained to strengthen a sense of shared "mobile workplace" within the group. To explore and understand the "mobile workplace" we commence from three aspects that have to be brought into light. First, work and workplace creates and establishes social similarities and differences, which are important for what constitutes a belonging to a workgroup. Secondly, as often highlighted in the field of CSCW and ethnomethodology, any "sense of belonging" requires working (production and recognition work [see for example Ryave & Scheinkein, 1974]) therefore one must focus on the actions and concepts that define work and in which the "community" is constructed. Finally, we follow the movement through, and dependency to, the environments as an important part of mobile work in which a sense of motion is created.

Mobility

Mobility is commonly described as a means for participants to reach co-presence, being linked to human corporeal travel. Besides, as an effort of reaching co-presence of people the expression also refers to the availability of, or access to, objects [Urry, 2000b; Wiberg & Ljungberg, 1999]. Thus being mobile is diminished to something that occurs between the main activities, i.e. meeting people, or actions coupled to physical objects. The mobility is understood as a non-activity. Even though it still is a vital issue in many sociological writings, since it enables many other activities such as co-presence and displacement (spread) of thoughts and ideas. Kakihara et al [2002] has shed some light on the understanding of mobility as a concept that relates more broadly to the interaction people perform. In the research area of CSCW a great effort is concentrated on bridging the distance in time and location by the use of information technology – creating a support for distributed work. Recently, systems based on mobile technologies have received a lot of attention in this, and other related research communities. Thus the research on user centered collaborative mobile work is now beginning to arise as an important field in its own right. Still, questions at issue have emerged from studies of stationary settings supported with collaborative systems. These settings with predefined places of interaction do also constitute a convenient environment to study. Examples are the tendencies to focus on filling the time-gaps between movements with mobile IT-use, when users have the possibility to focus on something else than motion [Perry et al,

2001]. Or it has concerned the possibility of focusing in other things than the movement when being mobile.

Spatiality of workplace

Recent focus on mobility challenge the notion of the performance of social similarities and differences as identical with a geographical topography. Mol and Law [1994, 2001] provide an alternative understanding of the spatiality of "the social" by their description of social topology. They introduce topological, or spatial metaphors, as descriptions of " the performance of social similarity and difference". Three different forms of spatiality to describe "the social" are outlined, the topology of regions, networks and fluids.[1] These types are useful for the understanding of the social spatiality of the "workplace".

When studying occupational groups one must refer to its workplace - "the social" that upholds and is created by work. Studies of concepts and actions that constitute communities, groups and workplaces cannot be made without a reference to the group. However, the physical environment has played a crucial role in the conceptualisation of the social, where the spatial definition of the social has concurred with its physical representation. A workplace is therefore a physical place as well as it restricts (and enables) actions, relations and other social attributes.

Thus, understandings of workplaces are in many occasions similar to the extensive research on place. Space and place and the multitudinous interrelations between these two words have been debated in various forms for centuries [Casey, 1997]. One contemporary definition of place is that it is "a space which is invested with understandings"[Harisson & Dourish, 1996], and that these understandings, or "perceptions of the place" vary with the different groups of people that share these understandings [Lynch 1990] Rofel's study of a Chinese workplace reveal how different groups among the staff share different understandings of workplace and organizing structure, in which they find themselves [1992]. In many cases one can see the work*place* as the representation the understanding of the *work*place. But it seems that the interrelation between the understanding and its invested space is more problematic. Within ethnomethodology and science and technology studies there is tendency to question these clear demarcations, as one starts to focus on the activity of making representations and adjusting to them [Berg, 1996]. But the notion of place is dependent on how we understand space – especially if we no longer act in a *Euclidean* (i.e. regional) space.

There is an effort to maintain a social space despite the mobility, or the displacement of objects and people. Thus, mobility is a problem for the stabilization of "the social" and problemetized in the writings of Law and Mol [2001]. But mobility can also be an activity to maintain and withhold the social space. In a regional topology the physical environment that reaffirms the social similarities, when being mobile, can be "well-worn paths" [Urry, 2000a:141], or workplaces with nodes consisting of shared CAD stations, colleagues' desks, meeting rooms etc [Belotti, et al, 1996; Bertelsen and Nielsen, 1999]. Kristoffersen and Ljungbergs [2000] modality of wandering is an example of mobility within a social space where the environment affirms shared understandings of the spatiality of work.

The objectives with the topologies are that the social similarities and differences are held stable within their spatiality. This objective is in many ways similar to the aim of the research in CSCW, where the goal is to mediate co-ordination and collaboration through computers in order to render a stable work and work organization. One has a special interest in what constitutes borders of communities. [Bowker et al. 1997] With increasing mobility and different social topologies than the regional, new understandings of the physical will occur. The traditional focus in the area of CSCW is on bridging the physical distance between the participants, usually in a stationary setting on desktop computers. The rapid development of technology has made available wireless technologies, to be used in a mobile setting. Thus the research agenda, as a number of authors have commented, of user centered collaborative mobile work is now beginning to emerge as an important field in its own right [Luff and Heath, 1998; Bergqvist et al, 1999;

[1] In their article 2001 they also describe a fourth topology – fire, which we do not intend to handle in this paper.

