Organising Self-Referential Taxi Work with mICT

The Case of the London Black Cab Drivers

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FOR MARLENE:

ONE DAY YOU WILL UNDERSTAND WHY IT TOOK SO LONG TO COMPLETE

ABSTRACT

London Black Cab Drivers have a rich and documented history of mobile work practices that are geographically distributed and driven by situated choices for everyday work. To date mobile studies researchers have not made a close examination of these mobile working practices, hence there is a gap in mobile studies concerning this type of worker. This dissertation aims to study the evolution of Black Cab drivers' work practices since the introduction of mobile Information and Communication Technology (mICT) in their everyday work. The theoretical framework for this research is based on studies of taxi drivers' work practices, mobility research, computer supported co-operative work and organisational change promoted by IS interventions. The ontology of this research pinpoints the factors influencing the situated and idiosyncratic choice associated with the use of mICTs when carrying out planned and unplanned work. The case study references a 420-year history of "old", established work practices as a comparison framework. When compared with the "new" and situated choice of mICT-supported work, it becomes apparent that there has been a change in the dynamics of how this type of work is actually completed. Embedding and mixing elements of self-referenced work – as discretionary and independent – with working practices in which mutual interdependencies are supported by the use of mICT aids seems to provide the case for a re-negotiation of the working practices model as well as its associated organisational forms, together with a social shift in the definition of the role and skills required to perform this type of mobile work.

The empirical data have been sourced from one-to-one interviews and video recordings using a combination of ethnographic methods and interpretative approaches for the data analysis. This dissertation makes a theoretical and practical contribution to mobile studies by understanding the changing of working practices; it further offers methodological insights for studying mICT-supported work. Finally, it provides a formative evaluation of the new organisational forms emerging as mICT has been introduced to everyday Black Cab work.

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LIST OF ABBREVIATIONS

CSCW – Computer Supported Cooperative Work

FX4 – Latest model of the classic London Black Cab (2006)

GPS – Global Positioning Systems

HCI – Computer Human Interaction

ICT – Information and Communication Technologies

IS – Information Systems

IT – Information Technology

LTI – London Taxis International Limited, subsidiary division of Manganese Bronze Holdings PLC, Coventry, UK

LU(L) or TfL – London Underground (Limited) – Company controlling the London metro, the name TfL is the new name for this organization but both names are used indistinguishably by Londoners.

mICT – mobile Information and Communication Technology

PCO – Public Carriage Office

PDA – Personal Digital Assistant

RRTR – Remote Real Time Recording

SIM – Subscriber Identity Module (SIM) is part of a removable smart card ICC (Integrated Circuit Card), also known as SIM Cards, for mobile, telephony devices (such as computers) and mobile phones.

TXII – Most popular model of the classic London Black Cab (2002)

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PROLOGUE

This prologue aims to help the reader of this dissertation to understand the activities representative of Black Cab work. This is a fictional piece of work describing the events and decisions a Black Cab driver confronts during the course of a typical working day. However it is based on the narratives collected during the empirical work for this dissertation. This is a day in the life of Ray, a London Black Cab driver:

4:40 am: Ray, who lives somewhere in Essex, a county neighbouring Greater London, will wake up and get ready to start his day in the cab. Before boarding his vehicle he will check that he has his mobile phone, purse with coins (for change), A-Z, and will check the 'fundamentals' in his vehicle (water, petrol, tyre pressure, etc).
4:55 am: Ready to depart for work. Today he is alone. Some mornings Ray will drive his neighbour Paul to Central London; Paul hires Ray when he needs to bring printed material to his shop in London. This doesn't happen everyday but helps Ray to pay for some of the petrol on the way to work. Depending on traffic, it takes Ray up to one hour to get to the City/Docklands area.
5:25 am: Ray turns on the computer cab system and joins the virtual queue; he estimates that by the time he is in the area of Canary Wharf, he will be second or third in the queue and will get a job assigned.
5:55 am: Ray calls home to waken his wife. He is conscientious about his role as an alarm clock, aware that the children need to reach school on time. His wife reminds him that it is his turn to collect his son from swimming practice later in the day.
6:00 am: Ray's computer cab screen flashes indicating that he has the first job of the day: to pick up a punter from one of the banks, he accepts the job to find the destination, The Vale, SW3. Ray is pleased as this is a good job to start the day with. He makes a U-turn in the direction of the punter. He turns on the radio and listens to the traffic report.
6:15 am: Ray is travelling in the direction of West London. Passenger on board (p.o.b), the punter is tired, however he keeps talking on his phone. Ray has closed

the shutter between the driver and the passenger so he can listen to the radio. He calls Daz, another driver who is working the night shift and they agree to meet at around 9 am in the Paddington area.

6:25 am: Ray is checking the traffic ahead. It is early morning Friday, and already the Embankment is saturated with traffic. Ray is planning the next couple of hours. He will stay in the Chelsea area where many jobs turn up in the system (children to be driven to school, people going to work, etc) and it is also easy to find people wanting to hail a cab. He things he will hang around the area until 8:30 am and then move in the direction of Paddington to meet Daz.

6:40 am: Ray turns his computer cab system on. He sets his system to indicate that he is ready to end the journey, so that he can join another virtual queue. He is 15th in the queue, and many taxis are in his area.

6:45 am: Ray reaches The Vale. The punter is a corporate client, who is generous with the tip given to Ray - all corporate expenses. Ray thanks him and drives away.

6:50 am: Ray is still tenth in the virtual queue. Ray spots a person waiting to hail a cab. He stops and asks where the person wants to go. They tell him Soho in the West End. Ray mentally calculates the expected fare and tells the passenger to get in.

7:00 am: While stuck in traffic the passenger starts talking to Ray and asking him for tips about places to go during the day. The passenger is a businessman with only a few days to spare in London. Ray recommends the best shows and happening events in London.

7:25 am: After numerous clever turns around the streets of London looking for shortcuts, he arrives in Soho. The passenger alights and gives him a generous tip. Ray heads back to the West End whilst checking for any jobs in the computer system. He is top in the virtual queue.

7:30 am: A bleep on the screen. Ray has been driving for a while with the computer system on, but no jobs have been allocated. Now he has one, he presses the accept button and the details of his next scheduled appearance. The centre of Kensington! It is going to be a good day. He works ceaselessly for the next hour or so, taking six jobs. It is busy. Then he remembers Daz and the boys.

9:00 am: A coffee break at Paddington with his colleagues at a café. This is the half hour in which they agree to meet and relax. Sometimes when there are no parking slots in the taxi rank or places to park Ray does not come, but today he is looking for some spares for his cab and Daz has told him about a place he can get the parts

cheap. He is going to check out with other cabbies what they are doing to get their spares.

9:30 am: Ray is back on the road and starts using the taxi rank at Paddington station; it is busy with commuters from Oxford and Reading going to meetings in the City. He has a punter going to Canary Wharf. He is delighted that it is a corporate customer.. The punter is busy talking on his phone. Ray calls his mate Dan to catch up with the news. There is a planned taxi replacement service next Sunday. If he can get listed for the drivers offering service that Sunday he can make a nice profit for a slow day. He tries only to go to work on Sundays once a month. It pays for the holidays in Spain. He calls the radio company and registers himself for the Sunday job. Dave will be marshalling. Ray knows Dave since the time both were knowledge boys.

10:15 am: Although the morning has been slow to pick up - he has managed to do five rides since he had his break, the day is looking promising. Most passengers no longer talk to Ray: they are busy talking to each other in their mobile phones. No that Ray minds, he is also busy calling places to find a bouncy castle for hire. His son's birthday is on Saturday so it is all a bit rushed. Ray has chosen work from both the street and the online cab system with no preference, but he tends to like to work an area of the city in slots of time to reduce the periods of time without a passenger.

11:30 am: After spending a couple of hours in the City and Docklands, Ray decides it is time to head to the west, to Kensington and Chelsea for the ladies that "do lunch". The online cab system is very good at producing bookings during this time from the City to that area. Husbands are meeting their spouses, people are taking the afternoon off, he is not rushed today so he can choose what to do at ease. Sometimes when the day has been low on punters he would take any service request including the City of London airport, which he dislikes working, because traffic is always bad and once he is at the airport he has to wait in the taxi rank to hail a passenger back to the city.

12 noon: Ray's wife calls to say that she is going to be late from her job. She is a nurse, and she needs to replace someone's shift. She is sending him a SMS text with a shopping list that he will have to buy on his way back home, otherwise there will be no dinner.

12:25 am: Ray gets a job waiting for someone in the Embankment who wants to go to Aldgate, but when he arrives to pick up the passenger he has to wait 15 minutes,

which gives him time to read quickly the newspaper. He doesn't mind waiting because the booking comes from the computer system, so he is being paid to wait.

1.00 pm: Ray is back in the City, the financial district, and is very busy. He has done one run around Liverpool Street Station since he dropped the passenger in Aldgate, and looks pretty busy, which is good for him. He works non-stop until, searching for and transporting passengers until it is past three o'clock.

3:40 pm: It is time to plan the final rides for the day. Ray changes zone in his computer system, pointing to the boundaries of the city towards the East. He has a final passenger before he disconnects the computer cab system and turns off the taxi for hire light off.

4.00 pm (approx): it is the end of the working day for Ray. He drives back to collect his children from after school clubs. He makes a call to his wife on his mobile phone to tell her that he is on the way to pick up their kids, so that she feels at ease. The radio is on. He will arrive in Essex around 4:50 pm just in time to pick up the kids, then will do some shopping and catch up with the news. He has been on the road for nearly 12 hrs. He plans to work six days this week. On Saturday he will break for his son's birthday but he will work on Sunday to compensate.

Note that Black Cab work is seasonal with high (Christmas) and low (August) periods of work. Drivers adjust their work patterns accordingly. Also depending on their personal preferences they might work during the day- or night time. For the purposes of this study we have chosen a day driver. The length of working hours and location(s) where this work is completed are choices drivers make depending on their physical circumstances, information they might gather using mICTs or based on their experience – in other words the context of their work.

CHAPTER 1: INTRODUCTION TO THE DISSERTATION

Since the early 1990s, the explosive expansion in the use of mobile technology in everyday life has produced significant changes in the way individuals and society use such devices to interact (Agar, 2004; Ling, 2007). Studies of mobility and mobile technology, and their social implications on the life of mobile users, have emerged in parallel as a domain of study within the area of Information Systems. Such studies have tended to focus on a referential research ontology based on the user adoption and embeddedness of the mobile Information and Communication Technology (mICT) artefact (Jarvenpaa and Lang, 2005; Pica, 2005).

In that research model, the dominant view is biased towards the ideas of using mobile technology to create an environment in which mobile usage can be carried out "anywhere, anytime" (Kleinrock, 1998). This view has been reinforced by case studies in the use of mICTs during leisure time or by particular age groups such as teenagers (e.g.: Fox, 2002; Carroll et al, 2003; Plant, 2003; Horst and Miller, 2006). However, studies referring to the use of mobile technology outside work produce no conclusive evidence that such concepts are a major achievement of mICTs usage at work (Czerwinski et al, 2000; Pratt, 2000; Bell and Tuckman, 2002; Kakihara, 2003; Al-Taitoon, 2005).

In the epistemology of such studies, the main underlying assumption about the way mobile work is actually performed is the static location of the individual when doing mobile work (Weilenmann, 2003). Mobile users or mobile workers continue to perform their work in a "static manner"; the workers still carry out their work in a "certain place" and at a "certain time for work" (Jett and George, 2003; Hoschschild, 2003). Mobile workers are able to carry out such work using mICT devices such as mobile phones, PDAs, laptops, etc. This is a way of taking the office out of its stationary setting to a different place but is not mobile work in the sense of being executed "on the move" (Wiredu, 2005).

Legacy research work undertaken in mobility studies is very much defined in terms

of the traditional ways of providing accountability for work completed (Malone, 2004). Contemporary research draws upon studies of managerial trends, starting with Taylorism (Thompson, 1967; Thompson and Bunderson, 2001), defining work as task-orientated and ICT-supported (Zuboff, 1988), to contextual and situated work (Suchman, 1987, 2007) and making sense of organisational evolution (Aldrich, 2006). The ultimate goal of these research works has been to find a way to manage mobile workers efficiently (May, 2000). Thus there is a lot to be said for this aim, as most of the received ideas concerning management principles appear to be incomplete or unsatisfactory under such working conditions. Hence the need to find new and innovative approaches to the management of mobile work remains (Malone, 2004).

In the discussions of mobile workers, it is necessary to have a comprehensive understanding of what mobility is. Mobility is a common word that is difficult to define rigorously, yet numerous examples of mobility can be given when taking the roles and activities of people into account (Kristoffersen and Ljungberg, 1999). A semiotic definition of the word "mobility" reveals two layers of meaning, motion and movement: the act of moving and the state of being in motion. The essence of mobility can perhaps be understood only in relation to what is generically understood as mobile: individuals, settings, technology, or information.

A more inclusive concept of mobility is one that includes the contextual and situated surroundings of an individual or group, where they regard themselves as more or less static and their surroundings – a car, a boat, etc. – are mobile. In this sense, mobility can be seen as transportation of people and their work. The definition this dissertation seeks is not, however, limited to transportation but also includes mobility enhanced by the use of mICTs. The use of mobile devices implies a layered model where mobility is superimposed over the technology. Together they provide access to information remotely and in real time, so that the definition of mobility can be extended to include a virtual space.

The growing popularity of virtual spaces cannot be denied. However, the idea of mobile work as a "virtual space" has been hyped by traditional media and advertising to such an extent that the term "mobility" is widely understood as restricted to "portable", "wireless" or "dynamic and flexible" (Weilenmann, 2003).

Common ICT definitions abound, such as Web 2.0 or 3.0, in which the term mobility is embedded (Norman, 1998). What matters is that those words can be understood only by referring to the *object* used for mobile communication (mICT), not the *practices in themselves*, which are derived from the use of the technology.

From the point of view of philosophy, the ideas of "being in a place" and "being in time" (Heidegger, 1962; Myerson, 2001) can be applied to those practices to enhance the understanding of everyday life from a practical and philosophical ontology in this post-modern era of technology.

1.1 Motivation and Scope of the Research

This dissertation is motivated by the need to identify and bridge the evident gaps in the field of mobility research. Mobility is a relatively new area of research where there discussion of methodologies and theories is far from exhaustive, and where are still in the process of consolidation into a structured body of research. The diversity of studies is in fact a major source of Information Systems researchers' criticism (Marcus, 1997; Ngwenyama, 2002).

This dissertation aims to take one step back and gain an insight into the working practices of mobile workers during their *time at work* and the aspects of such work that rely on individual choices made in circumstances where there is little opportunity for workers to interact with work or workmates regularly. Kakihara (2003) researched workers with professional skills doing this type of work. It was found that mobile workers have been seen as separated or segregated from their outside life and everyday activities (Shultze and Myers, 2000). .

There is another type of worker in which the characteristic of the work they do requires isolated periods followed by periods of intense interaction. The effects such practices have at individual level and the organisational forms, if any, that surge from those work requirements are part of the scope of this dissertation.

Such choices are referred to as "self-referential". The term implies that the decision process relies on few external parameters, and external influences on the decision process are minimal. The concept of "self-referentiality" is familiar to social

scientists, as an expression of the wishes and decisions of the inner self justifying the actions taken by the research subjects. However, in the context of work studies it has to date rarely been applied. There is a gap in this knowledge this dissertation is motivated to contribute with its findings.

Research into mobile work draws upon the use of the term mobility as a semiotic word to describe physical location. The use of terms such as local mobility, remote mobility and micro-mobility convey the desire to separate the object used for mobile activities from the mobile setting in which the activities happen to take place (Luff and Heath, 1998). The use of mICTs challenges the assumption that mobile work is located within the boundaries of the location to a virtual space limited by the user's capability in managing the technology (Manzmanian et al, 2005).

Mobility is also used as a complementary semiotic term for describing modes of transportation. In mobile work, the worker performs micro-coordination between a virtual location, regarded as static, and the physical place where the worker moves to execute the work. These places are given extra status as bases of mobility (Weilenmann, 2003). Some work, however, can be executed between places. Additionally there is an extra semiotic use of work mobility as an extended concept of micro-mobility, in which workers have detached their work from a physical place and are able to contextualise and situate their work (Weilenmann, 2003).

The aims of this dissertation have been shaped by more recent work in the field, exploring mobile work, as one of the above listed concepts of mobility, in greater depth. This exploration aims to bring together multiple variations of the mobility setting and context. Those variations might present a certain level of flux and contradiction in the practical and ontological meaning of the term mobility (Cousins and Robey, 2003). This duality is described on the work activities listed on the Prologue to this dissertation.

When exploring interpretations of mobility, there is a relativism associated with the subjective relations between the mobile worker, and the space in which this work is studied. This space is a complementary mix of contextual and situational parameters. Since this space varies over time at the individual and technological levels, creating a flexibility in which constant change generates a succession of unrelated events

(Seebeck et al, 2005).

From the perspective of a mobile worker, these changes might be perceived over time as changes in time and space, as hypermobility (Kakihara, 2003). Mobile workers – like all individuals – are motivated by the desire to pursue a balanced work and non-work life; self-referentiality and working practices developed using mICTs are the most efficient response to managing multiple variations of events and responses in their lives, and perhaps gaining a level of independence – not available to less mobile workers – which allows idiosyncratic choices in their working practices.

This dissertation aims to differentiate itself from previous studies focused on what mobile users do with their mobile devices when "not at work" by disassociating the use of the device from the use of sequential time as a main referential parameter (Tausig and Fenwick, 2001). Studies such as these have focused on segments of the population such as teenagers (Bachen, 2002; Carroll, 2002), and banking professionals (Al-Taitoon et al, 2003).

The empirical results of those bodies of research work show an effective overlap between mobile users' times at work and time used for leisure activities. Seen in isolation from the IS field, the theory and research methods used in analysis, such as activity theory (Wiredu, 2005) or phenomenology (Pica, 2006), are diverse. Above all, in those studies, research findings have been used to raise the expectations about what mobile technology can actually contribute when used as an aid to work practices.

In this dissertation, the research domain is gathered around mobile workers whose knowledge pre-dates the availability of data obtained via mICTs. In general terms such workers are known as "knowledge workers". The effects of mICTs on such workers are still to be discovered. The meaning of the term "knowledge workers" has to date been understood as the terminology applied to a semiotic definition of the concept (Kallinikos, 2003). Knowledge workers work in an environment called the knowledge network, now gradually being replaced by mICTs. Popper (1963) states that this network demands a constant supply of new knowledge for its continued growth, whether this growth is tacit or explicit. MICT seems to allow an exchange of

information, which is not constrained by the physical space or organisational set-up (Malone, 2004), leading to the concept of a fluid world of work (Bauman, 2001), which can be applied to research on mobile studies.

In the case of the domain of study selected for this research, the working practices of London Black Cab drivers have not changed significantly since the establishment of the service in the seventeenth century (Bobbit, 2002). A recorded history of 420 years or so is proof that the demand for knowledge in order to carry out the work has relied on the skills of the driver to be able to learn strategies, and more recently routes and maps, and then make choices leading to the selection of work that is profitable (Gambetta, 2005).

London Black Cab drivers had well-established everyday working practices before the introduction of mobile technology, practices that can be regarded in organisational terms as sedimented (Munro, 2007). To help the reader understand what is required in their work a prologue has been written introducing the activities these workers do in a day of work. Some of the oldest recorded practices are still in use, and are an invaluable source of comparison parameters in this dissertation, making it possible to refer to the previous working conditions before the intervention of mICTs. These workers also carry out their work, not in static locations, but through their contextual and situated everyday routines.