Brown et al, 2001]. There are now a growing number of studies of mobility in collaboration that offers observations and findings about the actualities of mobile work. Previous researches focusing on workplace (and thereby a regional topology of social spatiality) have been able to regard the environment as static or given, in which the shaping of the environment has become transparent. Whereas studies focusing on network topologies have regarded the physical environment as temporary inconveniencies [Kristoffersen & Ljungberg, 2000]. We find that the regional, network and fluid topologies of "the social" co-exist when describing and making accounts on the "mobile workplace".

Regions are the types of social spaces where activities, humans and objects are clustered together and where boundaries can be drawn, dividing those similar from those that are different. These social spaces often overlap its physical environment or as Law and Mol put it, they can be defined using coordinates in a *Euclidean* space. The traditional workplace, as a factory or an office, can be understood as a regional topology. The understandings of the work and its organization hold their shape by fixating to the workplace. Thus, place – as a fixed Euclidean coordinate - plays an important part in creating and maintaining concepts of communities and groups, not only for those settled in their territory [Halturp & Olwig, 1997, Fortier, 1999]. Many workplace studies in the field of CSCW are conducted in regional topologies, such as control rooms [Heath & Luff, 1991; Mackay, et al, 1998; Sanne, 1999], even though the technology they use are supposed to bridge the distance between distributed workgroups.

Networks are types of social spaces where distances between objects, humans and activities are defined by their relations rather than their physical location. The relations of similarity, rather than physical closeness, create proximity in networks. The network topology is held stable through relations where "distance" between objects, humans and activities are the same, as in the case of the telecommunication engineers [Wiberg and Ljungberg, 2000]. Objects in a network have stable relations between each other, these objects have been described as "immutable mobiles" since they are mobile in Euclidean space, but static in a network topology (immutable) [Law & Mol, 2001]. Traveling between distributed workgroups supported by computer-mediated communication could be perceived as network topologies. Therefore it is not surprising to find several writings in CSCW that could be analyzed as studies of network topologies. This perspective of topologies, to follow the relations, is also a growing field in anthropology [Hasturp & Olwig 1997:8]. Moving between similar nodes in the network is only mobile, "from the point of view of a regional topology, (objects, activities etc,) displaces itself from one place to another" [Mol et al, 1994, p 649]. What Kristoffersen and Ljungberg [2000] describe as the modality of traveling is in a network topology not an activity of mobility but merely physical displacement in Euclidean coordinates. In fact, their attempt to model the change of workplace by focusing on the characteristics of mobility misses its intention since they can identify a difference between visiting and wandering without deducting that difference from its characteristics. It is rather a difference between mobility in a regional topology or in a network topology.

As the cases with Belotti and Bly [1996] (where regional mobility inhibits network mobility) or Luff and Heath [1998], social spaces with different topologies can overlap and inflict on each other. But what about the spaces in which the topologies overlap without inflicting on each other? According to Mol and Law, one topological description, have been excluded, the description of "the social" as fluid. This understanding creates a notion where borders can shift and relations can alter. Borders and relations may exist but they can change or disappear without changing the social topology. Still, the fluid topology is a description over spatiality, which is stable by shifting relations rather than fixating them [2001]. Mol and Law first describe this topology when writing about the diagnosis of anemia [1994]. But the analytic advantage of the description is developed in the article by [de Laet & Mol, 2000]. The article follows the object called the Zimbabwe Bush Pump 'B', to find that the object "shows configurational variance" [Law & Mol, 2001:613]. The workings, construction and even the components of the pump vary depending on where it is located. Still, "[t]here is a sameness, a shape of constancy, which does not depend on any particular defining feature or relationship, but rather on the existence of many instances which overlap with one another partially."[Law & Mol 2001:614] The success of the fluid topology lies in its ability to *change and adapt* rather than fixating. For the fluid to maintain its constancy, "movement rather than stasis is crucial."[Law & Mol, 2001:615] Therefore it is not surprising that it is appealing to

use a fluid topology to describe social similarities and differences with regard to everyday mobility. But instead of using the metaphor as a way to describe: "patterns of social interaction… significally freed from spatial, temporal and contextual constraints" [Kakihara & Sørensen, 2002], we find that this topology of the "mobile- workplace" rather re-territorialize the landscape in which the mobility occurs [Hasturp & Olwig, 1997].