The increase of popularity on the use of mobile devices has also influenced the Black Cab trade. However, for the black cab driver, work has always been physically mobile. Since the early 1990s, mICTs have been introduced to aid or support their work. In the early history of mobile communication, drivers' micro-coordination was enhanced by the introduction of two-way radio circuits. With the progress of mobile technology, it is common for the Black Cab trade to be supported by computer cab systems, GPS systems, text based systems and online based booking systems. Such changes have not made use of any well-defined plan in terms of ergonomics, design or integration. It is noteworthy that the lack of design in London Black Cabs' complex control panels (Georgano, 2000) suggests that drivers have not made strong demands for mICT to be embedded, reflecting the fact that their working practices have adapted rather than being revolutionised.

In the case of the Black Cab drivers the introduction of mICTs have created complexity in the decision process linked to the everyday search for work: either picking up passengers who hail the cab on the streets or using one of the systems mentioned earlier. The new working practices are a combination of the established or sedimented practices such as the use of "the Knowledge", and new practices supported by mobile technologies (Townsend, 2003; Munro, 2007). In this dissertation an examination of the data gathered has revealed how these mobile technologies have influenced the sedimented working practices, as well as those social practices that have been enhanced by the apparent overlap between the "time at work" and the "time at leisure" hinted at in the mobility discourses encountered in the literature reviewed (Bunting, 2003).

Black Cab drivers are knowledge workers since before they can start any work, it is a requirement for their jobs that they must obtain an established practical knowledge of London. This knowledge is not only based on maps and street names, but as time passes, it is enhanced by experience. Black Cab drivers with many years of experience know for example not only the location and the names of restaurants, hotels, offices, but also the particular idiosyncrasies of each place and the contemporary folklore of London, or "urban legends". This knowledge gives them a privileged position where they are able to give advice and/or orientation that goes beyond the standard reference guide for London.

Black Cab drivers as knowledge workers are able to produce successful results - according to their self-referential parameters of optimum performance – when they can make the most of their strongest skills supported by such knowledge (Skok and Kobayashi, 2007). The drivers can often work and be engaged in many other situations at the same time: they know how to allocate their time, and they can magnify the results of their efforts by means of "soft" factors such as emotional intelligence and trust (Castells, 1996). London Black Cab drivers, unlike their counterparts in other European Cities such as Paris, Moscow, New York, and other important cities around the world (Skok, 2003 and 2005) require accreditation for their taxi work, not only by having a clean driving licence (no points, no police warnings, etc.), skilled control of the taxi vehicle (refer to vehicle TX II, TX IV, etc.) but also require a detailed knowledge of London within six miles radius from

Charing Cross Station, and must pass a series of examinations (termed "appearances") in order to obtain "the Knowledge".

London Black Cab drivers carry a number of books such as a London "A to Z" in their vehicles to help them in case of doubt or confusion with a query, but they will not hesitate to call a colleague if they decide this is the best way to obtain a quick and exact answer to a query. In doing so, these working practices correlate well with the research findings of knowledge management theory, where it has been shown that there is a need to access and search external knowledge bases as well as internally embedded organisational knowledge (Skok, 1999).

In the case of mICT, over time Black Cab drivers have developed some types of electronic systems – like the computer cab system in use by a taxi company in London, which was designed based on member drivers' specifications – that allow them to create, process and enhance their own technological knowledge, as well as to manage the technical knowledge of their co-workers (e.g.: when using code map zones or GPS locational services for positioning drivers in a virtual queue).

Overall the interest of this dissertation is focused on those aspects of self-referentiality that influence Black Cab drivers' choice of work. This self-referentiality is not just a physical situadeness but also encompasses other elements such as the motivation behind the choices of work for the Black Cab driver, linked to economic success, the individual goal of earning enough money to cover fixed and variable running costs of the day, and the need to earn a living wage.

However, London Black Cab drivers do not hold the monopoly on the London taxi service. The introduction of mICTs, and in particular the wide availability of GPS units that can installed in vehicles at low cost has opened the trade to competition. A new type of cab driver has begun to participate in the taxi market. This *minicab driver* is in most cases able to do his/her work aided by GPS systems and with very limited knowledge of the city. These drivers provide a service, the quality of which is affected by the accuracy of the data obtained from the GPS in real time. The common experience of Londoners is that minicabs provide a good service when the drivers know in advance the route to be followed.

In the case of Black Cab drivers, the ability to use the Knowledge for making the

strategic planning of their working day as a tool that complements the use of mICTs presents a switch between two methods of making choices. Depending upon the time of day worked, different working practices might be encountered, for instance in the early morning, early evening and late at night. The strategic planning interacts with the mobile technology used to complement their work. Decisions such as where and when to start work, which in ordinary occupations would be relatively banal, require the Knowledge. They need to take account not only of the routes that can be used but also rely on awareness of what is going on around the city, e.g. emergency shutdowns of roads, traffic works, events such as concerts, etc. Aided mICT such as the radio circuit or the computer cab system is a source of work that can be used according to the cab driver's strategic planning. As a result planned acts and emergent acts require parallel if no simultaneous decisions, depending upon where the driver is located and where the driver wants to go.

This choice of work can be regarded as not only an individual, but also an organisational phenomenon. Historically, Black Cab drivers have been loosely organised but heavily regulated. The introduction of mICTs for supporting their work is creating a change in this business structure. Organisations designed around the knowledge worker, as opposed to organisations designed around machine capital, are thought to integrate hierarchical self-organisation and networking more efficiently than is the case with more conventional approaches (Schaffers, 2003). Each design dictates a different communications and rewards system, and requires activation of knowledge sharing and action learning.

The environment in which Black Cab work is performed requires dynamic spatial and organisational activity. When humans and systems in organisations interact, there is always an element of this interaction that is unplanned (Suchman, 1987). A paradigm in human interaction with organisational systems is that a mix of the worst aspects of each is obtained unless careful control over the situated actions is exercised (Seshadri and Shapira, 2001). This leads to a socio-technological paradigm, which is more complementary to the ideas presented by Walsham (1993). In dynamic environments such as the work of the Black Cab driver, the existence of levels of improvisation or moods, influences the mechanism of choice of work (Ciborra, 2001). The chance of success is self-referenced to the situational act

executed by the driver, since the driver aims for maximum daily revenue. It is still unknown how these actions reflect on the organisational forms actively used by Black Cab drivers (Blount and Janicik, 2001).

The goal of this dissertation goal is to identify how Black Cab drivers strive to succeed in each course of action when choosing work. A successful choice depends on material circumstances, either in a real or in the virtual context of certain human strategies and organisational forms. However, there is a risk of falling into the trap of splitting the real and virtual components into isolated categories, which then fails to assist in answering two key questions: firstly, whether work is actually mediated by the technology and secondly, who is really benefiting from using it (Suchman, 1994).

To avoid this trap, this dissertation aims not to treat mobile technology as a self-evident, homogeneous or a naturalised entity, but, taking a more phenomenological approach, a combination of diverse factors: human, technological and organisational. The question that then emerges is whether the study of Black Cab drivers and their working practices really matters. Eventually the mICT (e.g. GPS) technology will be good enough to obtain results that are similar to, if not better than, the services offered by this knowledge worker. In fact cities that lack London's historical development in the Black Cab trade have had varying levels of success in implementing consistent taxi services relying on mICT (Skok, 2003).

In this dissertation, this question is discussed as an interesting paradigm about how technology is able to execute a role of de-skilling knowledge workers. The experience of other technology-driven sectors (e.g. banking) indicated that in the near future the Knowledge acquired by Black Cab drivers might not be required. The Knowledge will then either be lost, or electronically stored on mICTs. There are currently a number of social factors that might delay this process in London, such as the sheer size of the city and the restructuring of the Black Cab business to provide services to a niche market.

This dissertation takes the view that there is an extra point of interest in researching Black Cab drivers. Mobility studies are in most cases a research starting point which is focused on justifying the expansion in the use of mobile technology and up to a

point “selling” the idea of improved quality of work or better working practices through mobile technology. Research assumptions have been made based on this point of view, and individual or group practices are studied and modelled. Furthermore, work studies take it for granted that the condition of the mobile worker is “static”: they carry out work at the end of journeys but not when in motion.

The progress of mobile technology has changed the individual and social experience of the modern world to a more fluid state of being. Modernity is described by Luhmann (Rash, 2000) as the interoperability of the technology and the data that can be drawn from its users (Kallinikos, 2006) under “dynamic” conditions of work in a social context.

Black Cab drivers are an example of highly mobile workers carrying out semi-professional work in dynamic conditions of modernity. However, Black Cab work does not easily fit this paradigm, since drivers rely far more heavily on knowledge skills than on mobile technology for their work. The complexity of their working practices – in terms of information and knowledge – is something that has not been investigated in detail (Tamminen et al, 2005) as a situated and self-referential choice. It has rather been viewed as a knowledge management activity (Munro, 2007).

Modernity is for them a *cosmopolic* experience of the world (DeLillo, 2003). The term *cosmopolic* refers from the exposure to an experience in which information is sourced from many physical and virtual locations, which workers need to make decisions. This fluency of data is becoming the norm for the ordinary worker as the adoption of mobile technology for work diffuses in society. In their everyday working practices, Black Cab drivers are continually confronted with the need to make sense of the work world, the sense-making that Weick (1993) employs to try to make sense of distributed cognition in the known world.

From the point of view of Information Systems analysis, there is room for research in terms of organisational resources (Resca, 2005). Studies in mobile technology are focused on organisations in which some kind of hierarchy has established the roles, uses and practices at work. Of course the working practices might defer to the changes and choices made by individuals (Rafaeli and Worline, 2001). In the case of Black Cab drivers, the organisation of work has been highly informal, even if the

requirements for carrying out the work are not, and it is the use of mobile technology by minicab drivers, who, in competition with Black Cab drivers, are creating the need to improve the chances of success by using mICTs as integrated tools for the choice of work. Black Cab drivers have started to organise themselves, in the first instance loosely, and in other cases in a more formal way, for the purpose of collaborative cooperation between drivers. These reflect various forms of emergent organisation (Lanzara, 1983; Waldeck et al, 2004).

These organisations might cover basic roles such as distributing work between taxi drivers, to social engines taking a significant role in the life of Black Cab drivers (Bobbit, 2002). From the Information Systems point of view, these organisations use mobile technology as a parallel tool to create work, to compete for work or to converge resources for work (Malone, 2004).

In some ways such loose organisations seem to provide the best choice for highly mobile workers (Aldrich and Ruef, 2006). However when we examine the case of formal organisations such as banks, or other organisations that allow their workers to use mobile technology, it can be seen that formal working practices adapt more slowly to the uses and capabilities that arise from the use of mobile technology (Al-Taitoon, 2005).

In the field of Information Systems there is still an unresolved question about how to manage and make good use of the resources provided by the mobile worker. This study aims to provide an insight into this type of situated work. Black Cab drivers are still a long way from adopting formal organisations, since they are still loosely associated for everyday work, but there are indications that the introduction of mobile technology into their work practices, spurred by competition from minicabs using GPS, is leading them to organise themselves more formally (e.g. computer cab booking systems).

1.2 Research Approach

The main research paradigm adopted by this dissertation is an interpretative approach combined with ethnomethodology data collection. Interpretative methods of research take as their starting-point the approach that our knowledge of reality

(Searle, 1995), including the realm of human action, is a social construction (Walsham, 1993). The interpretative approach tries to understand the world as it is, created by inter-subjective meanings in a social process. It tries to understand a social phenomenon from the perspective of participants in their natural setting. In an interpretative study, the researcher does not try to impose his/her own previous understanding onto the situation (Shultze et al, 2000).

Mobile case studies are focused on work-related mobility within the parameters of office work and fieldwork. In moving away from static work environments, researchers have encountered methodological difficulties associated with collecting data within highly mobile contexts. The obstacles identified include observing the mobile device, observing the user and observing the mobile space, as well as the interrelatedness of these factors. The understanding of the differences between the situation of the mobile user in the real world and the researcher's hypothetical views is of paramount importance. Distinguishing between situated interaction in the world on one hand and interaction through technologies on the other is at the heart of virtual environments and mobility studies (Heath and Luff, 1999; Dourish, 2004).

This dissertation presents the data collected adopting a case study method. Benbasat (1987) indicates that the conditions for using this method are right when the current theory about a subject is at an initial stage, when the actors' experiences and views, as well as the context of action, are essential in gaining an understanding of a social phenomenon.

This dissertation has placed a great deal of emphasis on the field work preparation associated with collecting data within highly mobile contexts, which relies heavily on the use of mobile technology for work allocation and execution. For this purpose, highly mobile contexts are defined as working environments where work is spatially distributed outside the traditional office space. These ideas will be further explored through out the content of this dissertation.

1.2.1 Empirical Study

In this dissertation a significant interpretative value has been placed on the narrative as expressed by the object of study, i.e. what is said in the context of study. This approach is consistent with interpretative methods of research, for which the

knowledge of reality, including the realm of human action, is an elaborated social construction (Walsham, 1993; Bijker, 1993).

In the setting of mobile fieldwork, one method that can be successfully used to represent this interaction data is ethnography (Reeves Sanday, 1979; Garfinkel, 1986, Denzin, 2003). Recent researchers have been able to extract meaningful data using this methodology (Laurier, 2002; Weilenmann, 2003). Ethnographic methods assign a contextual value to the details in the dialogues and narratives used by ordinary people in their everyday activities when making sense of the world around them. Narratives, consisting of the voices of many subject studies analysed in parallel, help discover the link between the socially constructed elements of the research (Ellis, 2003; Silverman, 2001) .

Benbasat (1987) indicates that the Case Study Method (Gomm at all, 2000) is the proper method to use in elaborating a research framework when the current theory about a subject is at an initial stage. Stressing the context of action is essential to understanding a social phenomenon. Case study methods, therefore, are very useful for studying mobility and mobile interaction, considering that these are emergent subjects in the Information Systems research field. In designing the research, this dissertation has taken into consideration the concerns surrounding shortcomings in cross-case analysis (Yin, 1981).

In the first instance a pilot study was completed during the summer of 2004, which led us to identify two groups of Black Cab drivers for interview. Those groups were chosen because of their level of interaction with various mixed types of mICTs (e.g. mobile phones, computer cab systems, GPS). Some of the most striking characteristics of these two groups of drivers are summarised below. These characteristics will be analysed further in Chapter 4.

One group of drivers is associated with a very respectable and long-established Black Cab company in the London circuit of radio control companies. This company's services started with two-way radio systems 20 years ago, but it now works with a computer cab based system, designed in-house in the early 90s, and the company is equipped with a control centre in which more than one hundred people work. The company has a co-operative model, all Black Cab drivers own a single

share in the company, and the management staff is elected by democratic vote. Member drivers are obliged to a minimum of 30 *jobs or runs* a month, as well as paying a nominal fee to become members of the co-operative.

The second group of drivers is associated with a relatively new Black Cab company trying to establish its commercial presence in the London circuit. During the period of fieldwork research the company was bought by a bigger market player, merged and lost some of its identity. The Black Cab drivers do not own this company, but instead put the use of the mobile phone and GPS location-based services out for hire for a monthly fee. The system is fully autonomous so there is little human interaction in the allocation of work. There is no minimum number of jobs to be completed in a month.

In order to overcome the difficulty of direct observation of the subjects, the empirical study required two data sources, one related verbally and the second recorded electronically for subsequent analysis.

The first source of data is a set of one-hour semi-structured interviews, in which an attempt was made to engage the drivers in talking about their work experience, their use of mobile phones, work practices and engagement with the technology, and factors determining their choice of work. For this research it was important to give the respondents the freedom to relate their own story on their own terms (McCracken, 1998). The interviews were scheduled in settings used by the drivers for co-ordination work and/or work breaks (e.g. the radio circuit office, cafes, the cab repair shop). Interviews were recorded using the mp3 digital format. For the transcription of the interviews we found that due to the diverse variety of accents and the use of a significant number of slang words – mainly Cockney English and cabbie slang – automatic speech transcribers could not be considered.

A number of informal interviews and/or conversations with the company management staff were also completed; these interviews gave an insight into the working practices mentioned by the drivers during interviews, and also a comprehensive overview of the system design and management's expectations about the system use.

The second source of data is a video recording of a Black Cab driver workday. This

type of data collection takes into account the concept of dynamic events – in this case the many journeys and actions the driver might take whilst driving around the city – which are regarded as long-term temporal objects (Zelnik-Manor and Irani, 2001).

In accordance with the Data Protection Act (2002), the use of the camera device was restricted by the Public Carriage Office to video recordings of only the driver, not the passenger. A special camera setup conforming to these rules was arranged, in which the passenger was not visible to the camera and only the occupant of the driver's seat could be recorded. The driver was trained in the use of the video camera and instructed to use it over continuous periods of time to record work sequences.

The use of video as a tool for observation and analysis is well documented. It provides a context for understanding human behaviour and allows the observation of the subject's social interaction, both verbal and non-verbal (Rosenstein, 2002). During the data collection, the setup was kept as simple as possible since there are well-documented pitfalls in the management and analysis of video data (Spiers, 2004). There is an expectation that the use of video recording implies the use of the latest video programs in order to reduce the component of manual work when analysing data. We do not believe that this is the case, however, since there is a significant amount of data that would be overlooked by such tools. To this end, we have aimed for simple editing with Imovie and QuickTime on the Mac OS X platform**.**

1.2.2 Research Objectives

The mobilisation of work and interaction raises the issue of the conduct and management of work and the associated technologies deployed to support mobile work (Resca, 2005). Mobile workers confront everyday social paradigms when choosing work. This work can be either mediated (Olson and Olson, 2000) or interactive and as a result Black Cab work can be a planned or situated act. Furthermore, as the mobile worker strengthens his or her direct relationships between individual activities and associated technological support, essential issues of individual discretion and organisational control are raised.

From the issues presented in previous sections, the research objectives are defined by

looking into the temporal (when drivers are doing work) and the contextual (where drivers are doing work) factors that the use of mobile technology provides to highly mobile workers. In particular the scope is narrowed by the need to weigh up the situational act versus the planned act in choosing work by the drivers. Some of those choices are contextual and bounded by temporality (Liao, 2003), and common to all taxi driver services using mICTs around the world.

This analysis would be incomplete without taking into account the social context in which work is performed and the related organisational issues where the interaction is human to human (e.g. control centre to taxi-driver) or human to computer (e.g. radio computer system) (Schmidt, 1994).

Mobility for the highly mobile worker is described in its three dimensions: the spatial, temporal and contextual (Kakihara and Sørensen, 2002), which together form the social framework in which work is undertaken. For this type of worker mobile technology appears to be an extra tool used in their constant search for work.

The social fabric of the highly mobile worker is complex and can be analysed from many angles. What we know for certain, however, is that every work day a Black Cab driver has a planned sequence of financially motivated actions (McLaren, 1999), but the influence of emergent acts can cause changes to those plans, with room for improvisation and variation (Mirvis, 1998).

The research question being studied in the scope of this project is:

"Which situated choices in regards to work practices are challenged by the use of mobile ICTs?"

Related sub-questions include the various conditions of these work practices. These questions include:

a) Were well-established work practices already in place?

b) Has individual self-organising work been the primary form for carrying out such work?

1.2.3 Shortcomings of the Research

The main shortcoming of this dissertation is the reliance upon a combination of theoretical interpretative frameworks. Positioning the study in this way may limit the possibilities of making a significant contribution to the theoretical development of mobile studies. This choice was, however, made in the interest of describing the changes experienced by Black Cab drivers since the intervention of mobile ICTs.

This dissertation has a second shortcoming in that the wide range of data collected is based on the methods chosen for the fieldwork. The processing, categorisation and analysis of the data took longer than planned, and a significant proportion of the data collected demanded structural analysis, which was required in order to overcome the limitations in understanding the context in which this work is performed.

This has led the dissertation to study the type of work that can complement other studies in the field of mobile studies of work practices, but cannot be easily generalised without further exploratory research into similar occupations or trades.

1.3 Structure of the Dissertation

This dissertation is divided into seven chapters. A summary of the contents of each chapter is listed below:

Chapter 1 starts with an exploration of the motivations and scope of the study. A brief definition of mICTs is included, followed by a referential guide to studies of mobile work. Also the research questions and objectives of the dissertation are described in the following section. The chapter concludes by outlining the dissertation's structure.

Chapter 2 is dedicated to the literature review in both the mobility and sociology of work relevant to the area of research. This review includes an analysis of the dimensions of mobility: spatial, temporal and situated. Self-referential work and computer supported collaborative work are included for the specific domain of study of Black Cab work.

Chapter 3 explores the research theory used as the framework for this study. The chapter begins with a discussion of the shortcomings of research in the area,

followed by a discussion of temporality and situadeness in the context of highly mobile work. The strategic aim is to present the choice-making process emerging from planned and situated actions, influenced by self-referentiality and dependencies at work. The chapter then explores new organisational forms and the way they become apparent when modelling a highly mobile worker using phenomenological analysis.

Chapter 4 presents the methodology of the research. The research strategy is developed and discussed under the ontological and empirical conditions that are taken into account when making methodological choices from the point of view of research philosophy, strategy, type of data collection and analysis tools. Each research method used is explained in detail, also a brief discussion on the limitations of the methods is presented.

Chapter 5 presents the data analysis of diverse context and situations in Black Cab driver' work, in which emergent and planned acts influence the choice of work made. The body of the analysis is shown in this section. It is divided in two main sections to take into account the individual and organisational data encountered.

Chapter 6 presents the discussion of the dissertation results in terms of individual and organisational issues related to the use of technology in mobile work.

Chapter 7 concludes the dissertation, and presents the key contributions of this research, research limitations, and possible further research in the fields of mobility and mobile work.

CHAPTER 2: LITERATURE REVIEW

It is precisely because our plans are inherently vague – because we can state our intentions without having to describe the actual course that our actions will take – that an intentional vocabulary is so useful for our everyday.

(Suchman, 1987)

The contents of this chapter focuses on research that is relevant to an understanding of Black Cab work and the role mICTs have when supporting this type of work. The context of the material reviewed for this chapter includes the areas of mobility, computer supported collaborative work (CSCW), and the sociological and organisational contexts related specifically to mobile work.

The first section of this chapter gives a concise history of Black Cab work in London. As Suchman points out in the opening quote to this chapter, vocabularies of intention are developed as an aide to work that is vaguely planned, such as Black Cab trade. The aim is to describe current working practices, referencing them to typical activities based on everyday work, cycles of work and rhythms and routines. It also outlines the bureaucratic aspects of the organisation of Black Cab work and the guidelines for acquiring a valid driver license.

The second section presents literature relevant to the categorisation of mobile work as part of a contextual choice. The mediated use or non-use of mICT for this type of work is reflected in the relationships between the ways in which this work references itself for execution and CSCW. There is a body of research literature focused on discussing these aspects of mobile work.

The third section endeavours to examine the relevance of Black Cab work to IS research paradigms in mobile studies, thereby establishing the components of the analytical framework that will be explored in further detail in Chapter 3. The chapter ends with a reflection on the limitations of the current IS research approaches and a summary.

2.1 The Evolution of Taxi Work and the Use of mICT

The history of taxicabs is long and varied. The rich long ago had themselves "taxied" from one location to another using servants or drivers. In ancient times, royalty were transported on the backs of slaves from city to city (Munro, 2007). In terms of taxi work, services with similarities to the current cab trade have existed for three centuries or more. The emergence of the Industrial Revolution and the migration and concentration of population from rural areas to cities not only created vast numbers of new jobs, but also ushered in a cultural change resulting in new ways of working (Thompson, 1967). London, as the capital of the former British Empire – wealthy and an international hub for trade – was one of the first cities in the world to have a fully organised and regulated taxi service.

Horse-drawn for-hire hackney carriage services began operating in both Paris and London in the early 17th century. Royal proclamations in both cities regulated the number of carriages, which was the first example of taxicab regulation. In the 19th century, Hansom cabs largely replaced the older designs because of their improved speed and safety (Townsend, 2003).

Although battery-powered vehicles enjoyed a brief success in Paris, London, and New York in the 1890s, the 1891 invention of the taximeter by a German, Wilhelm Bruhn revolutionised the business. This familiar mechanical – and now often electronic – device calculates the fare in most taxicabs and ushered in the modern taxi era. The first modern meter-equipped taxicab was the Daimler Victoria, built by Gottlieb Daimler in 1897. The first motorised taxi company began operating in Stuttgart the same year (PBS, 2008).

Gas-powered taxicabs began operating in Paris in 1899, in London in 1903, and in New York in 1907. The New York taxicabs were imported from France by Harry N. Allen. Allen was the first person to paint his taxicabs yellow, after learning that yellow is the colour most easily seen from a distance. In London, the black colour was chosen to match the preference for this colour in fashion and the common grey sky and smog in the city.

Taxicabs proliferated around the world in the early 20th century. The first major innovation after the invention of the taximeter occurred in the late 1940s, when two-way radios first appeared in taxicabs. Radios enabled taxicabs and dispatch offices to communicate and serve customers more efficiently than previous methods, such as using call boxes. The next major innovation occurred in the 1980s, when computer-assisted dispatching was introduced (Garner and Stokoe, 2005).

There has generally been a legal struggle concerning the certification of motor vehicles such as taxicabs, which suffer greater wear and tear than is the case with a private car. In London, they are additionally required to meet stringent specifications. In the US, in the 1930s, the cabs were often DeSotos or Packards. General Motors offered a specialised vehicle for a time, named the General. The firm Checker then came into existence, and stopped manufacturing cabs in the early 1980s. Its cars were specially built to carry double dates or up to four users. The London cab has capacity for five passengers maximum.

Vehicle regulation differs worldwide, for example in New York City, all taxicabs are now required to be ordinary cars (Walton, 2008), mainly long wheelbase versions of the Ford Crown Victoria. Toyota Sienna minivans are the alternate vehicle of choice in New York's cab fleet. In the 1960s in Europe, Mercedes-Benz and Peugeot offered diesel taxicabs. With concerns over the high cost of fuel and fuel economy many cabs in the United States are switching to the diesel engine. Alternate fuel cabs, such as ethanol and propane powered vehicles are becoming more and more popular (Munro, 2007). In London the popular Black Cab is produced by Manganese Bronze Holdings PLC through their division London Taxis International Limited (LTI), a manufacturing company that holds the intellectual property rights to the design (PCO, 2008).

Today there are a variety of different cabs around the world, including horse-drawn tourist attractions, the standard yellow taxicab, luxury sedans and limos, and the London Black Cab, all of which are used to get from one place to another. The London Black Cab service is unique not only due to the type and specifications required for the vehicles but also due to the particular characteristics of the environment in which this work is done (Munro, 2007). In the next section a more detailed history of this service is presented, stressing the working practices and

situated choices for conventional Black Cab work.

2.1.1 A Brief History of the London Black Cab Driver and the Knowledge

The trading history of the Black Cab drivers in London goes back in time to 1662, when the service was established within the City of London (also known as the Square Mile). At that time, the term "hackney carriages" was applied to horse-drawn carriages, which were later modernised as hansom cabs (circa 1834), being operated as vehicles for public hire (Georgano, 2000). The term hackney carriage was later applied to electric hackney carriages, which were put out of circulation around 1901 after several years of use (Bobbit, 2002). During the 20th century horse-drawn carriages existed until 1947, when they were fully replaced by motor vehicles. Currently the most common motor vehicles in service are the TXII and TX4 Black Cab models (LTI, 2008).

All these vehicles had in common the characteristic that besides using mechanical technology for the motion of the vehicle there were very limited or no communication aids provided to the drivers. During this long service history and engagement with the life of the city, the Black Cab service undertook improvements to the vehicles used due to improvements in the automobile technology. Black Cab drivers have also experienced parallel changes in their work practices with limited use of mICT. Table 2.1 illustrates Hackney cabs through the course of history.

Century	Service description
16th	1588 marks the first recording of hackney coaches when one of Sir Walter Raleigh's expedition members, Captain Baily, puts four coaches on the Strand for hire.
17th	Hackney carriage services starts circa 1662 as horse-drawn carriages. The term "hackney" comes from the French term "Hacquenée" meaning "a horse for hire"
18th	Horse carriage services developed further. Hackney carriages were heavy four-wheeled carriages drawn by two horses and having six seats. By the 1760s there were over 1,000 of these causing congestion.
19th	Introduction of the one-horse and two-wheeled Hansom Safety Cabriolet (cab) in 1834 featuring a clockwork mechanical taximeter. Brief period of electric hackney carriages, 'Hummingbirds', 1880-1899 before the transition from Hackney carriages to automobile began with the invention of the internal combustion engine.
20th	1903 saw the first petrol-powered cab in London. Most horse-drawn carriages replaced by automobiles around the outbreak of World War I. Vehicle evolution on design linked to the rise of the automobile led to the last horse carriage license issued in 1947.
21st	Currently around 25.000 licensed taxis in London. MICT increasingly supports taxi work.

Figure 2.1: Hackney Cabs through History, Compiled from Various Sources (Compilation Presented at Elaluf-Calderwood and Sørensen (2008)).

The Public Carriage Office (PCO) heavily regulates Black Cab work, and is the organisation responsible for the regulation code for accreditation and practice of the service, which has the aim of benefiting and protecting the users. This organisation is part of the Transport for London authority, an institution that controls and regulates transport in the Greater London Area. The different modality of Black Cab work (individual drivers, associations, and/or circuits) is constrained by the PCO regulations and the requirements of the users to whom the service is provided. All cabbies and their vehicles have to comply with the regulations but there is wide flexibility and choice regarding the execution of everyday tasks. A driver licensed and owning a vehicle certified according to the PCO regulations is able to work with a minimum of interaction with other drivers.

The acquisition of the green badge – see Figure 2.2 – is the physical formalisation of this process of certification. The green badge accredits the driver as a "cabbie". Further requirements are listed in Appendix 3 at the end of this dissertation.

Figure 2.2: Green Badge or License Credential

Black Cab work in London can be understood with reference to a descriptive diagram of the human and non-human actors interacting in this service – see Figure 2.3. The actors involved are split between the formal regulations from PCO, the general public or users, and the drivers. Furthermore, the drivers can be grouped by method of organisation: individual Black Cab drivers with a low level of organisation, working at micro-level as independent units, or those belonging to organisations supporting Black Cab drivers work using mICTs.

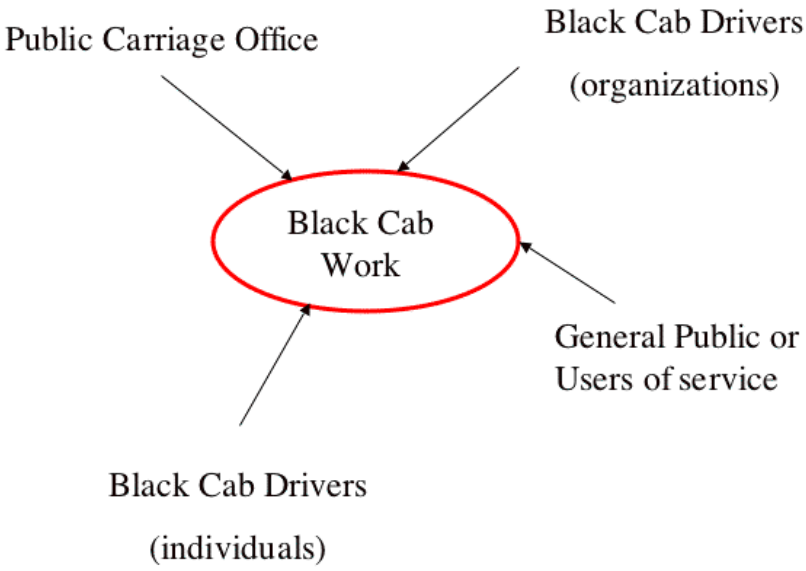

Figure 2.3: Descriptive Diagram: Black Cab Work Actors

The main task of Black Cab drivers is to collect and transport passengers from one physical point to another. This task is atomic and executed over discrete units of time. Historically, to be acknowledged as a Black Cab driver, an issued license was required, a business model that differs from other cities in Europe (Skok, 2005) and the world (Skok, 2003). Candidate drivers must sit a set of examinations in front of a Public Carriage Office examiner, which lead on completion to the acquisition of the Knowledge. This exam was implemented for the first time in 1851 (Bobbit, 2002) and with some modifications is still valid today. The license issued allows the driver to perform his/her duties within a range of 25 miles of Charing Cross Station in London. Historically the Charing Cross Monument in front of Charing Cross Railway Station has been the point from which any distance to London has been measured for mapping purposes. It is the country's benchmark for distance.

During the process of acquiring the Knowledge, candidate drivers are required to learn 300 (previously 400) routes or "runs" of London, as referenced by their guidebook or *Blue Book*. The Blue Book is the basic guide to be covered in the accreditation process for the Knowledge. The Knowledge itself is basically a process of elimination by examination and the volume of work involved is comparable to a

three to four year university degree. The method used to evaluate the candidate's learning is through a series of scheduled examination interviews, named *appearances*, each of which must be passed before the next is taken, with reductions in the time between appearances as the driver candidate passes the scheduled tests. To facilitate the learning of the runs, most candidates motorcycle around central London on small scooters at odd hours. The purpose of these learning tours is to develop a feeling for the city's roads. Candidates learn to match the physical location of a place and the most efficient routes from other locations, taking into account factors such as traffic, path shortcuts, alleys, time of the day and congestion.

Whilst engaged in training, most candidates support their income with work that is related to Black Cabs or taxi services: some are dispatchers in radio control centres, whilst others work in administrative roles in taxi companies, or are HGV drivers, or minicab drivers (London taxis that are not licensed or have limited service licences). Because the nature of their "day jobs" supports their study of the Knowledge, termed "chasing the Knowledge" by drivers, most drivers have a good grounding in the practical knowledge required to make a good Black Cab driver by the time they are licensed.

One of the first aims of a licensed Black Cab driver is to obtain the economic resources to own his/her vehicle. To this end, drivers commonly work overtime for their first two to three years as "cabbies" – the nickname for cab drivers. According to superstition, the first journey a new cabbie makes must be free of charge otherwise bad luck will fall upon the driver leading to his or her eventual departure from the trade.

On becoming licensed drivers, their choice of how to work is idiosyncratic. Through discretionary behaviour drivers are able to define their own timetables and schedules, based on their own particular circumstances. Black Cab drivers can – and some still do – work from their own knowledge with limited help from mICTs. However, when planning timed interruptions to their work, they tend to look for places where they can join other drivers in order to share information about news, gossip or what is going on in the trade.

To illustrate their highly independent and idiosyncratic choices two examples are

presented here. Drivers tend to organise their work following two main patterns. The first one is what in the context of this research has been termed the *regular* work pattern. This type of work has some similarity to work undertaken during conventional working hours. Sometimes drivers engage themselves in activities related to the Black Cab trade, such as marshalling. Marshalling is the activity of co-ordinating the assignment and boarding of taxis at taxi ranks. Such role co-ordination is still completed without mICT aids.

The second type of pattern is what in the context of this research has been termed the *diversified* work pattern. For example, some drivers will vary their routes, choosing to avoid certain places at certain times, such as football matches, because of the risk of traffic jams. The work pattern depends on variable external factors and is therefore irregular and unpredictable.

A common place used by cabbies for social meetings is the taxi rank, many of which are located in strategic areas of central London. The rank is used as the start and end point for daily shifts as well as for breaks during the working day. There are approximately 500 taxi ranks in the London area. The purpose of taxi ranks is to provide the general public with a set location where they can hire a licensed taxi. The rank is the only situation where a taxi may wait for hire in a stationary position. Ranks are situated in locations where the demand for taxis is highest, e.g. mainline London rail terminals, hotels and major shopping areas. Fifty percent of ranks are within the boroughs of Westminster and Kensington & Chelsea.

Over time, drivers acquire knowledge of the best times to approach a taxi rank, or if the day has been less profitable, waiting in a rank is regarded as a slow but secure way to obtain work. Some drivers specialise in working taxi ranks such as the ones located by London airports. As explained earlier, each driver has a preferred way to work that is highly idiosyncratic and with a low dependency on other drivers' choices.

Cabbies also meet at the Cabmen's Shelters, maintained by the Fund of the same name (established in 1875), which runs the remaining 13 shelters (from a total of 61 built). Most are staffed by an attendant who sells food and (non-alcoholic) drink to the cabbies, and the shelter is provided with a kitchen in which the attendant can

cook both this food and food provided by the cabbies themselves. The attendant is not generally paid a wage, but is expected to make an income from these sales. The shelters are also provided with seats and tables, and books and newspapers, most of them donated by the publishers or other benefactors. Shelters can accommodate ten to thirteen drivers. Gambling, drinking and swearing are strictly forbidden (Georgano, 2000). It is also common to find groups of cabbies that know each other from their candidate days, which regularly meet for lunch in certain places, such as cafes.

Because of the complex set of regulations with regards to the vehicle, and the knowledge required for the work, the supply of London cabbies has always been below the level of demand, and parallel to this licensed service, similar taxi services with less trained drivers have existed for a long time. These services received the generic name of minicabs, and in the first instance were supplying to a niche market of the public. A common characteristic of these minicab companies was the lack of drivers with the Knowledge or vehicles fulfilling the requirements of the PCO. In recent years the use of mICTs has allowed more drivers without the Knowledge to offer the same and – in some cases better – services than the established Black Cab taxis. This has been made possible either by offering newer and more comfortable vehicles with lower fares for specific routes, such as those between airports and central London, or simply reducing costs by having a *drivers for hire* business model with shared ownership of vehicles instead of the *one cabbie, one vehicle* business model preferred by cabbies.

In practice, however, it can take cabbies two to three years from getting their green badge to learning the ropes of the Black Cab trade. The long time spent on training and self-learning discourages many potential drivers from obtaining the license, making this qualification as difficult to obtain as a university degree, at least in terms of the time and commitment that it requires.

The expansion in the minicab service has had an effect on the Black Cab service, and to address the issue of competition, new forms of organising work have been put into practice. This research work analyses how the use of mICTs has generated new mobile working ontology's for these workers, reflecting upon organisational change that is still under development, and uses the data obtained to make a limited forecast

of the future direction of Black Cab driving.

2.1.2 Black Cab Drivers Sedimented Work: A View of Traditional Black Cab Work

This section aims to present a review of traditional Black Cab work, that is the work of drivers who do not belong to an organised circuit and therefore do not rely heavily on mICT aids. An example of a Black Cab interior looks without mICT is shown in Figure 2.4.

Figure 2.4: Black Cab without any mICT Support System

Drivers who choose to work independently in this way are a significant majority of the estimated twenty eight thousand or so drivers – around sixty percent – registered. The reason for this high percentage is the attraction this type of work holds for individuals who prefer to manage their own work and time: the possibility to choose when to work and when to stop working is very attractive compared to other jobs normally taken by skilled workers in London, such as construction workers. In fact eighty percent of the drivers interviewed, at some point in time before becoming Black Cab drivers, had worked in the construction industry. Cabbies express their dislike for *office work routine* or *8 to 5 o'clock office work*. They are dissatisfied with the idea of work *stagnated* by routine.

Traditionally Black Cab work has been performed by white males between the ages of 20 and 60 from lower middle class or working class backgrounds. In particular, Eastenders (people living in East London) and Essex natives dominate the Black Cab driver population, with women and ethnic minorities under-represented. This is gradually changing thanks to the efforts of the PCO, yet women and minorities remain significantly under-represented in the trade.