Our intention is to study how this notion of social topologies affects the understanding of the physical surroundings (or environment). Previous researches focusing on workplace have been able to regard the environment as static or given, in which the shaping of the environment has become transparent. Whereas studies focusing on network topologies have perceived the physical environment as temporary inconveniencies [Kristoffersen and Ljungberg, 2000]. The three topological descriptions of "the social" are of assistance making accounts on work and to explain the "mobile workplace". Mobility implies that something is displaced but also that this displacement occurs through something. The motion does not necessary occur through a foreign environment it can in fact occur within the realms of "the social". Some aspects of mobility strengthen the stability of objects, facts and spatiality's rather than posing a theoretical and sociological problem. We find that the movement through the environment cannot be disregarded when trying to understand the concepts of the "mobile workplace".

Traveling through in Auto-mobility

Contemporary mobility is an emerging issue among scholars in social science and in which auto-mobility plays a central role. Auto-mobility is sometimes described as the "modern mobility paradigm" where the everyday mobility is exercised [Beckmann 2001]. The complex or infrastructure, users, objects and institutions have been analyzed from various angles to extract an understanding of its social workings. These studies often regard auto-mobility as either the static object of a car or as the roads as "the natural habitat of that useful but awkward monster, the American automobile" [Appelyard, 1964]. The first category highlights the symbolism of the car in our society [e.g. Miller 2001], whereas the former analyze the overall workings of global systems such as the writings on road systems as Large Technical Systems. The writings on Large Technical Systems are preoccupied with centralized systems and focus on those centers without insight in the coordination that takes place on the roads [Juhlin 1994].

These descriptions tend to leave out the interaction and collaboration that is necessary for the entire road-use complexity to work at all, a view expressed for example by Beckmann when he refers to Adorno and Horkheimer. "Men travel on rubber in complete isolation from each other" [2001:601]. Our objective is in the contrary to focus on the interaction in road-use. We see road-use in itself as a collaborative activity where the maneuvering of a vehicle is dependent on co-located road-users. It relies on an understanding of the other road-users intentions and upcoming movements, where co-ordination can be established through flashers, horns and the current positions of the vehicles [Juhlin & Sjöberg 1999]. Thus to understand the sociality of road-use one must observe the work in which road-usage is created.

Among researchers that focus on mobility it is common to focus on the environment that the subject takes with them while to ignoring the environment that one, while mobile, passes through. When Urry refers to road-use, he focuses on the environment within the car with its "controls and sources of pleasure". The road-user is seated in "a place of dwelling that insulates them from the environment that they pass through… The environment beyond the windscreen is an alien other, to be kept at bay"[2000a:63].[2] Kristoffersen an Ljungberg describes the traveling modality as problematic for instance since you cannot be certain if you are allowed to sit or stand in a bus.

[2] This paper refers to the environment as the surroundings of human activities, a "physical space" outside the windshield. Environment refers also to the features that are invested with understandings, thus, part of what constitutes a place. It consists of trees, forests, lakes etc. but the word, in this paper, do not refer to environmental change and pollution and the ecology of our existence.

Laurier [2001] discusses an often-noticed feature of mobile phone calls, namely the geographical locating of each other. He has been following people sitting in the passenger seat, and overheard discussions on the mobile phone where at least one part has been on the move. The participants of the conversations have been geographically separated, and the initial question is important to receive contextual information regarding the one on the other side, for example if it is suitable to discuss work related tasks. Brown and O'Hara elaborate further on the contextual adaptation [Brown and O'Hara, 2002]. They discuss the reconfiguring the "static place in movement" so as to fit the characteristics to be suitable for current work activities. Effort is put on the artifacts and the relationships, which are possible at different locations.

This environment, inside the car and its social meanings for the driver, [as a private room, a suit etc. Hagman 2000] is important to understand the mobile work but it does not enhance the understanding of the "mobile workplace" as any different from a desk. Focusing on the static environment that you take with you, a placeless environment as described by Meyrowitz is created, where objects and the physical environment can be substituted as information [1985].

We find, and further elaborate in this paper, that the environment beyond the windscreen still plays an important part in the conceptualization of "the social". [Juhlin and Vesterlind, 2001; Esbjörnsson and Juhlin, 2002] Such environment is more situational and its shape differs as one travels through it. Mobility becomes the main activity to withhold and create shared understandings within these vast "mobile-workplaces". In this environment, seen through motion, actions continuously affirm "the social".

But how can we understand this environment, and the patterns as sensed in motion, or how can we as Hasturp and Olwig puts it "capture mobility in the landscape"[1997:7]? Remarkably little has been said about the "environment as perceived through motion" even in the research areas that study mobility. Instead we have turned to the theories and methodologies developed within the field of architecture and city planning to find research on the "sense of motion", namely the writings of Kevin Lynch and his colleagues.