Some cabbies choose to be at certain locations in the city during their shift as there is a higher probability of obtaining work (based on their previous work experience). However if there is no work available, then they improvise using pre-defined strategies for generating jobs, either migrating to a new area or observing, and developing awareness of, events in their vehicle's surroundings. This is known as "rehearsed spontaneity" or "planned serendipity." (Skok, 2005). Improvisation of this kind is deeply rooted in the culture of the Black Cab driver, and typically it will also inform their actions in the event of a breakdown or emergency (get off main traffic lane, put on hazard lights, call breakdown service). It allows a wide range of situations to be handled in a consistently reliable way.

Traditional Black Cab work has a very important limitation in this contextual awareness in that the information the cabbie has is subjective and restricted to their visual capacity. Sometimes there are too many drivers concentrated in one area such as a railway station, where trains arrive at infrequent intervals and the number of passengers disembarking cannot be determined through an observation of the surroundings. In this case, some drivers are forced to leave the station without passengers and migrate to other areas in search of hails, incurring additional operating costs.

Serious competition to a service that was previously dominated by Black Cab drivers has emerged, as GPS systems have become available to unlicensed minicab drivers. These systems enable drivers without the Knowledge to work the same routes as Black Cab drivers, and they are especially good when undertaking cyclical work such as collecting bankers from City Airport and driving into the Docklands financial district. These drivers do not own their vehicles, hence the minicab companies can offer reduced fares to customers.

In some cases traditional sources of work have dried up as new working practices are defined by office workers able to work remotely or at home some days a week; companies trying to reduce their office costs have also reshaped the demand for Black Cab drivers. To their credit, drivers have been able to rise to the challenge. Not only have the methods of managing the supply of Black Cabs benefited from the introduction of mICT, but the working methods employed by drivers have also changed. The most successful cab companies are thus those able to compete in this

environment using sophisticated technology.

The characteristics of this type of work can be summarised in Figure 2.5, which shows the relationships between the different elements of Black Cab work and concepts previously discussed. The concept of self-referential work will be discussed in further detail in Chapter 3, since there are significant shortcomings in the literature in this area. This dissertation considers self-referential work as one of the main areas of research to be explored.

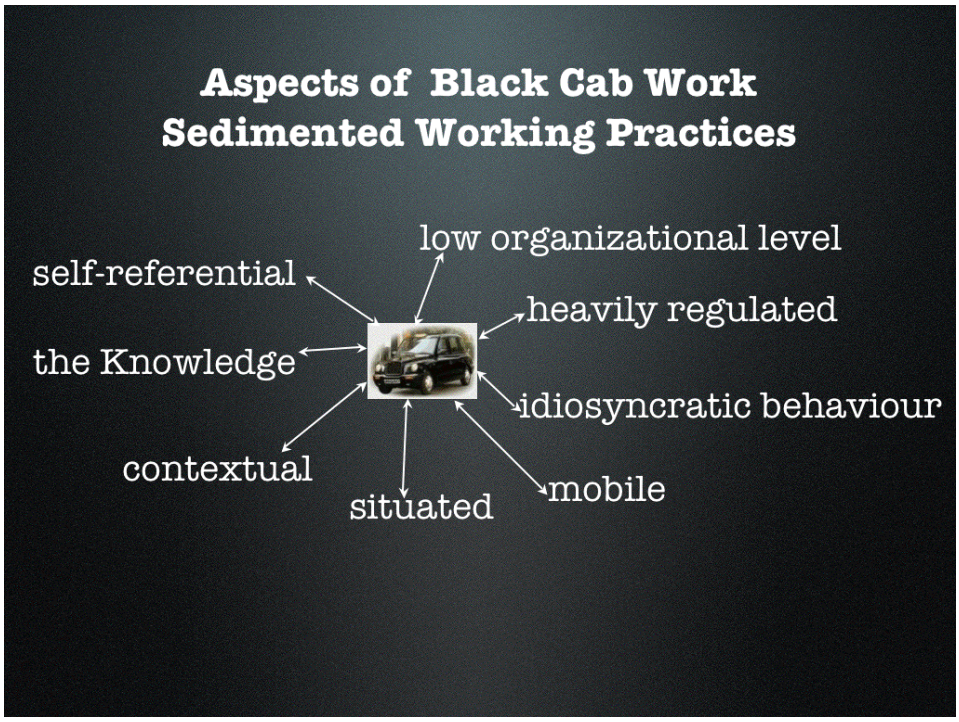

Figure 2.5: Aspects of Black Cab Work Sedimented Practices

The next sections in this chapter aim to link the concepts and ideas surrounding London Black Cab work with the literature concerning the other areas of research relevant to this dissertation.

2.2 Mobility

This section will discuss the general meaning of mobility and mobile work, drawing upon the available research in the area of mobile studies and mobile technology.

What is mobility? Mobility is one of those words that are difficult to define, despite the existence of many concrete examples of the concept (Kristoffersen and

Ljungberg, 1999). A search into the English meaning of the word ***mobility***[1] shows the following:

> **1. concept** motion, **function** noun, **definition** movement; **Synonyms:** act, action, advance, agitation, ambulation, body English, change, changing, direction, drift, dynamics, flow, fluctuation, flux, gesticulation, gesture, high sign, inclination, kinesics, locomotion, mobility, motility, move, oscillation, passage, passing, progress, sign, signal, stir, stirring, stream, sway, sweep, swing, tendency, travel, wave, wavering
>
> 2. **concept** motion, entry movement, **function** noun, **definition** motion; **Synonyms:** act, action, activity, advance, agitation, alteration, change, changing, deed, development, displacement, dynamism, evolution, evolving, exercise, flight, flow, flux, gesture, journey, journeying, locomotion, manoeuvre, migration, mobility, motility, movableness, move, moving, operation, operativeness, passage, progress, progression, regression, shift, shifting, steps, stir, stirring, transfer, transit, translating, transplanting, undertaking, velocity, voyaging, wandering

Mobility then is etymologically understood as consisting of two layers of meaning: motion and movement, i.e. the state of being in motion and the act of moving. This provides an interesting view that has no direct equivalent in the sphere of social and information systems analysis due to the breadth of the meaning, which makes it difficult to use the term in ontology and classification. Perhaps mobility can only be understood in the context of what we call mobile: either individuals, physical settings, technology driven by devices, or the information available "anywhere, anytime" that can be used to connect to social systems outside the immediate environment.

The literature review for this dissertation has been focused on understanding the classical concerns, pragmatic uses and emerging discourses that are covered by research in mobility (Lyytinen and Yoo, 2002; Sørensen, 2003). The review process aims to illustrate how an awareness of the impact of mobile technologies on contemporary life contributes to a discussion of the effect of the mICT use on

[1] Semiotic definition of the word "mobility" taken from Roget's Millenium Thesaurus (2004). The word is comprised of meaning in two layers: motion and movement, the act of moving and the state of being in movement.

working practices amongst Black Cab drivers. It is discussed in terms of changes to the concepts of individual identity (Heath and Luff, 1999), working practices (Wiredu, 2005, Al-Taitoon, 2005; Manzmanian et al, 2005), home, family and society (Bauman, 2001; Barley and Kunda; 2004).

In the area of mobility, IS studies have focused on the functional characterisation of mobile technology (Kristoffersen and Ljungberg, 2000) aiming to make a contribution to the design of the interfaces to, and functions available on, those devices that are used in mobile work (Luff and Heath, 2001). Many studies focus on work that has been transformed from stationary to mobile and the type of difficulties this change implies (Weilenmann, 2003). Other studies have focused on understanding the creation of virtual spaces for work (Al-Taitoon 2005, Pica, 2006). These studies focus either on the uses of the mobile device or social practices for which communication is enhanced by the use of mobile devices (Laurier, 1999; Carroll, 2002 and 2003).

There is more to the study of IS than the technology itself, which might have been overlooked in the research literature available (Elaluf-Calderwood et al, 2005). A great deal of effort has gone into characterising mobility in terms of mobilisation and the emphasis on the temporal, geographical and contextual aspect of mobile interaction (Kakihara and Sørensen, 2001); there is, however, a dearth of studies that extend Information Systems beyond the classification and descriptions of the uses of mobile technology, the purpose of which is regarded as either work or entertainment (Grinter, 2001; Hulme, 2001; Hertzfeld et al, 2003). In sociological studies mobility is mainly seen as a technology to be studied for its interesting properties in terms of appropriation, communication, and social interaction for specific groups in society (Bachen, 2002; Fox, 2002; Geisler, 2002) or as a social force of exclusion (Urry, 2000, 2001 and 2002).

It has been argued that mobility studies has too many angles of interpretation, that its aims are too general, and that it is also too narrowly based on a technology-centric understanding of the uses of the technology (Sørensen, 2003). In recent years, however, the study of mobile workers is an area of research that is being explored from a different angle, with the aim of understanding how the use of mICT influences working practices. Studies such as those undertaken by Kakihara (2003),

Wiredu (2005), Al-Taitoon (2005) and Pica (2006) have successfully explored those changes using interpretive study methods and phenomenological analysis.

The terms "mobility" and "mobile work" are interrelated. Depending on the use of the mobile technology and the degree of mobility the work entails, workers may find themselves in situations where aspects of one or both terms apply. Their identity as mobile individuals is under constant re-negotiation. There is an ongoing philosophical discussion about the effects that this renegotiation has on the definition of identity of individuals and society, the *Dasein* of Heidegger (Myerson, 2001).

This debate surrounding the renegotiation of identity and the boundaries of being is at the core of the research paradigms in this dissertation. Mobile work has been so far described in relativistic terms, as observed from outside the realm of work activity. Very few pieces of contemporary research have explored the meanings conveyed by the shift in the perception of work described using self-referential parameters.

This dissertation identifies the need for further research into these concepts, taking into account both a semantic and a socio-technological approach to the working definitions of mobility and mobile work. The literature review strongly indicates that there is a gap in the body of research knowledge, as will be demonstrated in the sections that follow.

2.3 Black Cab Work as Situated Mobile Work

In many research studies, mobile individuals are commonly assumed to be at work only when in *static* situations, such as when undertaking most of their work from their desks or when moving between static places of work or stations. This is a limited view of mobility: if we consider mobility in terms of physical settings, individuals might regard themselves as more or less static, yet their environment – a car, a boat, etc. – can be mobile. Both mobility and technology are implied by the use of mobile devices, which have the capacity to access information remotely "anytime and anywhere" (Kleinrock, 1998).

Another theoretical approach to the question of the essential quality of mobility can

be directed by a common understanding: mobility is “portable”, “wireless” or “dynamic and flexible” (Weilenmann, 2003). Those words can be understood with reference to the object used for mobile communication, not the individuals themselves (Myerson, 2001). This is a view within reach of most non-academic individuals, and it has influenced the way individuals address research questions related to mobility.

Mobility is a relatively new area of research in which there is still room for the discussion of methodologies and theories. Some of the research in this field has also defined mobility in terms of location, using such terms as local mobility, remote mobility and micro-mobility, inspired by the desire to separate the object used for mobile activities from the mobile setting (Luff and Heath, 1998). We have seen that the notion of a separation between these two concepts is the approach taken in all of the three models above. The main assumption in these views is that work, even if mobile, remains within the physical boundaries of the location. There is an underlying assumption that mobile workers are somehow separated or segregated from their outside life and that everyday activities do not interfere or interact with work regularly, and from that point of view, work is seen mainly as office work.

Mobility can be regarded as a mode of transportation, i.e. work co-ordination might occur during a journey, or work might be carried out at the beginning or end of the route; in this dynamic view of mobility some spaces in which the worker moves to perform work are given extra status or weight as bases of mobility (Weilenmann, 2003). This analysis does not properly explain what happens with those of types of work that is carried out when travelling between places, and in addition there is – for the mobile worker – an external life that often intrudes into the work.

Mobility has also been also explored through the vision of the concept of “anytime, anywhere” (Kleinrock, 1998) – joyfully embraced by mobile operators as a catchy slogan for marketing mobile phones – which, applied to place and time, gives us the ability to create relationships between tasks that can be independent or dependent on time, whilst the task itself can be independent or dependent on place (Wiberg and Ljungberg, 2001).

Using this model of mobility Kleinrock (1998) applied those concepts to work and

home interaction and linked it to the person and the object that enables mobility, which can be juxtaposed against the techno-centric approach discussed above. We present below a list of the four major conceptual situations in time and space forming the context in which mobile workers carry out their work. See Figure 2.6:

CASE	DESCRIPTION
1	Work that must be undertaken at a particular time, but can be in any place.
2	Work that must be undertaken at a particular time, and in a particular place.
3	Work that can be undertaken anywhere, and at any time.
4	Work that can be undertaken at any time, but must be in a particular place.

Figure 2.6: Four Major Conceptual Situations for Mobile Work (based on Kleinrock, 1998)

This four case vision has been criticised by Wiberg and Ljungberg (2001), Kakihara et al (2002) as lacking appreciation of the contextual nature of work in a relatively narrowly defined context – for many activities, there is no choice as they have to be performed at a certain time and in a certain place. From a social perspective, networks and human interaction in networks are never symmetrical (Nardi and Whittaker, 2000); we constantly need to negotiate our interactional preferences against those who either attempt to contact us or those who we wish to get in touch with (Kahikara, Sørensen et al, 2002). Because the context of work and human reaction to that context is not always synchronous, the vision can perhaps be redefined as "sometime, somewhere".

What is important in the context of the arguments in this dissertation is that the concept of mobility enables us to analyse Black Cab work from two angles: firstly, the traditional *static* network, where work is based on the discrete steps of a process, where the field of work is *static* and collective, work and home are static points, and the *dynamics* are seen from the point of view of an external observer. Secondly, the

dissertation considers the mobile dynamic network based on service work, highly distributed in time and space, which may be physically undertaken anywhere. The latter view is based on individual needs fitted into the spaces and times allocated for work. Black Cab work is mainly individual, or sometimes collaborative, but from the point of view of the driver the network is regarded as static. Events and actions can be regarded as the building blocks of a driver's everyday work.

In the case of Black Cab drivers, the parameters of mobility – as seen by an external observer or a static view – are characterised by flux and contradiction (Cousins and Robey, 2003). The driver's flexibility depends upon his or her ability to enter and leave mobile situations at will, sometimes called *hypermobility* in recent theoretical literature (Kahikara, 2003). The worker's drive is to organise and follow his work and his life in the most efficient manner possible in terms of maintaining social contact, distance, time and fuel. The constant state of flux between mobile and static situations can appear to generate a succession of unrelated events. The essential question of how work and life are balanced can here be answered by determining how these constant changes relate to events and actions that are sequential and fluid.

An understanding of self-referentiality contributes to the answer to this question, and is an area of research that this dissertation has identified as important and deserving further investigation. It might legitimately be asked whether the discussion of mobility as a theoretical framework raises further essential concerns related to the ideas of time and society: the linear perception of time and sequence of work is a characteristic of Western society (Lee and Liebenau, 2000a) that is being slowly altered – if not directly challenged – by mobile work and mobile devices. Theoretically, drivers can, in a mobile setting, work statically, at least where the components needed for work are provided. The time linearity is broken; space and the static location for work disappear. Black Cab work can then be a seen as a pattern consisting of a series of buffers punctuated by static life events. The question remaining, then, is how to determine the components of social being in the driver; furthermore, it is an open question whether the static view of this type of work offers a better approach to their dynamic view of everyday work.

An answer to these theoretical questions can be provided by social network theory: the mobile worker will define himself as being based not in a location or in time but

in the networks to which he belongs. In its extreme form this fluidity of movement is converted into *nomadism* as visualised by Kleinrock (1998). Nomadism, however, does not seem to be the way to express the mobile work - mobile life interaction because it overlooks the social ties, which remain the same whether within or outside the mobile environment. Rather, it will be the form of these social ties to the immediate social environment known by the mobile worker that will perhaps define the settings and boundaries of that interaction.

Whatever the reasons for understanding mobility, and narrowing the understanding to Black Cab work, the relationships between work, the artefacts used to work (mICTs) and the limitations and capabilities of the technology need to be linked and explored. The following section summarises some of the ideas that have been used to analyse such relationships.

2.4 Social Paradigms in Black Cab Work

In theoretical discussions of those types of work that can be carried out anywhere, anytime, the shift of work from static environments to dynamic or fluid environments is defined by the mechanism of co-ordination in communications that occur in the field of work. There are two opposite positions taken by researchers in the field.

The first position consists in asserting the use of mICTs as the best way to keep work as mobile. Weilenmann (2003) describes mobile work using a vocabulary of location. Despite the wide range of definitions of the nature of mobile work that can be found in the available literature, there are a limited number of research cases covering mobile workers who developed mobile work practices unaided by mobile devices before their introduction to the workplace.

The second position taken is to assert the use of mICTs as a support tool for mobile work. A mICT can act as a source of raw information (e.g. providing live congestion data) or as a location dependent tool (e.g. displaying maps). Alongside these roles, however, the communication device is also a social work tool. The dissertation analyses the social interaction observed when mICTs are installed as a support tool. In particular, we analyse the degree of communication between members of

distributed work groups, the effects of mICT on collaboration and the mediation of technology in the distribution of activities (Kraut et al, 2002).

From an IS point of view, the sociological aspects of work take a twist when trying to interpret the phenomena arising from the intervention of mobile technology in the workplace. Considerations drawn from IS theory and practice risk a misunderstanding of the essence of technology, and sometimes take a simple interpretative approach to the use and variations of the technology (Mingers, 1984). This discussion leads to a reflection on the nature of the technology itself and the artefact that is being used to mediate in mobile work. Often omitted from such an analysis is the elaboration or engineering of appropriate responses to the new uses such devices are put to, in terms of work practices: it is not simply a case of thinking up new applications for the technology, but also of organising work processes around those uses. New sequential organisation and coherence is likely to adhere to the new working practices, *since every course of action depends in essential ways on its material and social circumstances* (Suchman, 2007).

Mobile work is thus taken to a wider and more generic level of analysis. Opening the 'black box' of technology is a metaphor (Orlikoskovi and Ianocono, 2001; Kallinikos, 2002) for understanding the links between working practices and the integration of the artefact and its uses into those practices. This analysis is limited by the actual usability of mobile devices when in the field of work. This encompasses both the time when the technologies are physically usable, the opportunistic use of the technologies (Horning et al, 1999) and the management of complex paradoxes that surface in working practices due to the use of the technology (Jarvenpaa and Lang, 2005).

In IS the study of mobile technology is focused on the effects technology has on the way work is performed, but this approach leaves open the question of how to understand overlapping mobile technologies that might be used simultaneously. A way to overcome such shortcomings in the research is to understand the types of work where mICT can be used, and the mICT designs that are orientated to support such work. In this way distributed work becomes possible. This enhances the abilities for interaction and outeraction. *Outeraction* is a term used to describe "communicative processes people use to connect with each other and to manage

communication, rather than to information exchange" (Nardi and Whittaker, 2000).

The literature available is not conclusive in determining just one avenue for the research approach. This dissertation has chosen to follow the path of CSCW and the sociology of work, stressing the temporality and the situadeness of the relationships between the worker, the work, the artefact and the technology embedded therein as core issues to be explored, forming the theoretical background to this dissertation.

The literature review includes the review of concepts related to mobility in terms of CSCW (Schmidt, 1998; Olson, 2000; Nardi 2002). The emergent body of research work that explores the social and organisational aspects of mobile technology, in general emphasising its overall social impact, contrasts the everyday uses of technology against the use of such technologies at work or in educational settings (Wiredu and Sørensen, 2005).