Lynch acknowledged that even when mobile "[t]here was a apparently drive to organize the environment impressions into meaningful patterns… Since the city environment is complex and fluid, this is a difficult operation… Certain elements seem particularly important in furnishing distinctions for area classifications in the city, such as people and activity; land use; and general physical form, spatial form in particular" [1990:198-199] The environment that is perceived through motion is organized into meaningful patterns. Through further empirical research he also found that these concepts were "social creations": "We learn to see as we communicate with other people" [1990:233].

Thus, ethnography and other qualitative methods have to be taken into consideration again, even though they were "main target of criticism" over place-focused anthropology [Halsurp & Olwig, 1997]. Therefore to understand the use of the environment that one passes through we adopted a method similar to ethnography but also to the methods that Lynch used. We have followed our informants as they travel trough their environment similar to Lynch method when doing *a walk around the block.* But we have narrowed our focus to two small, intimate social groups as they go about their everyday affairs. Furthermore our study has not been focused to bring forth an understanding of the positions along the route that are of importance for the area that we studied. Our objective has been to investigate how locality and markings of positions, as defined within groups, can be a collaborative recourse. We have studied how the participants of the group communicate and cooperate with one another regarding or through the use of these markings. Thus we hope to enrich the understanding of the mobile "workplace".

Road guards: Marking locations

Road-use relies on passable roads, which is the main responsibility of the road inspectors. Each inspector spends most of his working day alone inside the cabin of the truck. He must identify and deal with objects and defects that could disturb traffic. These tasks are all regulated in a contract with the orderer. An inspection tour lasts around seven hours and takes him 150 to 250 kilometers. The inspector patrols the

road-network according to a predetermined schedule. The frequency of the inspections on each road type is determined by traffic flow and road size. Main roads in the region are inspected every other day. Minor roads are inspected with less frequency.

In many cases there is a weak understanding of locations, especially between different work groups. There are elements of interaction with people outside their organization e.g. the police and/or the Traffic Information Central (TIC). When one of the inspectors described his working tasks during an inspection tour, he commented upon the difficulties of driving and simultaneously observing, and identifying, possible defects in the road safety fences. One major problem occurs when the police open up the fence to help animals away from the road. They are supposed to inform the inspectors about their activities, but they seldom do. From the inspectors' point of view, the relation is insufficient. Since the police and the road inspectors do not share a similar understanding of locations situated in their common area of work, the collaboration seems to be lacking. Even though the locations are defined by physical attributes such as broken road safety fences, it is difficult to identify them in the vast working area. The meaning is out of date for the police, as they have accomplished their task when their activity has given a meaning for the road inspectors. A problematic issue when defining locations is when the participants cannot be simultaneously present, and the location do not affect them in the same way. As members of two different social spheres the understanding and importance of the location vary. Membership of similar social groups and time are important aspects to understand a location. This example does also illustrate the difficulties in explaining the relationship in, and between, the workgroups as either a regional or a network topology, even though they have a coupling to the specific location. The mutual understanding of location between the police and the road inspectors is weak, or almost non-existent. Even though they have technical equipment in their vehicles to mark up specific locations, and thereby communicating them, this is not done. The inspector is surrounded with a large palette of technological equipment, including an FM-radio; communication radio (UHF); a Psion handheld computer; and a mobile phone equipped with a hands free speaker. The *ProData*-system, consisting of a mobile computer (Psion Workabout) connected to GPS-receiver, is the main tool for gathering information during inspection. All defects reported by the inspector are coded and linked to the correct geographic location. The codes are based on a contract with the orderer, and they are described in a document placed in each vehicle. The log created by *ProData* will then verify that the roads have been properly inspected. Mobile phones are used to inform colleagues about local contingencies and to delegate tasks. It is also necessary to communicate with colleagues to stay updated on the status of the road network and to share joint information regarding their tasks. In excerpts below, we will see how they create stronger relationships by marking locations and sharing the understanding of them.

Normally the visual indications are of great importance when defining and maintaining a location. This is illustrated in the following case.

> When turning into the Vallentuna-exit Jacob discover the loss of one reflection-pole. When in place of the lost pole, we can see it lying in the ditch. He stops the car and starts to look in the list of available defect-codes. He selects a code, and enters a text where he describes the exact position, despite the position given by GPS. He justifies it with the argument that he wants to make it obvious that the pole was placed in the curve of the exit. This is done without leaving the vehicle. He leaves the pole until he comes back to take care of the defect. He memorizes that he has to bring some extra poles, since the top is broken on several others. He does not take notes on this.
>
> **Excerpt 1: A broken reflection pole.**

The *ProData*-system is supposed to be the main tool when reporting and managing identified defects along the roads. Nevertheless it has its shortcomings, it appears not to be strong enough alone to define a location. It is not in itself an immutable mobile. Some of the reasons derive from the fact that the reported data is not accessible while being out in the car, and the information is not shared among members of the workgroup. The inspector specifies the location by a geographical description, in addition to the one supplied by the GPS. Furthermore, except from only using the system, he deliberately leaves the broken

reflection-pole as a visual clue even though he could have loaded it on the truck. Apart from only being a defect reflection-pole it now fulfills an additional purpose, as a physical object defining the location and the task connected to it. The location is of importance in his work while he has to take care of the defect at a later occasion, and by bringing the needed equipment. The next time he performs this inspection round, the following scenario take place.