The effects of mobility on workers' boundaries between work and what is not work is often presented as the view of an external observer describing events and objects. The discussion in this dissertation focuses on the viewpoint of workers that are highly mobile and examines mobility from their mobile perspective. With this type of worker, the job(s) are executed in different locations over time. Whatever the type of mobile work being executed by the worker, we shall seek to determine whether this apparently ever-changing situation is the perception of an external or dynamic viewer.

The worker is aware that in moving between places, life cannot be completely put to one side, or will at least continue in parallel and return to him later in the day, after work is finished. The worker then perceives the work as being mobile and himself as static, even though it is only the worker's focus that has moved from external factors influencing his work to the internal, static view of the work. The static view is an insight into the apparently ever-changing negotiations and priorities in the life of the worker that could contribute to identify and prioritise certain elements of the worker's work and life, aiming to establish a more fluid balance between private life and work.

Intrinsically linked to this idea of an internal or external reference for defining work is the increased use of mICTs as tools to determine the relative distance between

workers, in what are now known as emergent working practices created by the 'death of distance' (Cairncross, 2007).

The concept of work that is internal, or self-referential is researched throughout this dissertation. Self-referentiality is a broad term for the concept of work which is organised by its own logic, illustrated by the idea of the black cab as a mobile office, as opposed to work that is mobile but where the reference point is external, for example when cab work is viewed from outside the cab, by a radio controller, for example. Self-referentiality can be exercised to differing degrees and can take various forms: it can be discrete, continuous, or idiosyncratic. External, contextual factors – outeraction – can also be taken into account.

Research undertaken in the field of CSCW has focused on determining how coordination mechanism for collaborative work can be enhanced by the use of mICT tools, when there is some kind of external referentiality at work. Research in this area has identified the emergent temporal behaviour linked to collaborative work (Seebeck et al, 2005). The first sign of this emergent behaviour is the effects that proximity – or the lack of it – has on collaboration (Kraut et al, 2002), with different levels of success. Identifying mechanisms that promote collaboration that is virtual or physically distanced by CSCW designed tools is an important aim in this field of research.

Understanding the subjective differences between the viewpoints of workers that carry out distributed work of some kind is another issue with impact on self-referential workers (Armstrong and Cole, 2002). Autonomous self-referentiality is limited in mobile work by the physical conditions in which this work is performed. In this dissertation this assumption is questioned and further explored, as will be shown in later chapters. Mobile mediated oral communication can amplify or distort the ideas of relative distance, and severely limit the capacity to learn by watching – the "out-of-sight, out-of-mind" dilemma. As well as the effect of physical distance, time differences widen the possible range of actions available to the worker to include the recognition of conflicts or overlaps in the working dynamics established (Olson and Olson, 2000).

For self-referential workers the creation of an organisational context can be a

challenge at diverse levels, from understanding the expected role of the worker in task executions, to the actual evolution of the organisation they belong to, if any. In an interpretative approach, the variations in working practices provided by self-referential workers are negotiated through interaction, and the selection of emergent practices by understandings and compromise (Aldrich and Ruef, 2006). In some cases this can lead to a complete rejection of current practices with a high dependency on shared learning.

In contrast to Suchman, CSCW has dealt with self-referential workers as technology mediated workers who obtain from their work tools new benchmarks for their work reference, maps or scripts (Schmidt, 1997) which can be used to increase their awareness of the world external to their work (Schmidt, 1998, Wiredu, 2005, Pica, 2006). This helps in obtaining better objective information about the choices they have for work, reducing the self-referential component of this information. CSCW research however has produced a wide range of technologies that in some cases overlap each other depending upon the contexts in which the work is executed.

The next section in this chapter discusses how the use of mICT allows contextual choice for mobile work, taking into account the role improvisation, moods, and self-reference have in the perception of how such work is actually carried out. Work for the mobile worker aided by such tools drifts away from planned routines, schedules or maps (Suchman, 1987) towards a more environmentally contextualised experience of decision-making or work choices, exploiting the opportunities that arise from learning to discover and elaborate the diverse factors influencing the choice of work.

2.5 Mobile Work Studies and Taxi Work

Black Cab work is by its very nature mobile. Whilst many studies have focused on describing the nature of mobile work using ethnographic methods (Suchman, 1987, Orr 1992), others have discussed what mobility is (Weilenmann, 2003). Black Cab work has for a long time – nearly 400 years – been a trade in which technology, other than the vehicle itself, had a lower level of intervention.

The most relevant aspects of Black Cab work, which have been studied in detail by

social scientists, are related to the role of knowledge or of the knowledge worker and knowledge management (Skok, 1999 and 2003). Such studies have reflected upon a definition of the contextual space in which these workers make work choices, thereby influencing the work executed. Besides the historical trace of events in Black Cab work service evolution, there have been few organisational studies of this type of work.

Throughout this dissertation, an empirical understanding of mobile work and Black Cab work is used as a foundation for the development of the research framework. Such an understanding is rooted in a classification of relationships between mobile workers whilst at work, based on the level of interdependency versus the level of mobility (Karsten, 2003), and applying such a classification to Black Cab work.

Until now, the interdependencies – discrete and continuous – between mobile workers and mobile technology have been explored in general terms. This is also the case when it comes to understanding mobility as a constituent part of the setting in which mobile work is performed. Such interdependencies now need to be examined for the particular case of Black Cab work and its associated daily activities.

In the IS literature reviewed for this dissertation, clear conceptual boundaries are encountered when attempting to define those interdependencies. One of the first is the case of workers with a low level of mutual interdependency with their co-workers, and low mobility at work. In this case, workers find it more difficult to define their own rules of interaction between work and home life (Bachen, 2002). The awareness these workers might have of their work is derived from the supervisor of the work and the rules that are established in such a working structure. External home life can interact with work life but only with difficulty. For example, a call-centre worker confronted with an emergency at home cannot just leave his desk and start managing the home problem: he will need approval or permission from his manager, following the rules of his office before dropping work to attend the home emergency. Extreme examples of such dependency in the working conditions workers have to deal with on an everyday basis are provided by Bunting (2003).

Another case of interdependency is the case of workers with a high level of mutual interdependency with their co-workers but a low level of mobility at work. When

this is the case, those workers find it relatively easy to negotiate the rules for managing work and home life. Having interdependencies means that the worker is able to trade time for events outside work with working time. For instance, a shopkeeper's assistant can negotiate shifts with co-workers or management with a short notice period and can also be relatively free to be contacted by his family at work if necessary.

This second case of interdependency seems to be a favourable starting point for understanding shift choices based on individual, idiosyncratic choices for work. Following studies in the sociology of work in relation to time, individual time and organisational time can be seen to diverge for workers in this category (Blount, 2001). Shifting and keeping balance between the work and home take a higher priority (Zeruvabel, 1979), from which emerge complex schedules with a variety of rhythms marking the passing of time in everyday life (Lefevbre, 2004).

The third case of interdependency is the case of workers with a low level of mutual interdependency with their co-workers but a higher level of mobility at work. In this case the workers define their own rules for work and home life interaction with ease. Historically there are many documented cases of this type of worker, especially within distributed organisations (Hinds and Kiesler, 2002). This worker's category is distinguished by the constraints that are internal to the worker himself. For example, a mobile worker such as a taxi driver can choose if necessary to stop whatever work he was aiming to handle and deal with an emergency at home.

The fourth case of interdependency is the case of workers with a high level of interdependency with their co-workers, but with a high level of mobility. The literature reviewed shows that such workers might find it difficult to define their own rules for work and home life interaction. Interruptions are the norm (Rouncefield et al, 1994). Events and situations are in a constant state of fluidity and change is the common status. For instance, a network engineer in a crew might need to be aware of where work needs to be done and which co-workers are available to change shifts or handle an emergency at home.

From the literature reviewed, this dissertation concludes that it is important not to underestimate the importance of complexity and uncertainty in understanding work

and life choices, as they will be polarised where work is mobile. The importance is heightened when studying the domain of this research, namely highly mobile workers with highly embedded technology (Mackinlay et al, 1999). Nevertheless when trying to reflect on the sociological aspects of this work, a temporality (to use a phenomenological term) is attached to the choice or work, whereby work is split into discrete, smaller units of time, as for example in the case of task-based work (Lee and Liebenau, 2000). Balancing the shift over time and space seems to be an area of research in which there is no clear predominant theory that can be used to set out the choices at work.

From the four cases of interdependency presented, the work of Black Cab drivers is identified as belonging to the third case, that of low interdependency with other drivers and a high level of mobility during discrete short-term tasks. Contextual awareness of which jobs to take and when to take them relies very much on the level of self-developed expertise gained by years of experience in the trade. Hence the case of Black Cab drivers differs to that of other workers in this category. Since these workers were already mobile, the role mobile technology has played in reshaping the definition of this type of work has led to a more ambiguous definition. CSCW highlights the importance of determining how work is done in the real world before design, and this idea can be extended to understand the tools used for work before contextualising it.

Mobile work is seen as chained actions aimed at performing a job. As in the case of police workers (Pica, 2006), research can draw upon the everyday mobility of Black Cab drivers' work. Together both police and Black Cab working practices have evolved over time, influenced by the adoption of mobile technology at work. The reflection of such changes in organisational terms is also significant. From self-referential and highly individualised work, Black Cab work that is assisted by mICTs seems to be evolving towards a heterogeneous collection of organisational forms in which loose associations and perhaps ephemeral organisations create new working practices which are suitable for an increase in the levels of contextual awareness.

There is a body of literature in IS dealing with the conceptual modelling of planned change action to enhance technology adoption and behaviour (Lippert and Davis,

2006), complementing the idea of ephemeral organisations (Saunders and Kreps, 1987) as a series of complementary actions configuring the settings of activities or actions. The organisation of work mediated by mICTs aims to enhance contextual knowledge, for better choice of work and revenue. The organisation is seen as more ephemeral, but no less effective. It must be noted that the rise of such ephemeral organisations has not been promoted by situations of sudden emergency or temporality.

Over time, the mechanical and organisational components of Black Cab work have evolved differently. Focusing first on the evolution of the vehicle itself, from hackney carriages to motorised vehicles, the core working practices of cab drivers were relatively unchanged. This mechanical evolution liberated drivers of the restrictions of handling horses, thereby extending the distances covered and daily working times. No other changes occurred for a long time. Working practices changed over shorter period of times due to the introduction of new technology. As seen in Figure 2.3, Black Cab work has had several periods of change during the existence of the service. The question as to whether the adoption of technology is or is a contributor to changes in organisational form, or changes in the organisation demand the use of new technology, remains open.

The two main changes that have occurred to the adoption of technology of this type of mobile work are the changes to the physical aspects of the vehicles and the increasing reliance on mICTs as an aid in the search for work. The argument that mobile technology makes work more fluid (Urry 2000) is here applied in reverse, since they were already mobile prior to the adoption of the technology.

The variations in technology and organisational forms for Black Cab work are reflected at an individual level in the changes in working practices that were observed during the fieldwork. However, it is empirically striking that the more so-called “awareness-enhancing” technologies such as GPS are embedded in the everyday work of these mobile workers, the more unlimited self-referentiality seems to give way to organisational settings in which the main mediator and organiser is the technology.

2.6 IS and Everyday Mobile Work

The intervention and rise in the use of mICTs for mobile work is part of a wider evolution in the development of IT tools to support work. Theoretical frameworks have been prepared by Thompson (1963), Zerubavel (1979) and later Zuboff (1988) at the early stages of the introduction of IT into work practices, aiming to understand the intrinsic changes that such interventions have created in the working practices.

In the discussion of what mobile work is, when and how it is done (Weilenmann, 2003; Kakihara, 2003; Wiredu, 2005) there is the need to reflect on how such work is contextualised. The discussion of context choice is a complex paradigm in social studies of mobility. A variety of examples can be taken from the early sociological approaches to understanding space and time for work. From photocopier repair engineers (Suchman, 1987; Orr, 1992) and pilots in plane cockpits (Adams, 1990), to Black Cab workers (Elaluf-Calderwood and Sørensen, 2006), there are wide variations when trying to understand the context of mobile work.

To address such a wide spectrum we can discuss contextualisation in terms of the communication of resources. The ability to convert data provided by the environment surrounding the physical location where work is executed, whether or not this is aided by mICT tools, is part of a complex process of communication and consolidation of current and previous knowledge and experience in relation to the activity or task whose execution is being planned (Suchman, 1987). If contextual knowledge requires a dynamic variation in knowledge of the environment, execution of planned work becomes more difficult, and areas of the work may never be completed due to lack of knowledge. Communication and understanding of the information available can overwhelm the worker as well, producing an overload of interruptions and information (Speir et al, 2003; Allen, 2005; Sørensen, 2003).

Contextual choice is seen as limiting and narrows the understanding of the choices made at certain physical locations. MICTs in their diverse forms create virtual spaces in which choices are also contextualised. Examples of this type of virtual space are supplied by Al-Taitoon (2005), Wiredu (2005) and Pica (2006). Every course of action depends in essential ways on its material and social circumstances (Suchman, 2007), and in order to define contextualisation, all such circumstances need to be

enumerated. The interpretative analysis of the practical objectivity of situations that arise from this understanding can be contextualised in a phenomenological view of the world in which such work is done.

The consciousness or lack of it when embedding work actions in-the-world requires a Heideggerian approach to the notion of being and the individual and organic or environmental organisation surrounding work. It leads to the question as to whether the ability to control or manage contextual and located work depends on the kind of resources, real or virtual, which are available. Whilst work in its generic sense is always contextualised – for example for a factory worker, the context of his work is the factory production and his work premises are the factory itself – technology and in particular mICTs are expanding the meaning of work, so that the boundary between settings is becoming blurred and contextual choices become dynamic variables.

Whilst at work, *everyday engagement with the world directed toward the accomplishment of practical tasks* (Dourish, 2001) is the function of mediated technology such as mICT. All those actions engage with the world, and are fundamental to gaining an understanding of the world, the work and the relationship between them. Hence the perspective is not merely that the worker is embodied in the world, but also that the world is the contextual setting of all his activity or work. Such a setting is influenced, and perhaps shaped, by the activities and awareness workers are able to achieve. An example of this has been described in the Prologue.

2.7 Discourses and Limitations of Current Research

This chapter has presented the research themes relevant to the study of Black Cab work and mobility studies as they were encountered in the relevant literature available. In the first instance, a historical review of the origins of the Black Cab trade was made, presented from the point of view of the drivers' working practices with mICTs: unsupported, computer cab systems and GPS based systems were described. A narrative about how work is completed was related, together with details of how the use of those systems became widespread. In so doing, a gap in the understanding of this type of work was identified. At an individual level the concepts of self-referentiality form an area of research that needs to be explored

comprehensively. In organisational terms there is an open question regarding the impact that the use of mICTs has had on organising Black Cab drivers' work. From the socio-technical point of view there is a vast body of literature covering research in the use of mobile phones by identifying parameters such as age group, gender, and leisure activity. It is only in the last few years that a more ubiquitous interest in the study of people at work has emerged, encouraged by discussion forums for online user groups. This leading edge in research has been motivated by the desire to improve the design and operability of mobile devices.

There exist a number of limitations to the current research approach to mobility studies in IS. One limitation in IS research is the definitions of and balance between the relationships of the real world and the virtual world created by the use of mICTs. Ethnographic studies or ethnomethodological studies have only provided a partial understanding of what really happens at an individual and organisational level. Both layers will be analysed using the theoretical perspective outlined in Chapter 3. There will also be further insight into how the methodologies used (by interviews and RRTR) were applied in the analysis.

A phenomenological approach to research in mobility and mICTs can present a more complete or enhanced analytical lens for the issues addressed by systems aimed at increasing awareness and raising opportunities for distributed work. Currently the feedback provided by the research available in the field has an indirect link to design inputs in CSCW or organisational theory. This is in part because of the diversity of cases and methodologies used to undertake research in the field. Overall, the diversity of methods and theories used to interpret how mobile work is done is a serious diversion to a coherent view of studies of mobile work.

2.8 Summary

The available literature in the area of mobility and mobile technology focuses its analysis on understanding work that has been influenced by the use of mobile technology in its working practices. This research has identified a research domain in which the pre-existence of mobility within established working practices has not yet been researched in depth. CSCW gives the theoretical background to understanding the issues raised by shifting working practices from independent self-referential

backgrounds to bounded or associated work with a higher level of interdependencies.

Using this approach, it has been possible to establish the scope and limitations of the research domain. Due to the contextual nature of the mobile work researched, a phenomenological approach is required to understand the pressures and processes that these workers are subject to when at work. The main work task completed by Black Cab work happens on the streets. Responding to passenger hails is the principal activity executed by cabbies. This semi-professional worker does his/her job by performing an activity, which is in fact a public service run by private operators. Paradoxically, the service needs to be heavily regulated before it can be carried out, but once on the road, cabbies have absolute freedom to choose whatever working practices (schedules, timetables) they wish. Cabbies rely on information sourced from their physical or virtual surroundings to do their work. Until now, studies of Black Cab work had focused on knowledge management, *understanding the critical issues arising from reforms to the service implemented* (Skok and Tissut, 2003) in recent years to enhance commercial competition in the service. There has been very little research focusing on the effect the intervention of mICT support tools has on the daily work cabbies perform.

This dissertation takes this last point and examines how mICTs support work in the context and situadeness of mobile Black Cab work. This is achieved by splitting Black Cab work into two analytical layers, one at the individual level and one at the organisational level. These are applied to both theoretical and empirical work. This dissertation aims to contribute to an understanding of the work that is performed and how it is carried out in such contextual and situational settings.

Finally, the case was made for Black Cab work to be understood in the context of mobile work, taking into account the evolution in the working practices in the trade. The conclusion drawn was that the current literature does not have any relevant studies of work reflecting the mediation of mICTs as dynamos driving new organisational forms aimed at enhancing contextual awareness or self-referentiality.

The principal aim of the following chapter is to describe the relevant theory underpinning an understanding of work that is influenced by the context in which it occurs, in an attempt to overcome the lack of current research in this area. Besides

the social aspects of this work, this dissertation proposes a phenomenological understanding of context, reconnecting the situadeness of the choice of work by restricting the research subjects to an ethnographic discourse.

CHAPTER 3: THEORY

In everyday life, what is relative to social relations thus appears to every subject as necessary and absolute, as essential and authentic.

(Lefebvre 2004)

This chapter presents the theory that is to be used to answer the research questions on self-referentiality, which forms the core of this dissertation. This chapter focuses on the situated nature of the choice of mobile work, on the mobile workers such as Black Cab drivers making those choices, and on the mediation of mICT in their working practices. This chapter examines the conceptualisation of mobile work that has a strong self-referential bias, with a high degree of temporality in the choice of work. It also sets out research into organisational changes that follow from the intervention of mICTs in the workplace.

Mobile research undertaken in the field of IS usually involves a deterministic analysis of the ontological framework of discussion. Traditional studies in IS make use of such a research framework to determine the relationship between the actors and the technology, understanding the relationship either as a 'black box' or a 'non-black box' that is socially meditated (Orlikowski, 1992). These frameworks – and there is more than one lens of analysis – elaborate on endogenous concepts such as moods and individual choice that are to be organisationally reconstituted (Ciborra and Wilcocks, 2006); this approach, however, has limitations when attempting to understand less structured work settings.

A conciliatory approach to IS mobile research attempts to address these concerns, by making a more inclusive understanding on how mICTs and mobile technology in particular shape and are shaped by their everyday use (Kahikara, 2002, Kietzmann, 2006) . Lefebvre (2004) points out that individuals and organisations form part of the set of observed social phenomena, conferring them with a relativistic character. The literature review in Chapter 2 presented the themes of mobility studies in relation to Black Cab work and the main research areas in both traditional and less conventional approaches. What is most striking is that there is no body of theory making reference to the main socio-technical studies in this field. Furthermore, theory is frequently

used either as a channel for expressing the values and aims of the research agenda, or simply for the purpose of comparing case studies that are not vastly different. Consequently there is scope for researchers in the field to explore many theoretical paths in greater depth.

In this dissertation it is necessary to define an ontological terminology of the elements to be researched, in order to determine firstly, the domain of study and secondly, those components of the research that are associated with strong methodological beliefs in social science (Weick, 1979; Orlikowski and Baroudi, 1991; Walsham, 1993; Suchman, 1994; Myers and Davison, 2002). This is reflected in the methodology adopted by the research. An attempt to illustrate the link between the components of the research undertaken and a basic ontology is presented in Figure 3.1. The components of this descriptive illustration are described in greater detail later in this chapter.

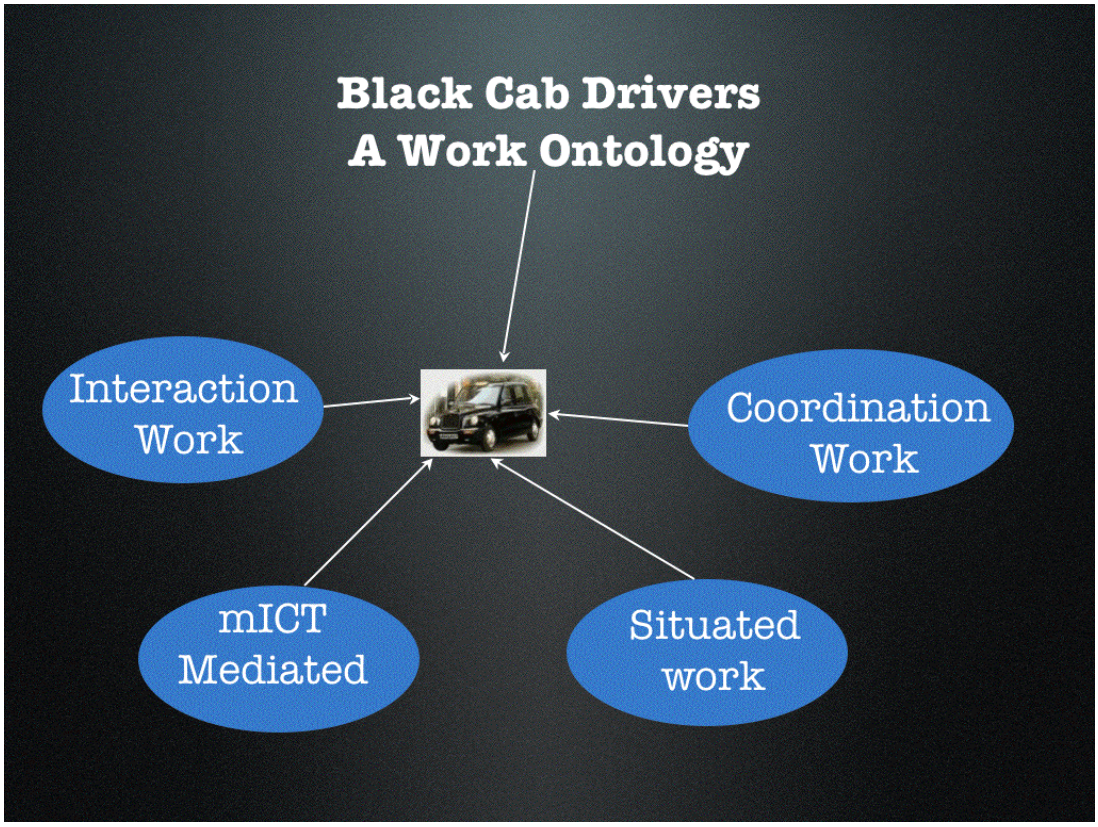

Figure 3.1: Descriptive Illustration: The Ontology of Mobile Work in this Dissertation

Throughout this dissertation a number of assumptions have been made about how mICT-supported Black Cab work is carried out, with the aim of supporting the investigation of self-referentiality with the research methods described in Chapter 4. In order to make these assumptions, the researcher has been motivated to seek the commonalities between case studies of mICT-supported Black Cab mobile work, whilst determining the relationships between contextual and situated choices for work patterns at the core of everyday work transactions.

The analytical lens has limited relevance when describing the situational choice of work aided or supported by mICTs, and instead focuses on determining what influences changes to planned and situated acts. In particular the research aims to address the shortcomings in the literature about work that is highly mobile, such as that of Black Cab drivers. A phenomenological approach is seen as a logical response to the apparent diversification in choice experienced by mICT-supported Black Cab drivers.

In the individual, self-referential experience of Black Cab work another recurrent theme is organisational change. Drawing upon the available literature, differences in organisational evolution have been analysed and taken into account (Aldrich and Ruef, 2006). Historically, Black Cab work has had a very low level of formalisation in terms of organisational resources, since it is based on self-referential parameters for situated choice. In recent years, the introduction of mICTs has created an organisational paradigm in which agile or dynamic organisation relies upon technology to provide a more comfortable ontological framework for this type of work.

Taking this approach, in which the technology used and the user are embedded in a contextual and situated setting, we may observe a synergy with the philosophy of situation or being in the world, which is seen as the most suitable and complete basis for explaining the phenomena from a phenomenological point of view (Heidegger, 1962). Thus this dissertation embeds its findings and core research work within the context of the wider and still very heated debate of interactions at work involving mobile technology.

The role of Black Cab drivers, able to perform their work both unaided by mICTs

and with their support, and the effect mICT mediation has on the choices that are made in terms of working practices, determine the level of analysis. This forms the core of an understanding of the relationships between planned and situated choices. It should be pointed out that the scope of this understanding is confined to situated work where technology provision is able to affect the formation of new organisational settings. There remain classes of professional and semi-professional work such as bus driving where mobile technology has been introduced, but it has had limited or no effect on the organisation of workers because work choices are limited.

This chapter is divided into four sections, the first three discussing an ontology for describing mobile work, and the last section covering organisational issues associated with the creation of a virtual environment in which the decisions made are transferred to the real world, producing changes in situation and location of work choices for the mobile workers. The phenomenological approach brings clarity to the discussion of the themes that form the basis of this approach.

3.1 mICT Research and the Situated Act

This section explores the problem of understanding mICT use at work when the work is determined by situated acts. To this end, a general analysis of current research issues in the domain of study is first presented. Secondly, further insight is gained into how planned and unplanned work are linked to the working practices of mobile workers with mICT support. This exploration of the themes is loosely link to a phenomenological approach based on cases and events, and can readily be used as an aid to understanding the situational issues associated with the study of mobile work.

3.1.1 Black Cab Drivers' Sedimented Work: A View of Traditional Black Cab Work

The empirical efforts of this dissertation, in terms of the research components applied to the mICT and mobile work domains of study, can be used in understanding the research paradigms attached to working practices and mechanisms of choosing work, mediated aid or support from mICT and changes to the organisation of work.

The problem in determining the relationships between those components can be seen when examining the research areas of design such as CSCW. However, an attempt to explain the problem without taking into account the sociological aspects of work, such as nature, idiosyncratic behaviour, and the multiple aspects that contribute to decision-making in situated and contextual and mobile work, limits the value of the insight that can be obtained from such research (Dourish, 1995). Re-orienting the research agenda towards the understanding of the technology itself does not provide a full interpretation of the reality of the work. An enquiry into what occurs within mobile work needs to determine the source of action or inaction (Dourish, 2001). This has been formulated by Suchman (1987) as *the question to be solved – what constitutes purposeful action and how is it understood – is the same,* which appears to be key to understanding the philosophical underpinnings of mobile work that is aided or supported by mICTs.

Taking into account what has been understood from Chapter 2 of this dissertation, the understanding of situated choice leading to individual or structural changes in mobile working practices, requires us to determine the planned and unplanned elements of the work performed. These distinctions – planned vs. unplanned acts – have themselves evolved since the introduction of mICTs for everyday work.

It is argued in some of the literature reviewed that one of the aims of introducing mICTs at work has been to aid the creation of mobile settings for work (Weilenmann, 2003, Pica, 2006). The focus of the discussion of mobile settings frameworks has been to define the types of actual physical settings where work is performed. It has been argued that the effect mICTs have on changing the elements of the work that is actually carried out has been to foster the creation of multiple, discrete time segments of stationary work that are perceived as mobile because of their fragmentation in time and space (Lee, 1999). Furthermore, mobile working practices differ significantly from the stationary working practices that were discarded when the decision to enlist the aid of mICTs was made (Wiredu, 2005).

In the case of distributed or distant work, which is primarily executed either on an individual basis or undertaken in team structures, is not a new phenomena, but has in the past been used by colonial structures such as the East India Company with a great level of success (Hinds and Kiesler, 2002). Such organisations showed that

trust and clear organisational structures helped to reduce the impact of physical distance and time gaps in communication between employers and their employees. Furthermore simple reporting procedures and established organisational rituals were significantly relevant to that success.

The industrial revolution and the implementation of sequential procedures of production developed a managerial school for managing human resources where mistrust of distributed or distant work was the norm (Bunting, 2003, Thompson 1967).

The technological developments at the end of the last century and the significant reduction in the cost of ownership of technology led to individuals, for the first time in history, having ubiquitous access to many forms of technology for work and communication. The direct impact on work and working practices has been an increase in the opportunity for workers to request and obtain more flexible schedules for work, both in time and location. Such work, it has been postulated, is necessarily aided by IT devices, specifically mICTs (Bauman, 2001, Beck, 2000), although this is open to dispute given that many organisations offered flexible schedules before the use of mICT became widespread.

The use and generalisation of mICTs has blurred the boundaries between established and emergent work practices in mobile work. Such a change leads the researcher to question what has happened to work and work practices that were already mobile or highly mobile and which had well-established or sedimented practices in place, by means of which it was already able to perform its work tasks efficiently. For this type of work, the use of mICT has improved access to work resources, such as spatial awareness and real-time information about events beyond the normal range of work activity (Schaffers, 2004).

In the case of work that relies on self-referential decisions, the use of mICT seems to provide the opportunity for changes that have progressed beyond the individual layers of choice, and has also had an impact on the organisational forms associated with such work. However the theoretical work in this area is limited to understanding the organisational form rather than its cyclical evolution (Aldrich and Ruef, 2006) or changes to it that cannot be measured using traditional management

methods (Galliers, 2006).

This dissertation argues that analysing the choice of work using the distinction between existing knowledge and mICT-mediated knowledge is more appropriate for increasing the understanding of the work context, as it is a component embedded and adopted as part of the daily practices of work. However, this analysis is significantly aided by including in the analysis the relevance of planned and unplanned work, in everyday choices, which are explained in further details in the next section.

3.1.2 Planned and Unplanned Work - the Role of Technology

The general discussion of the sociology of work mediated by technology expresses philosophical and practical concerns as to how planning the human actions constituting work can lead to a de-humanisation of work (Thompson, 1967; Illich, 1997; Kling, 1996; Zuboff, 1988). This de-humanisation is fundamentally represented by the intensive use of technology as a way to justify allocating certain types of work to workers with a lower level of non-ICT knowledge. This is not necessarily the case, yet the generally received views on the nature of work, and the direction in which the understanding of work has evolved, have tended to express those concerns at a very high level of analysis: a hierarchical analysis of approaches to work studies is proposed, presenting an overview of macro trends before a more granular analysis of work and everyday practices can be made.

In this dissertation, some of those concerns of de-humanisation have been researched. In epistemological terms the research takes the opposite approach to the evolution of work studies. Instead of the unit of analysis being based first on macro trends and only later moving towards the individual, research into work that is technologically mediated works its way up the hierarchy from the individual to the organisational model and vice-versa. The theoretical foundations of this research are based on understanding the mediation of the emerging circumstances of action whilst at work (Suchman, 1987), with a particular emphasis on mobile work.

The design of a research framework is aimed at developing a theory for human actions and interactions with the technology at work. Suchman (1987) argues [that] *artefacts built on the planning model* [of work] *confuse plans with situated actions*. The use of mICTs allows plans to be "fast forwarded" and repeated, and *while plans*

can be elaborated indefinitely, they elaborate actions just to the level that collaboration is useful; they are vague with respect to the details of action precisely at the level at which it makes forgo abstract representation, and rely on the availability of a particular embodied response (Suchman, 1987).

Examining work in mobile settings from a phenomenological perspective, it may be postulated that the increase in mICT usage has blurred the transition between planned and situated acts. If plans are a representation of action, the mediation of mICTs converts actions into events that occur seamlessly. Plans are distinguished from actions by the fact that, to represent our actions, we must in some way make an object of them (Suchman, 1987). In part due to what Katz and Aakhus (2002) call the interference of mobile technology as a mind and society altering technology, the creation of this object has a mixed output in the everyday activities of mobile work.

This output is expressed in the way the use of mobile artefacts affects work following their adoption, but before they are finally embedded in the everyday life of the worker. Mobile technology has been quite distinctive in its progress towards ubiquity in modern life, but the precise effect of contextualising mobile work tasks as situated actions provides a wider lacuna for empirical and theoretical research by social scientists.

These philosophical underpinnings to the research assist progress towards an analytical narrative. In this situation, situated actions at work need to be placed at the core of the research agenda, as there is a significant change in the scope of what these actions represent for the overall understanding of mICTs and mobile work (Ciborra and Wilcocks, 2006).

3.2 Philosophical Underpinning of Research: an Interpretative Approach to Mobile Work

In order to elaborate the boundaries of the domain of mobile technologies in mobile work that is self-referenced, this dissertation proposes a method of analysis that follows an interpretative approach inspired by phenomenology. It is based upon the concept of a situated act that is decided both by mood and emotion (Ciborra, 2006) and a concept of planned acts modified due to the mediation of the technology (Suchman, 2007). It also holds a view complementary to Heidegger's situadeness or

being, in which every course of action depends in essential ways upon its material and social circumstances (Suchman, 1987).

This research methodology aims to determine the relational nature of the elements of mobile work, described in section 3.2.1, in order to infer the relationships between working practices and the mechanisms of choosing work mediated by mICT support, and changes to the organisation of work. In taking this hermeneutical approach, a set of various paradigms is explored, assisting with the development of an ontological framework through which the empirical work of this dissertation is sustained. The research possibilities are explored through the many cases and their subsets, onto which the real actions are projected (Heidegger, 1962); this is illustrated by the methods to be described in Chapter 4 of this dissertation. The aim is to gain an appreciation of the meaning and purpose associated with the technology-mediated work choices elaborated by mICT users.

The extension of the notion of being through the mediation of mICTs has led to a re-assessment of the value of understanding the being-in-the-world or Dasein of Heidegger (1962) as a modern metaphor for the ontology of a being that relies upon technology for everyday communication (Haddon 2000). The aim here is to build upon an understanding of what is contained within mediated work executed by workers in the domain of study, in terms of either elaborated rituals and procedures, or improvised acts of work (Crossan, 1998).

In terms of a theoretical understanding of the recurrent themes described above there are three major fields from which to elaborate thematic underpinnings, and those are:

- The contextualisation of work in every day life
- The individual work choices and mutual interdependencies
- The correlation to the organisational settings due to enhancement of mutual awareness and the level of collaboration at work.

3.2.1 The Contextualisation of Work in Everyday Life

Attempts to understand the contextualisation of work in everyday life have been made largely by 20th century philosophers trying to understand modernity and its

social phenomena. Heidegger (1962) is the philosopher who, by taking a hermeneutic approach in which phenomenology gives primacy to the experience of the everyday in the analysis, tried to build narratives consistent with social phenomena. This philosophical framework provides a flexible theoretical framework for the research approach of this dissertation.

Myerson (2001) aims to link the usage of mICTs to the philosophical queries of Heidegger. A major issue is the representation of the basis of space time in terms of the determination of a contextual setting in which behaviour, individual and team work, communication, consensus and discrepancy can be situated in multiple layers of time (Goffman, 1959). These elements of space-time constitute ”time layers”, which can be described as discretionary or continuous, depending on their particular characteristics.

More traditional approaches seem to provide a frameset for different thinking about space and time, with a more linear description of events. Whilst there is a whole philosophical contribution by Lefevbre (2004), on finding the cycles and rhythms on everyday actions. Such philosophical view aims to reconcile or merge the two visions of time and space as an idea of *togetherness*.

This togetherness is reflected in our everyday life acts in diverse ways. Everyday life acts, such as work acts mediated by mICTs, have a level of repetition and coordination that has been researched from the point of view of design: the physical location of place that is either real or virtual for starting or ending a work task, the determination of a time that can be discrete and sequential for completing work, routines that are established but relatively undocumented, and choices in how work is done. All these give the worker a sense and notion of identity in a temporal situation, which might change as a new cycle of work starts.

The body of knowledge at work, which is being continuously augmented, needs to be taken into account. The use of mICT aids provides a referential framework for the choice of work. This is illustrated in the prologue of this dissertation by describing the types of work Black cab drivers choose to do when supplied by mICTs. The scope of those choices is broadened by the worker’s ability to operate a mICT device. Being at work with mICTs might reveal or promote the evolution of ways of

work that were previously not noticed. The interaction with mobile technologies reveals mobile workers' methods of working. The situadeness of the mobile artefact at work and the social constitution of the surroundings is a symbiotic relationship, which can give an insight into the role of technology in the everyday choices of work. The perpetual contact due to technology makes this relationship even more blurred (Katz and Aakhus, 2002)

It is not easy to probe such a relationship using a phenomenological approach, since there are interdependencies present. An interpretative approach benefits from the linearity and discrete approach to time, but makes less sense when technology allows overlaps and redefines time as a non-linear and continuous variable and as a component of everyday life events (Lefebvre, 2004). However this non-discrete approach to space and time is not a chaotic mix of relationships: there are patterns, cycles and rhythms that originate somewhere: old habits and new habits mix to create such liaisons. Understanding the interaction that is provided in a certain contextual setting is hermeneutical in nature because of its intentionality to the world (Pica, 2006). Actions are then translated into the ontology framework and, within its boundaries, plans and situated actions are enacted.

In this dissertation the domain of study is defined by the mobility of the research subjects while at work. Their interactions occur over overlapping layers of knowledge and technology with multiple spatial and time connections. It is a challenge to distinguish between the idiosyncratic and self-referential behaviour – which will be referenced from a theoretical standpoint in section 3.3.2 – and where there is a rational or even planned chain of actions to be exposed to variations and permutations in choice due to the support provided by mICTs.

3.2.2 Independency of Choice and Mutually Interdependent Work

Sourcing the diverse range of studies in mobile technology and mobility reviewed for this dissertation, an important recurrent theme is found: the ability of mobile workers to make work choices and how those choices are dependent on the level of interdependency they have at work. As explained in Chapter 2, mobile studies have focused primarily on defining the boundaries of their own area of research, and the driver of research in that area has been the study of mICT usage during off-work time. Hence this dissertation identifies the need for further elaboration of the

relationships established in the case of mobile workers who do work using mICTs and rely on their own skills and knowledge to work, as is the case with Black Cab drivers.

The distinction between referenced or mutually interdependent work and self-referential work is becoming blurred. Olson and Olson (2000) made a discretionary categorisation of work depending upon its level of collaboration, which helps in acquiring an understanding of the ontological framework in which changes seems to evolve over time. In defining the term self-referential, it seems to be that current theoretical research frameworks take two parameters into account. The first is at the spatial level, which relates to the ability to develop individual awareness of the diverse components of mobile work. The other is time valuation, where time is a variable either continuous, discrete or cyclical depending on the activities or tasks that are chosen to be undertaken.

Some of the workers who comply with those parameters also rely on their own acquired knowledge of the tasks to perform, as well as good skills for self-management of personal and knowledge resources, or evolutionary trading patterns and behaviour (Wyart and Bouchaud, 2007). In various cases, from consultants or freelance professionals (Kakihara, 2003), to banking professionals (Al-Taitoon, 2005) and health professionals (Wiredu, 2005) the motive to act according to the demands of the work is seen as part of a collaborative effort in which mobile technology has a relevant enabling role. This leads to the question as to whether self-referentiality (when cyclical and discrete) has perhaps more than two relevant parameters when trying to describe mobile work with the characteristics described above.