> By the exit to Vallentuna we approach the reflection-pole identified as a defect during Monday. Jacob has brought a renovated pole that he assembles. He has to use rivets to get it together. He does not report it in the ProData-system. 50 meters ahead he discovers a defect road sign, which has no reflection. He stops the truck, reports and finally leaves the truck to take pictures of the road sign. The next time he will bring a new road sign, so he can replace it.
> **Excerpt 2: Taking a photo of a defect road sign.**

When taking care of the reflection pole, and thus reduce the importance of the location, he identifies a road sign with poor reflection functionality. Alternatively of reporting, he uses the camera to take a photo of the defect. Instead of only letting the physical defect act as an artifact defining the location, he creates another physical object, the picture, which will act as a definition. In addition he is also able to bring this object with him. Another common method of creating physical definitions of locations is the use of PostIt-notes, which makes the definition available when being separated in time and distance. Physical objects are also used to communicate with others, like a blue ribbon on an abandoned car on the side of the road will inform the road inspector that the police have been at the location and identified the car. These are temporally short lived and restricted to being in the vicinity of the location in question, but still making it possible to share an understanding.

These examples show how the road inspectors associate understandings to locations and link locations to objects, both those in the environment (the Euclidean space) and objects that they take with them ("immutable mobiles").

Public transport: order and organization

Public transport is an activity where those that carry out the service are highly distributed and mobile. But at the same time it is dependent on predictability and reliability – the organizations has to be held stable. The potential passengers must be able to get access to the vehicles that constitute public transport but also to be informed of the destination for the bus. Timetables, watches and bus stops are important to co-ordinate the movement of the bus with the anticipated movement of passengers enabling them to participate in public transport. There are bus stops located along the bus-route where passengers are supposed to board or exit the bus. These locations are marked with poles and/or booths. The passenger is expected to wait at the defined place (bus stop), prior to a time noted in the timetable. When the bus-driver passes a bus stop, with a waiting passenger, s/he is obliged to stop, letting the passenger to embark on the public transportation. But standing at a bus stop does not necessarily mean that the people want to embark onto the bus. As one driver described: "People show their intentions. They walk forward if they want to get on the bus. They get up from the bench. They return into the booth and sit down or turn their backs to the bus if they don't want to board… They can also wave to show that they don't want to get on the bus." A subtle negotiation between passengers and bus-driver is needed to handle the understanding of the location and to verify a shared notion of it. Similar negotiation occurs when a passenger wants to disembark public transport where communication is mediated between driver and passenger through the button and its bell. But passengers can forget to press the button and drivers can miss bus stops and thus missing to perform the task associated to the bus stop.

The location of the bus stop is also negotiable, either through the passengers familiarity with the driver, moving the bus stop to the entrance of that passengers home, or through passengers negotiation of a new location for the bus stop, thus sifting the location to undefined part of the road from the marked location with a booth and a post. Not all efforts to relocate a bus stop were successful during the fieldwork but there was a on-going negotiation between passengers and drivers a part of the daily work. Thus the

understandings of the bus-stop could shift through negotiation between passengers and bus-drivers, even the coordinates of the bus-stop could be altered. Much of the workings of public transport are dependent on the marked locations along the route, but neither the locations nor the relation between them sustains a stable topology. The drivers rather shift between fixating the topology to locations and to fixate it to relations.

The bus-drivers are dependent on well-organized plans and support for co-ordination while the plans also have to be flexible for the changes of their work environment. They have pre-defined routes, available on maps, to follow at given times, available in the timetable. These are important for the co-ordination between passengers and drivers. The route is ascribed with a number that the vehicle can display. But in order to establish a predictable public transport, passengers and drivers have to co-ordinate themselves temporally too. The vehicles have to follow a predictable rhythm on the road. The timetable is therefore equipped with several departure times along the route. These times enable the driver to adjust her/his rhythm on the road. Through several drivers movement on the road an intricate network of coordinated public transport is created. But this coordinated network is dependent on each driver's ability to maneuver according to the pre-described timetable – to maintain stable primarily in relation to the timetable which delegates the organization - unless the drivers' are able to adjust themselves to each other. The bus drivers are therefore equipped with communication support to enable these adjustments, namely radio-communication devices and mobile phones as a resource when the organization falters.

The temporal relations between bus stops are used to move in a predictable way. But shared understandings of locations can assist co-ordination within workgroups as well. The understanding of the physical locations, as visual aid, can mediate division of work within members of a social spatiality. Divisions of work that have been agreed upon though continuous work and experience. The following excerpt is from bus-drivers involved with reinforcement busses. Sometimes one bus is not enough to take all the passengers waiting along one bus-route. By reinforcing a particular route with extra buses the management of public transport can temporarily increase the local passenger capacity. As he passes a bus stop he comments:

Bus-driver: [Passing a bus stop] there is a passenger standing there but I won't pick him up, a bus behind me will. I will start picking up passengers at "ICA Länghem". By the way, this is called re-enforcement traffic. I'll drive into the village of Limmared while the other bus drives strait pass that village. I'll pick up the passengers on the 27 as well. [27 is the "name" on the main road in the region]

A little later as he stops at the bus stop by "ICA Länghem" he says:

Bus-driver: See, here comes the other bus behind us.

He continues the route in front of the other bus without stopping at any bus stops even though there are many passengers waiting there. After the third bus stop from "ICA Länghem" he says:

Bus-driver: I'll pick the passengers going to Limmared that stands on this bus stop.

The bus-driver looks at the waiting passengers while he slows down the bus. Then he suddenly speeds up again and drives of without stopping.

Bus-driver: Well, they didn't stand there. There is usually two guys staning there that goes to Limmared. But they weren't here. Of'cause if someone doesn't know how we drive then he has to go into Limared as well or he might call me up on the com-radio. We have tested our way through in order to be able to get into Tranemo in time, and I think the way we drive now works fairly well.

Researcher: How have you realized that this way of managing is good?

Bus-driver: We have tried driving in different ways. Once we took every second bus stop but then we got so delayed with the ordinary bus-route and it didn't work with those that were going to Limmared.

Excerpt 3: reinforced public transport, handling and collaborating through shared notion of locations.

The route for the reinforcement bus may differ from the main bus' route, something that needs to be negotiated and agreed upon. The driver in the excerpt explains the division of work between him and the involved busses as he maneuvers through the route – the relationship that has to be held stable between him and his colleagues. The excerpt is an example how shared understanding of passenger's requested destinations and the locations associated to those locations assists the driver's work in dividing the reinforced route. The organization between the drivers' are not created though a sequential pattern, instead it is negotiated though experience. The bus-driver knew the passengers that used to go to Limmared and at what bus stop these passengers used. But he also altered the intended action when he saw that his passengers were not at their bus stop. The location, the understanding of it i.e. the passengers going to Limmared, and the drivers view over the location (the bus stop) helped him to maneuver his bus in relation to his colleague – thus he altered his relationship to his colleague due to the understanding of the marked location. He also showed that the experience regarding the location can differ depending on the circumstances, thus he said that he was going to stop at one particular location but changed his actions when he saw the passengers waiting there. Therefore it is not only the location that is important for the co-ordination; rather the location associated to the experience on passengers travel requests. Both the network and the Euclidean topologies can act simultaneously and in which the driver maintains a stable "mobile workplace" by alternating between the two types of spaces – thereby rendering a predictable public transport system.

As expected pre-defined locations enables co-ordination between and within different groups, which in many ways is the aim with the description of the regional topology. Such locations are subject for re-negotiation and articulation when being in proximity of the location. But the understanding of the pre-defined locations can also change if there never is a re-negotiation and articulation of the location. As we passed one bus-stop the bus-driver commented: "You drive on habit, you won't notice if someone stand on that bus-stop, there will be an abrupt stop the day someone stands there." The location blur into the physical environment even though they have visual markers like poles if there. The relationship to the location is lost. The driver reflected over his uncertainty whether anyone was waiting at a bus stop that he just passed. He didn't expect anyone there and subsequently he didn't look for anyone, as one would expect him to do when approaching a "bus stop place". The location had lost its understanding as a bus stop because the driver had never needed to stop there. Instead he focused on other simultaneous tasks, such as road-use. Locations that are given an understanding are useful resources in co-ordination and organizing. It provides a relationship between people and objects that act in the topology of public transport. The physical environment organized into meaningful locations, are thus used in shaping "the social". But the understandings of the location are rather flexible resources than stable and pre-defined. The articulation, flexibility and even weakness of the understandings of location become apparent when observing the interaction within and between social spatiality's in proximity to a location.

"Mobile-workplace": traveling through, coordinating an organization

The sense of traveling trough the environment is important for the understanding of the "mobile-workplace". This becomes reasonable when one tries to determine the actions among mobile-workers. The conception of other members' whereabouts is important for the shared sense of social similarity. Locations are tools to relate and to describe relations. As in the following excerpt where the researcher is traveling with a driver that is supposed to meet another driver at a pre-defined meeting-place.

James [*Driver in loudspeaker*]: John over?
John [*Driver whom researcher travels with*]: Yes John speaking. You were the one who tried to reach me just a moment ago? Over.
James: Yes. I am turning into Lockryd a bit late; we are just passing the railway in Aplared. Over.
John: Good, then I don't need to call and tell that I'm late.
[After the conversation the driver turns to the researcher.]
John: In these cases, when informing the connection bus, the communication radio works well.
Daniel [*Researcher*]: He told you where he was, why?