In organizational terms, mICTs have a dual role in the case of self-referential work, which rely on workers who have little or no need to work in teams. The dual outcome arises from the work choices they have made based on knowledge of their tasks. On the one hand the intervention of mICT does not change the work itself – e.g. Black Cab drivers do pick up passengers from the streets independently of the mICTs that might be installed in their vehicle – but it does seem to create conditions for increasing the awareness beyond previous levels, which might have restricted physical limitations and in so doing created the space for new forms of collaborative

work and formation of loose associations or organisations.

3.2.3 Mutual Awareness and Collaboration at Work

In studies of collaborative work, spatial and physical awareness have an important role in enhancing the ability of workers to choose work (Armstrong and Cole, 2002). Mutual awareness, as studied in CSCW research, focuses analysis on the use of artefacts whose aim is to enhance knowledge of the conditions of the environment surrounding a worker, by enabling distance work or geographically distributed work, or by the interaction of virtual or real teams (Armstrong and Peter, 2002; Armstrong and Cole, 2002).

A considerable amount of CSCW research has been dedicated to an exploration of the links between the components of collaborative work (Schmidt, 1998; Olsen and Olsen, 2000). There is enough empirical evidence in CSCW research to indicate that mICTs expand the physical radius of action for work. Work is here viewed as taking place over a distributed physical space, in which processes that create change are measured over periods of time. Such periods are not immediate, but discrete, and have gradual developments of added or repeated cycles of work (Sørensen and Pica, 2005).

The issues surrounding collaborative work are determined not only by the proximity of groups of collaborating workers but also by the way communication evolves between members of a group and the type of management that supports such communication. Unlike self-referential workers, for whom the management structure is individual, successful collaborative work has relied upon good management strategies (O'Leary et al, 2002).

While most distributed work requires mediated communication, face-to-face communication is presented as the most important way to obtain clear and optimum results. This perception is at odds with the development of mutual awareness and collaborative work. If workers are provided with an adequate understanding of what is expected of them in terms of mediated communication, then mICTs are able to help overcome the lack of face-to-face contact, (Nardi and Whittaker, 2002).

The theories associated with communication theory at work do not explain

satisfactorily the diverse factors related to managing distances between co-workers, either physical or virtual. The continuous and discrete demands for communication as well as the boundaries of aggregate awareness are linked by the knowledge required to provide a basis for non-conflicting distributed work. Many rules have been encountered depending upon the work or task executed (Fox, 2002; Shaffers, 2004).

Collaborative work requiring spatial distribution presents many challenges to the coordination and elaboration of the tasks and sequences that need to be executed to complete a job or task. In a wider sense, the use of spatial and virtual resources in collaborative work can be aided by mICTs. In this dissertation, the domain of study – Black Cab drivers – presents a valuable set of data for fulfilling the characteristics of the work under discussion.

In this interpretative approach, elements of a phenomenological analysis contribute to a consistent model of how to couple or merge the external world with the mICTs embedded into this type of mobile work. The existence, in other words, of such coupling might or might not be relevant to an understanding of the influence of mICT on working practices in this work context.

The particular limitations and boundaries of the technology in use limits the choice, cycles and working rhythms of the user. This is exacerbated in the case of work choices that are already idiosyncratic or with a strongly defined behaviour, as is the case with black cab drivers (see the activities described in the Prologue to this dissertation). The situational act of the event, chosen through the use of mICTs, relies on the context for the most important results, either at an individual level or at organisational levels in which the technology is supporting work. This reasoning leads us to present, in the next section, parameters identified in mobile studies that are essential to understand what characterises mobile work in relation to the domain of study and the phenomenological research proposed.

3.3 Towards an Understanding of Black Cab Work

In this dissertation, the research questions aim to create a better understanding of Black Cab work when aided by mICT. The use of the term self-referential has been linked to idiosyncratic and highly individualised behaviour in mobile knowledge

workers. However in the case of Black Cab drivers there are two other aspects to take into account when aiming to understand the effect of mICTs on this type or work. One is the temporal view of the work they actually do and the other the cycles and rhythms associated with this type of work. The sections below aim to explain in further detail the theoretical framework used to include those two aspects of Black Cab work in the context of this research.

3.3.1 Temporality View of Black Cab Work

Temporality is defined in common English language as a noun (pl. temporalities): "*the state of existing within or having some relationship with time*" (Soames, 2006). Attempts to develop an explanation to the links on how the present moment emerges only at the point where our projected future curls back into the past constitute the main body of work by the philosopher Heidegger (1962) through phenomenology. According to Husserl's (1964) philosophical line of thought, who was a teacher of Heidegger, the basic operation of human consciousness takes place during the actual present, constituted by the ever-emerging flow of impressions, which (finally) disappear through an ongoing transformation and modification into retained memory.

If a phenomenological approach is taken to analyse planned or unplanned actions that are taken over a day of work follow a similar process: emerging from impressions, through acts of transformation, to retention and archiving. However, no action can fully provide its own interpretation in any given instance. Instead, every instance of meaningful action must be accounted for separately, with respect to specific, local and contingent determinants of significance (Suchman, 1987).

According to this world view, the world is composed, exists, and operates as a series of objective events that are happening in the present. There are links between the internal world of the worker and the overall context of external actions. When individuals – in this case workers – are permanently on alert and ready to respond to any external environment stimuli, actions are at permanent risk of being disrupted, in which case the event may be unexpectedly curtailed.

Temporality, in this research, takes the approach that at the core of the theory is an understanding of how to manage mobile work in an ever changing physical

(contextual and situated) location, and the constant need to be ready to reply to the requirements of the surrounding environment in which the work is situated. There are categories or distinctions to be made in this idea of temporality.

Noss (2002) developed the concept of temporality further by making separate conceptualisations for temporal events, temporal occupancy and temporal flexibility. Temporal events are seen as behavioural acts at work where the length of time required for completion is known. A temporal occupancy refers to the physical aspects of such acts and temporal flexibility includes variations in the lengths of temporal events.

At an individual level the consciousness of the task to be executed requires the interacting individual to link to some type of social system or organisation. The existent temporality is split into those three elements. The dynamics of interaction for the communication and perhaps collaboration between the individual's previous knowledge and the expectations of delivery to be acted upon requires the negotiation of temporal flexibility when using mediated technology such as mICTs.

The presence of mICT in mobile work allows the creation of physical spaces superimposed onto virtual spaces where temporal events in mobile work are then determined by time frames that fall in no particular sequential order. In trying to juggle the best temporal occupancy available for the tasks required to complete some kind of mobile work, the time events that occur become fragmented.

The analysis of time based on its fragmentation into sequential units (Lee and Liebenau, 2000) can lead researchers into believing that this is what actually happens, whereas the linearity is responsible for distorting the perceived real effects of the overlapping channels of communication provided by mICTs. The discrete and sometimes sequential time intervals appear as continuous and perhaps cyclically evolving time.

The convergence of simultaneous work events in Black Cab work is a common and recurrent action that when analysed using a phenomenological and interpretative approach ought to take into account the perceived conceptualisation of time and the value assigned to that time by the Black Cab worker. In this dissertation the empirical narrative has reflected the idiosyncratic and particular behaviour of the

research subjects. Temporality has then taken a relative value from one case to another.

The more idiosyncratic the individual behaviour, the more time patterns emerge from an understanding of choices and motivations geared towards contextualising and situating the mobile work executed in a particular time frame. *The successions of alternations, of differential repetitions suggests that there is somewhere in this present* [temporality] *an order, which comes from elsewhere* (Lefebvre, 2004).

3.3.2 Cycles and Rhythms in Black Cab Work

Black Cab work, in common with any other type of work sharing contextual settings, has time and physical cycles and rhythms of work particular to the tasks embedded in the working practices (Collins, 2004). The concept of temporality is one way to better understand how this work is done. What needs to be understood is how idiosyncratic behaviour is nevertheless structured as patterns. It would not be possible to understand this without taking into account time as a social variable, which at first sight might appear to be common to all cultures and individuals, but when examined closely turns out to be highly personalised or fragmented (Adam, 2006).

In mobile work research, diverse theoretical frameworks have been offered to explain the cycles and rhythms of mobile work (Warren, 2004). From ethnographic studies (Weilenmann, 2003) through activity theory (Wiredu, 2005) there has been an exploratory process of understanding such phenomena. In mobile work there are two layers of cycles or rhythms. One is generated by temporal regularities in the everyday activities of work and the other by social or work schedules (Zerubavel, 1981).

The concept of planned and unplanned actions, when studied in the context of work (Suchman, 1987), theorises the idea that the elaboration of such acts has an effect-cause relationship on the course of action. Such effect-cause courses of actions ought to be repeated in mobile work, either because of the situated arrangement of the nature of work itself, or due to the idiosyncratic personal preferences of the worker. This effect-cause course of action is what Licoppe (2005) recalls as a more pragmatic approach to understanding choice in mobile work.

In the case of temporal regularities, there is a cognitive dimension, which allows us to maintain expectations of our surrounding environments. Many activities of a regular work schedule, the *planned acts* of Suchman (1987) rely on assumptions about the regularity of the physical temporal location of the work and the rate of recurrence of events (Zerubavel, 1981), and such cognosis is a social phenomena in which the boundaries of what is expected from work tasks collides with the particular expectations of the mobile worker.

An understanding of scheduled work also relies on assumptions about temporality. If a scheduled event occurs on many repeated occasions, there is a greater chance that this event will metamorphose into a routine. In this context, a routine is a mechanical execution of an activity. Planned actions, for example, might result in a demand for some spontaneous act of change, which has an effect on the social dimensions of interaction. Those interactions, in the case of mobile work, are provided by some kind of organisational setting acting as master scheduler of time. The same can be said regarding rhythms at work – although it might not be so evident at first – where the scheduler is either the regularity of an action, or the interval between actions.

Even the unplanned act is subject to fall into a certain cycle or rhythm. Plans can be vague and widely subjective, hence there is a high potential to create such cycles or rhythms. From the phenomenological point of view, such phenomena require an answer to the question: do cycles and rhythms matter when attempting to understand mobile work? This tendency towards cyclical work at the individual level is also mirrored at the organisational level, in which the level of complexity addressing the balance between temporal and scheduled work can be difficult to determine if approaching the analysis with non-phenomenological reasoning.

However, where other research approaches have failed or have produced partial explanations of mobile work, the use of an interpretative and phenomenological analytical framework can give further insight into the individual and organisational changes inspired by the use of mICTs for this type of work.

3.3.3 Organisational Agility in Black Cab Work: Enhancements Sourced in the Use of mICT Artefacts

The organisational form supporting mobile workers aided or supported by mICTs has not played a major role in this dissertation, except perhaps as a benchmark for understanding the differences between work that is loosely associated and work with a high level of collaboration. There are many organisational forms over the history of Black Cab work that has evolved with the trade (Bobbit, 2002; Townsend, 2003; Munro, 2007). However few of those organisational forms seem to adapt well to the challenges presented by the repeated temporality in the Black Cab drivers' choices for everyday work.

In terms of temporality, organisational forms are used to keep working structures in place for referential purposes (Lanzara, 1983). In ontological terms, the organisational level has reflected upon general objectives that are to be achieved by the mobile workers, which as a group have had a wider freedom of choice for work. From the research body in mobility studies, the exploration of how the intervention of mICTs has changed, modified, and perhaps challenged current organisational structures is again diverse in terms of outputs and methodologies, reflecting on the limitations to versatile change when based on individual choices.

Although organisations might have been forced to evolve or change due to new working practices emerging from the use of mICTs (Aldrich and Ruef, 2006), there is still a profusion of unanswered questions. The three types of changes this dissertation identifies as relevant when reflecting upon the impact of mICTs in organisations are:

- Changes in work practices (Al-Taitoon, 2005; Elaluf-Calderwood and Sørensen, 2008),
- Changes to organisational hierarchy or procedures (Pica, 2005) and,
- Changes to organisational constitution (Kakihara, 2003; Barley and Kunda, 2004).

These categories of work changes do not have any particular analysis attached to the context in which organisational settings are dynamic; instead, organisations are

understood in more conventional terms. This is not the case for Black Cab drivers' work, where the organisational presence is minimal or very limited. In dynamic situated work environments, a tendency towards organisational settings with a more dynamic nature seems to be a wiser strategy for operation.

Where new organisational forms have been developed, and such forms rely on technology for support, complex cases are formed. Some have been explored as temporal discourses mainly for emergency situations (Lanzara, 1983); others have a direct technological determination (Hart and Denison, 1987), or are socially elaborated by socio-technical change such as globalisation and the Internet (Malone, 2004).

In this dissertation, where the case of Black Cab driving is analysed as mobile work, discourse is encountered as a mixed organisational form. For Black Cab drivers the categorisation of work is linked to the level of dependency and mobility. At the core of the discourse, the organisational forms might exist and be latent over long periods of time without having a major impact on the everyday work practices. However, the use of a mICT artefact (e.g. a two-way radio system or a computer cab system) forces individual users to reconsider their individual and group role, in which optimising their idiosyncratic choice of work determines the relevance of the organisational form.

The next sub-section explores the possible organisational issues that might emerge from Black Cab work that is highly interdependent, theoretically conceptualised in the understanding of organisations' evolution and development as *agile* processes.

3.3.4 Highly Independent Black Cab Work: The Organisational Issues

In the search for an ontological framework for mobile work that is highly independent, and in particular in the case of Black Cab work, the self-referential characteristics of this type of work, its overall view and understanding of the world, is useful as a factor in determining the level of dependency between workers and the physical spaces associated with their work.

In common with IS research into the diverse domains that share similar characteristics of independent work, a number of sound cases arise that are not yet

fully researched from a socio-technical point of view. This dissertation aims to contribute to the determination of a framework for self-referentiality regarding situated Black Cab work that is mICT mediated, which can later be generalised to a model for situated mobile work.

Lee and Sawyer (2002) describe how mobile work that is highly independent has a strong link to the level of temporal interdependency, depending upon certain behaviours at work. In organisational terms, the common ground of work shared by workers associated with this temporal interdependency will determine the level of organisational structure required (Olson and Olson, 2000). If the work that is performed requires some kind of mechanism of coordination, the organisation to be built up might reflect a distributed or centralised architecture of coordination, or even hybrid organisational structures in which processes will be modified to allow temporal interdependency to be flexible and effective.

Adding to the temporal interdependency link are the requirements of highly independent workers; there is an increased awareness that support, through interaction in physical or virtual spaces (Schmidt, 1994 and 1998). The greater the reliance on external sources – in addition to the self-referential ones already provided – for increasing awareness, the more the organisational structure seems to reflect upon those needs (Sørensen and Al-Taitoon, 2008). Paradoxically the concentration of resources or knowledge when supporting highly independent workers does not seem to influence a particular organisational structure directly (Orlikowski and Yates, 2002).

The main organisational issues for highly interdependent work, such as Black Cab work, seems to be focused on providing a stable ontological framework in which to do the work. Chapter 2 of this dissertation showed that the historical changes in Black Cab drivers' organisational forms can be grouped using a set of chronological criteria, and in doing so, a number of operational models may be identified. When analysing organisational forms for highly interdependent workers, the first question to be answered before seeking to determine an organisational need is where the boundaries of the organisation that they belong to, if any, lie. In later sections of this dissertation it will be seen that such boundaries can be artificially created by the

mediation of mICTs determining, for example, which workers belong to a certain taxi circuit by restricting the use of artefacts in the vehicle.

Management theory classifies organisational forms based on the role of perception as objective or subjective, with emphasis given in processes within the boundaries of the organisation (Aldrich and Ruef, 2006). The boundaries of the organisation seem to be a major factor in defining organised Black Cab work, and help to determine who is in charge, who defines the rules and who verifies the compliance and penalties for the operational work.

The fact that Black Cab work is highly independent and self-referential provides a guide to the creation of a reliable framework for understanding what needs to be provided and what can be obtained from the organisational setting in terms of work completed. Furthermore, changes and variations in temporal variables reinforce the need for a flexible and dynamic organisation, but the product of such organisational requirements can differ from case to case.

The dissertation elaborates the sections described in this chapter into a research framework for self-referential and situated Black Cab work that is mICT mediated, taking into account the historical legacy of this particular work activity. This historical legacy is represented by sedimented working practices already embedded in Black Cab drivers' everyday work routines.

3.3.5 Situated Black Cab Work which is mICT-Mediated: Work Components Model

In chapters 1 and 3 the term self-referential was introduced for the purposes of this dissertation. Self-referential work is an area that has not been fully explored in mobile studies. Since this dissertation takes an interpretative approach to the domain of study, there are several aspects of self-referential work to be taken into account when studying mobile subjects. Those aspects vary from individual to individual, and from organisation to organisation. The contribution of the different elements listed, together, can help the search for establishing a research framework for studying this type of work. An illustration of the model proposed as a guide to research for the remainder of this dissertation is shown in Figure 3.2.

The ontology for this model consists of the physical and virtual spatial surroundings

of Black Cab drivers, which are represented by their vehicles and the mICT technologies that are used for mediating their everyday work. Each quadrant of this circle is one of the theoretical components reviewed in this chapter. Hence to stress the relevance of enhanced awareness and dependency at work, there are references to the self-referential nature of the work as well as to its highly idiosyncratic behaviour such as independence, cycles and rhythms, and to the physical context in which this mobile work is executed.

The contribution of the interpretative analysis to the research approach is shown by the link between the situadeness of that work and the selective choices of work that drivers perform. This model has a physical counterpart in the form of the domain where this mobile work actually happens and where organisational forms – new and old – are presented as ontological parameters.

At the centre of this research framework is each individual Black Cab driver and the wide range of mICTs that can be used for supporting his or her work, as well as more traditional knowledge tools such as the A-Z Street Map of London, and radio. Such tools offer direct intervention into the work, require adoption, or else the technology is embedded into the working practices. Following intrusions of this kind, the mobile worker then determines actions and plans or executes situated acts that might create the case for new emergent practices. The aim of this model is to provide a simple but clear description of the links between the different components of this type of work, which will be developed further in Chapters Five and Six of this dissertation.

The model proposed embodies the theory discussed, and is aimed to provide an understanding of how the individual and the organizational forms in which highly mobile work such as the work performed by Black Cab drivers interacts with mICT. The use of mICT in the support of everyday work encourages a low level of interdependency, and given the temporality of the work analysed, other factors might influence the interactions. At a theoretical level, however, this model provides an interesting framework to answer the research questions proposed in Chapter 1 of the dissertation.