John: It's better to say so, that he is passing the railway and then I know exactly where he is, and then I know how he drives and so forth. It's also easier for me to know when he is coming.

Excerpt 4: The driver informs about his present location

The conversation shows how drivers use locations along the route as tools to relate the work that they conduct themselves with the work of the colleagues. The linked relations rely on mutual understanding of locations. James describes the location where he is rather than estimating time of delay. This enables John imaginatively to follow his colleague's work i.e. the movement from the described geographical location, towards the location were they are supposed to meet.

Due to the actions of the drivers and the way they talked made us assume that shared understandings of locations are important for the organization and co-ordination, but to confirm our notion we had to assume that they share and negotiate their understandings. Generally, negotiation and sharing on the understandings of locations are difficult for the researcher to identify since these understandings are based long experience and commitment. However, they appear when members disagree. This occurs when members meet, far from the location that is described, such as a conversation at a morning meeting, coffee break or through communication systems. A driver described the content of a conversation on a mobile phone, that the researcher overheard: "It was my husband who is also a bus driver .He wanted to know the procedure of the connection between bus route 301 and 302. … This morning a driver wanted to do the connection in Lockryd, that's what's written in the manual, but we normally don't do it that way. My husband asked me about my procedure, so that he could do it the same way." The bus-drivers had a conversation regarding a misunderstanding regarding the meaning of location, which occurred earlier during the morning. The driver who called did not participate in the situation when the misunderstanding occurred, but still he participated in an effort of forming a shared sense of understanding the locations. The misunderstanding made the drivers uncertain on their organization of locations. By calling each other they could confirm, or educate, a shared understanding of the location, so that the work could run smooth later on.

For "mobile-work" some information, to carry out their tasks, is only available in the environment. By communication about locations, an awareness of understandings arises. This could improve delegation of tasks between the members if the relations between "mobile-workplace" (with for instance understandings of tasks and responsibilities) and the locations were stable. But instead we found that the ones responsible for repairing locations were unable to delegate surveys of the location to obtain vital information even though colleagues were co-located to these locations. They had to be co-located to create an understanding of the location. This showed how relation varies depending on the proximity between "mobile-workplace" and location. Neither position nor relation is fixed. Moving in the proximity to locations can create collaborative tasks. When using the locations being in proximity, the details are available, which is not the case when being distant. Visual clues available in proximity are lost when distant from the location. This inhibits the ability to identify, use and negotiate meaningful patterns when located distant from the location in question. An alternative is to bring physical objects that are linked to the location. "Immutable-mobiles" representing features of the locations. As described in a sequence between two road inspectors:

Robert calls Kevin who is sitting in the other road inspectors' truck. He recalled that he forgot to tell Kevin about the red Ford Orion which is located along road 76. Robert reported it the last week, so Kevin does not need to do it once again. But since Kevin has already done his report, he has to erase his input. During the conversation Robert pass *Krukan* (a pottery and a café). The amount of signs along the road is increasing, and placed in the borderland of what is allowed. Kevin and Robert agree that the people back at the office have to take a look at this. Robert takes the chance to tell Kevin about another car along his section, but he cannot recall the specific location. Later the same day, Robert fetched newly developed photos.
There were pictures on the Ford Orion, which he called Kevin about earlier today. Additionally there are some pictures on the other car. He calls Kevin immediately and tells him where it was.

Excerpt 5: Photos of the object in question.

This excerpt, exemplify how the environment that passes by is brought in to collaborative tasks as they start discuss the problems concerning *Krukan*. It also exemplifies how it is difficult to recall remote locations, when discussing the abandoned cars. It is apparent that the locations are weak despite details about circumstances and the understanding of the location is obvious. Robert remembers the cars, but he cannot define its location. However Robert can recall the location of the other car with the visual aid of the photography and the temporal proximity to the discussion on the location as he fetches the newly developed photos. Showing that the sense of the location (its sensed attributes) is as important for the place as the understanding of the location.

Mobile = A "*fluid* workplace"?

Workgroups that conduct mobility negotiate and share a common understanding of many locations along the road. Taken together the study indicates the complexity for the inspectors to localize objects of interest, to remember the task/information connected to it and to inform colleagues about these matters. The information gathered, and distributed, is an important aspect of the "mobile workplace". It is needed when delegating tasks among colleagues, and in a broader sense every road user is dependent on augmentation of the road network. The road-network could be understood as an augmented environment seeing that people traveling along the roads, constantly receive information regarding local contingencies, either by traffic-rules, maps, signs or by messages on the radio. We find that these members are dependent on the use of locations as recourse for coordinated mobile work. Further we note that objects in the environment, such as reflection poles and passengers, and objects that the members carry, such as post-it notes and photographs, aid this shared understanding of the physical environment.[3]

For the purpose of analysis we adopted the descriptions of social similarities and differences as presented by Mol and Law [1994, 2001]. The notion of 'workplace' can be used in a regional topology to refer to overlapping of physical characteristics, tasks and understandings. For traditional work the 'workplace' has often been a central symbol in defining the social similarities and differences. But we find that it is difficult to adopt a regional topology for road inspectors and bus drivers. One could describe the main office or the garage as their workplace; the workers have their lockers, lunchroom and their maintenance of the bus at the garage. Many tasks and understandings are associated to the physical characteristics of that building but this is not the place where they conduct the activities they perceive as their main work - the mobility. If we describe the 'workplace' as a set of locations, objects and actors linked between each other by stable relations a more expressive description of their work emerge. Then the notion of 'nodes of workplaces' can be used to describe the social similarities and differences of their work. However the relations vary continuously as work progresses. In physical terms, the Euclidean space between the nodes of locations, e.g. bus stops, where often as important as the locations themselves, but this too varied continuously. The work that we observed could not entirely be understood as a network topology, neither as a regional topology. Still the stability and organization of the work depended on a flexible shift between both topological descriptions. This led us to perceive the "active" space that surrounded these

[3] In the project on road inspectors there is an initiative to support the users with a tool, enabling them to bring representations of objects, which are possible to share among colleagues. The actions performed in the proximity of a place will be strengthened, as well as in the case of remoteness to locations. We augment the sense of motion and delegates remembering and sharing of location understanding. The design implications for a new system is introduced in [Esbjörnsson and Juhlin, 2002], which demands less of the user in terms of activities on the spot of the incident, or defect, since he is occupied with other activities, such as driving the car. GPRS would facilitate sharing of voice messages among colleagues, and accordingly each particular inspector would not be so strongly tied to his assigned roads. A forthcoming evaluation of the proposed system will take place during 2002, where we have the possibility to elaborate further regarding places. The data recorded in the system will provide a useful material when analyzing their shared usage and understanding of places.

mobile workers as a fluid topology, primarily since the motion is more than an issue of moving to a different place of work – it is the work itself.

On the other hand the physical environment was predominantly a part of the space in which they worked. The distance between objects, urban and rural spaces and the need for displacement between these were the motivation for their professions. The pre-described work activities, from identification of defects in road infrastructure, reporting of accidents and other disturbances in traffic to carry through repairs of the identified defects, to collaborations with colleagues and notion of common passengers, bus-stops, busses, crossings, meeting points, collaborative tasks, memories, accidents, etc are what shapes and reformulates the shape of their social spatiality's.

How then, is a social space-of-work to be maintained without a 'workplace'? In our fieldwork we found that a shared understanding between members of the topology demands extensive mobility. Such mobility can be regarded as movement through placeless environment where the only the immediate environment within the vehicle is vital for the notion of the 'workplace'. This is a common (and perhaps dominating) view of the "mobile" workplace, but this perspective disconnects the driver from her/his surroundings and creates islands of hermits in their private social spaces. We find that this perception ignores the collaborative and coordinating aspects of work, which is the focal point for social similarities and differences at all. By conducting empirical fieldwork on mobile-work, we found that:

- The environment, which the mobile workers pass through, is continuously marked by associating understandings to locations.
- These locations are shared with other members in the workgroup.
- The locations are part of what constitutes the stable spatiality – the organization in which the work is conducted.
- The environment aids the "mobile workers" in their effort of understanding where the colleagues are and do.
- The relations between locations and those that travel through it vary depending on understandings, time, proximity to the location and availability of objects to associate with the location – it is flexible.
- It can therefore be difficult to recall tasks that are associated to locations that the mobile worker is distant from.
- The constancy of the "mobile-workplace" is therefore a result of the flexibility rather than its stasis.
- The locations and the recollection of them are strengthen through the use of objects change of objects and movement of objects.

Thus, the 'workplace' for the members is the garage, the bus and roads, crossings, bus stops, beautiful views, industrial zones and passengers – everything that the drivers associate with the activity of corporal mobility i.e. the environment as sensed through motion. Thereby the bus-drivers and road inspectors do not only drive through an environment, they move through their organization and upcoming tasks. Such "mobile workplace" is confined not only by its borders, its relations but also by its shifts as the "mobile worker" moves though the environment.

When studying mobility, should we ignore everything we have learned about human and non-human in relation to place and environment? And should we speak about mobility only as means of reaching different places, thus reaffirming the focus on place in sociology? During our research we found that "mobile-workplaces" consisted of static objects and locations in the environment and mobile objects and environments, all invested with understandings vital for the mobile worker. Thus the worker benefited from the environment that s/he traveled through. Therefore we find that mobility – as an activity – should be regarded as such in there own "habitat" i.e. in the environment that passes by.

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