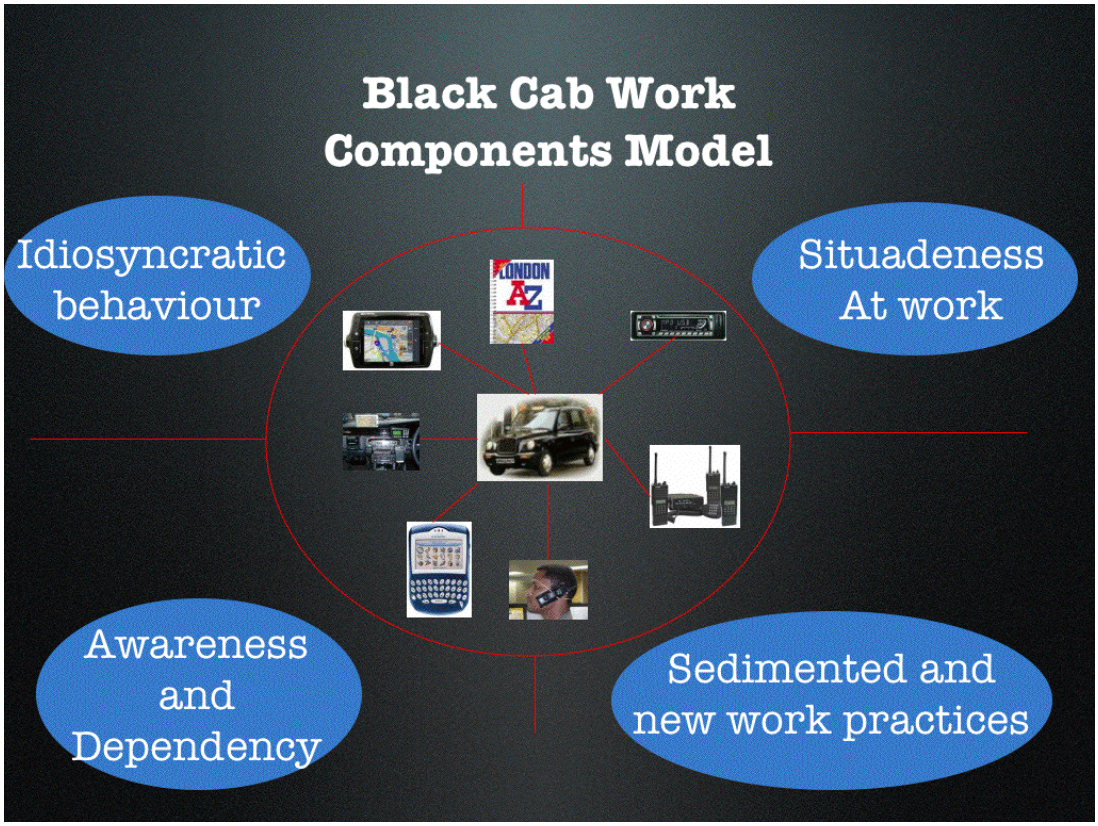

Figure 3.2: Illustration for this Dissertation: Research Framework: Components of Black Cab Work that is mICT Mediated

3.4 Summary

This chapter has aimed to present a theoretical framework for the interpretative analysis of the domain of study. The theory of mobility and mobile studies is diverse and complex, with no particular research agenda or directional preference in terms of elaborating a general overview for mobile studies. This research has chosen to develop a case-based theory bringing together diverse theoretical elements already explored in the research field of mobility and mobile studies under the umbrella of a phenomenological ontology, which is used for the interpretation of the context in which Black Cab drivers carry out their work.

Four major research fields were identified as relevant to understanding highly mobile work aided or supported by mICTs such as that undertaken by Black Cab drivers. In Section 3.1 of this chapter, the problem domain was first analysed and contextualised as part of the research into planned or unplanned acts. Given that mICTs are mediated artefacts for work, one of the effects they have on work seems

to be to allow shifts between acts based on temporal actions at work.

For this reason, the second section of this chapter (3.2) has probed the philosophical underpinning for phenomenological research, which takes into account the considerations of time and space in the every day aspects of work, self-referentiality, and the link to mutually independent work and mutual awareness.

As the theoretical framework evolved, temporality, as a parameter of significance for mobile work, required further analysis, which forms section 3.3. It is possible to understand cycles and rhythms of work from the perspective of planned and unplanned acts vs. contextual and situated acts. Until then the discussion in the chapter downplayed the influence of organisational settings in the choice of mobile work to be executed.

The final section of this chapter (3.4) has attempted to conceptualise the organisation and organisational changes emerging from working practices in which the theoretical concepts discussed in previous sections merge and co-exist. A model for mobile work embodying such characteristics then emerged, which was presented and explained in section 3.5.2. This model forms the basis of the rest of the work in this dissertation and the conclusions in Chapter 7 will reflect upon the structure of the model described in this chapter.

Chapters 4, 5, and 6 contain the core of the methods, data, analysis and interpretation for the empirical work undertaken with Black Cab drivers and the effects of projecting mICT support onto the work practices of these highly mobile workers.

CHAPTER 4: METHODOLOGY

There is no such thing as a logical method of having new ideas or a logical reconstruction of this process.

Sir Karl Popper (1969)

This chapter describes the research methods applied in this dissertation. The dissertation requires relevant and consistent research methodologies to study highly mobile workers and their contextual and situated choice of work when such work is supported by mICTs. The first section of this chapter outlines the overall research strategy used; ethnographic methods and video recording methods are presented as the primary mode of research for this investigation. The main characteristics of these two methods are discussed, including their strengths and limitations. The sections that follow later in this chapter offer a more detailed explanation of the data collection methods used.

4.1 Philosophy for Interpretive Research Approach

The word philosophy is used in the context of IS research as a global world that encapsulates methods and concepts related to the essential questions IS research aims to address. In the case of IS research the general use of computer-based information systems by all layers of society has highlighted the importance of interpreting social issues when trying to make sense of technology adoption.

From the IS point of view qualitative research is complementary to quantitative research. However, qualitative research can be seen in the context of an underlying epistemology in which positivist, interpretive and critical research approaches point toward the object of study, regarded as three parallel ways to address the research methodology (Myers and Davison, 2002).

Each of these approaches has its own advantages and drawbacks for the design of the research. This dissertation is focused on an interpretive research approach, which can be understood as consisting of an ontological base sustained by the assumption that

access to reality – either existent or perhaps socially constructed – can be obtained only by social constructions such as consciousness, shared meanings and language (Walsham, 2002).

The differences between interpretive and positivist approaches can be addressed more formally by considering epistemological and ontological stances. As illustrated by the quotation from Popper at the start of this chapter, the logical process for the re-construction of those processes is a complex one. Historically, the rise of an interpretive research school in IS has been subject to an evolution process that has been closely associated with positivist approaches (Bensabat et al, 1987; Yin, 1994) attempting to drive the interpretive methodology process to more conventional information systems research.

In the case of epistemology, the contrasts with positivist stances are evaluated using two alternatives: 'non-positivism' – in which facts are mixed with value judgements, and it is hard to disentangle them, both being involved in scientific knowledge – and *normativism* – which takes the view that scientific knowledge carries ideological weight and is inevitably conducive to a particular set of social ends. For the IS interpretive researcher both positions are open for general adoption.

In the case of the ontology, concerned with the nature of reality, there are differences between *external realism*, which considers reality as existing independently of the construction of it, 'internal realism' which views reality for us as an inter-subjective construction of human experience, and 'subjective realism', where each person is considered to construct his or her own reality. The usual IS research position is to take the position of internal or subjective realism, especially when working with human interpretations and meanings associated with IT systems (Walsham, 2002).

Interpretive studies found in the IS literature available cover a range of case studies (Orlikowski and Baroudi, 1991; Suchman, 1987; Walsham, 1993; Orr, 1996), yet there are no clear compilations of how these studies correlate to research findings that could be articulated in one main body of research work. This is a research opportunity incompletely explored by the IS field that has been noted in the literature review chapter in this dissertation.

Another way to visualise IS research using an interpretive approach is to understand

it as a structural process in which two-tier processes can be found (Walsham, 2002). The first layer is that of the analysis, in which the researcher tries to understand the world in which the research subject exists, using the data collection methods available. A second layer is added to this analysis when the data is interpreted. Interpretive research methodology is a very important tool for the social sciences, as well as in applied sciences, because it adds to conventional research a concern for human interaction with other humans or artefacts (E.g.: computer mediated systems, mICTs).

Others such as Mingers (1984) have argued that there is considerable value in a careful examination of the philosophical basis for different interpretive approaches, and these approaches can be identified as: phenomenology, ethnomethodology or ethnography, philosophy of language, and hermeneutics. This philosophical basis to the research value underpins the valuable interpretive aspects that have arisen from case studies well known in the IS field such as those of Zuboff (1988) using phenomenology, and Suchman (1987) which focused on particular ethnographic methods . This research diversity has contributed to the enrichment of the field of IS, as Markus (1997) pointed out, forming the most important characteristics of IS research sustainability.

From early research efforts, interpretive research in IS had a starting point in the ethnographic research tradition (Van Maanen, 1979; Sanday, 1979). However ethnography on its own does not – as correlated by first order or second order field observations – address the IS researcher's concerns about the role of theory in the research work completed. Eisenhardt (1989) revised this and in the context of organisational research identified three distinct uses of theory: as an initial guide to design and data collections, as part of an iterative process of data collection and analysis, and as a final product of the research.

Interpretive research studies, in the early stages of the research, are motivated by the need to use or create an initial theoretical framework, which takes into account the body of previous knowledge available in the research area, a sensible theoretical basis for informed topics, and approaches to the empirical work (Walsham, 2002). Knowledge can, for example, be taken from theory such as contextualism (Pettigrew, 1985; Walsham, 1993). Others have drawn upon interpretive studies, in which the

use of ethnography is reflected in IS-related knowledge studies (Prasad, 1997; Sawhney and Gomez, 2000; Shultze, 2000; Skok, 2005). There are possible limitations associated with the use of theory at an early stage of the research, as for example when the researcher is unable to see further than the theory suggests, even if provided with accountable data indicating the opposite. It is very important for interpretive research to preserve a considerable openness in the field data, and we must be willing to modify initial assumptions and theories if rigorous analysis requires us to do so. Such openness results in an iterative process of data collection and analysis, with initial theories being expanded, revised, or perhaps abandoned as the research progresses.

This approach to the research process allows researchers to extract information from the decision-making process and decision makers. They are not regarded as passive recipients of information but as active participants in the technology-human interaction process (Schulze, 1999). For IS researchers, it is sometimes difficult to make sense of the research process as many theories may seem to suit or provide a partial explanation of the research problem. In this situation, researchers might try to limit the research area and encounter conflict; the overall orientation of the research confronts the research duality that occurs between specificity and generality, regulating the particular social reality under study.

Interpretive research studies stress the importance of considering the ontology in critical parts of the research; this allows the researcher to be provided with meaning and significance of the fundamental way for perceiving, understanding and framing the social reality under study (Carroll, 2000). This path is not free of paradigms in which the various components of the study are revisited due to overlaps at various stages, theory validation versus theory development, and description analysis versus normative prescriptions (Jacucci, 2006).

Walsham's (2002) two-tier analysis for interpretive research issues raises the idea of the conceptualisation of organisations as interpretation systems, in which the interpretation is a critical element that distinguishes human from lower level systems (Daft and Weick, 1984). In this dissertation a qualitative and interpretive approach to analysis is adopted, with contributions from phenomenology (video recording) to the ethnographic analysis (interviews). This analysis is supported by the data collected

in the fieldwork. In the case of the research subjects the use of mICTs is an interpretive system but it does not offer sufficient understanding of arrangements made by individuals or organisations linked to the domain of study.

In some IS research a strong bias towards ethnomethodological work is encountered, such as Suchman's (1987, 1994); it has, however, been pointed out by Ciborra (2001, 2006) that IS studies lack an understanding of the social process attached to the use of technology since where humans are involved there is space for improvisation, moods, and other non-deterministic factors that influence Information Systems research objects. To understand and manage the interaction between humans and technology, the researcher must adopt an interpretive approach.

For highly mobile workers in dynamic settings the temporality of their work raises further concerns, which can be addressed by taking on Weick's (1979) approach for *sensemaking* of the social context in which the domain of this study is embedded. This is in part possible because of the temporality attached to the work practices of these workers, which means that a phenomenological (Heidegger, 1962) and interpretive approach to understand the being in the world - or at work - is also needed to reflect on the contextual complexity.

In the context of this study Weick's interpretive approach is used to understand the changes to working practices brought about by the introduction of mICT at organisational level for highly mobile workers with sedimented working practices. This theory is further developed in the work of Suchman (1987, 2007) and Ciborra (2006). The adoption of the interpretive approach for this research furthers the aim of contributing to an understanding how mICTs enable mobile work, taking into account the cultural and social context of this work.

4.2 Research Design in Mobile Studies

In mobility studies, current and previous IS research has been focused on trying to reflect on the emergent social practices that arise from our increasingly mobilised world and the interaction between mICT and mobile users. In the previous section of this chapter, it was discussed how epistemological queries are encountered by IS researchers. One of these queries is “What is known to the researcher?” and the other

is “How is this known?” Thus, under this view IS researchers’ proposals to study mobility and mobile interaction through fieldwork have been very innovative using ethnographic methods, phenomenology, action research theory, activity theory and hermeneutics.

The problems encountered and the challenges presented to traditional research methodology are well documented (Laurier, 2002; Weilenmann, 2004; Wiredu, 2004; Al-Taitoon, 2005; Pica 2006). The main concern for this type of research has been the focus on the use of mICT in stationary work settings. However, as the technology and use of mICTs has progressed, new research methods for mobility studies have been developed. Weilenmann (2004) refers to the work of Christine Hine (2000) in adapting ethnographic methods to the study of the Internet, as an inspirational approach to studying mICT in spatial and virtual contexts. Further research in the field has been able to develop relevant methodologies for mobile studies. This research work is contributing to this body of research, adding methodological approaches to mICT studies taking into account the contextual and spatial aspects of work through an ethnographic analysis.

The difficult part in mobile studies is to record mICT interaction and in addressing this research issue, four areas of research have been identified: the actors/users, the technology, the actual location of the work and the virtual communication space (created by the use of mICTs). These new perspectives on mobility studies allow researchers to go beyond observations of static office work. For a long time, IS researchers have come to recognise in this type of study the importance of acquiring a good understanding of an organisation and its context as part of the process of designing, implementing or installing IT systems (Anderson, 2005) such as mICTs. However we can go beyond 'story-telling' as a means of data reporting and analysis to provide deeper and wider contributions in researching work practices.

4.3 Domain of Study

The use of case studies in mobility studies is well documented by the works mentioned in previous paragraphs and it is widely used in IS research. For this dissertation the chosen form of research design is the case study. The domain of the research has been a highly mobile worker, and the particular research subjects were

Black Cab drivers in London. As explained, and due to the contextual and situated nature of the work, great importance was given to the iterative design of interpretive studies, which leads to the choice of this case study for the research design. For this research, attention has been paid to the examination of a contemporary phenomenon and its real-life context when carrying out the case studies, in which there can be multiple variables and relations, and in which phenomenon and context cannot be separated.

The research subjects, when using mICTs to support their work, are situated in the spatial (vehicle) and contextual space (the city, everything that surrounds them) that cannot be separated from the mICT use. This support or aid can be active or passive in its mode of interaction with the research subjects. At first sight the complexity of this study arises from the wide range of subjects' research themes or narratives that can be encompassed with this approach. In order to narrow the research work and focus on a more specific objective, and taking on board the recommendations of the IS departmental assessors, a pilot case study project was completed during the summer of 2004. This preliminary work in defining this case study contributed very early on to the development of the relevant theory building process required in the delimitation of the subject and domain of study.

The scope of this pilot study was to test the hypothesis sustaining the preliminary theory of social networks, mobility and sociology of work. This applies to the case of highly mobile workers, such as service engineers and taxi drivers, using mICTs for work. One discovery made during the process of testing was with respect to the influence of the working practices supported by the use of mICT within the workers' organisational structure. Hence these research categories were adopted and then applied in the ensuing research work.

The pilot study was a set of 12 interviews helping the researcher to become familiar with interview techniques and to assess the challenges that the use of mICT presented for this type of research work (Elaluf-Calderwood et al, 2005). From the evidence of early attempts at collecting data for the fieldwork, there was a clear limitation in how to observe the research subjects at work, which is mobile and dynamic. Hence arose ideas about using some kind of video recording technique (see section 4.4.3). The lack of pre-defined variables in the interpretive research approach

allows for the emergence of inductive themes through the data collection states and analysis.

Once the pilot study was completed, the research topic was narrowed to analyse how the uses of mICTs influence the working practices and organisation of Black Cab drivers. When approaching the research, this question is relevant as it enables us to relate the *how* and *why* questions. This research has been highly exploratory in nature and has allowed the emergence of themes that tackle the complex aspects of social working practices that are influenced by the use of mICT in temporal, contextual, and physical surroundings. However, there is a need to take into account the fabric of the social construction of these workers' social realities, and the relative subjectivism of learned knowledge embedded in the philosophical foundation of this study..

In the final research work the potential sample of research subjects was quite vast: around 30,000 Black Cab drivers registered in London, and to choose without a criteria could have widened the research objectives to a level of impracticality. From the pilot study and analysis of the context in which the research subjects carry out mobile work, it was possible to identify a very important characteristic to differentiate the research subjects by the type of mICT primarily used for work. Some used computer-based booking systems, others GPS-SMS booking systems, others two-way radio or a combination of these systems. Using these socio-technological criteria, a decision was taken to research two types of Black Cab drivers using two slightly different types of mICT technology as their support tool for work (Elaluf-Calderwood and Sørensen, 2005).

For any external observer, these two types of cab drivers are apparently the same, but as the research progressed I found synergies and discrepancies that could be diagnosed from the type of mICT chosen for work. Hence using the IS theory available for case studies, ideas are developed further, for instance the use of ethnographic tools as a way of collecting data, complemented by ethnography , as well as video recording with video interpretation methods for analysis.

Traditionally the completion of ethnography studies has taken a long time – in some cases it can be several months or years; allowing the researcher to be immersed, and

often participate, in the culture being researched. Ethnographic methods have been applied to research subjects to whom changes occur more rapidly, such as implementing IT technologies in the business world. Hine's Virtual Ethnography (2000) presented a research context in which the ethnography is applied with an adaptive approach – the case study being the Internet – reflecting on the methods used to address the interactional relationships between subjects, which is not taken into account by traditional ethnography when applied to organisational studies (Weilenmann, 2004).

In mobility studies this methodology has allowed researchers to undertake studies in which the subject is influenced by such factors. Take for example the concept of *mutual awareness* (a CSCW term) for activities on the road between different drivers. The manner in which drivers reach decisions is not properly described by ethnographic methods (Laurier, 2002; Orr, 1996) since there is a self-referential view of the world to be included in the analysis.

At this point in research design in mobility studies, the role of ethnography has increased relevance for the interpretive analysis. Indirect ethnographic research methods can assign a contextual value to the details in the dialogues and narratives used by ordinary people in their everyday activities when making sense of the world around them rather than focusing on classifications and generalisations as general ethnography does (Anderson, 2005; Garfinkel, 1986). This value to that is given to narratives and dialogues allowing the research potentially to dip into the pond of interactional relationships that lie at the core of the use of mICTs.

One important way ethnography has been used in this dissertation is in the analysis of the categories and methods that research subjects use to describe their activities. The researcher focuses his/her attention on research subjects' categories and methods, rather than categories and methods proposed by the researcher. Ethnographic methods such as ethnomethodology were applied to IS studies by CSCW work (Dourish, 1996; Suchman, 1987, Orr, 1996) with great success. In Suchman's case, her research used video recording to capture the human-machine interaction with fax machines, which was the basis for the theoretical analysis of situated and planned acts.

Other examples of case studies in which ethnographic methods have been used on mobile research subjects are video-based field studies in workplaces such as control rooms in the London Underground (Heath and Luff, 1992, 2000). In the case of study of vehicles in motion, the use of the car as a mobile office or office space is becoming a more common practice for mobile workers (Eost and Galey Flyte, 1998, Laurier, 2002). This latter research path is important to support the methodological choices of this study. The following sections explain in greater detail how the research fieldwork was carried out using these methodological tools and some important shortcomings in the methods will also be explained further.

4.4 Data Sources

In previous sections it has been mentioned how multiple data collection methods were employed in the process to obtain qualitative data. The aim was to establish the contextual settings in which work practices and organisational issues occur and to capture their complexity (Bensabat, 1987; Suchman, 1987 and 2007). The following data collection methods were used:

4.4.1 Observations

During the pilot study some problems were encountered attempting to locate research subjects willing to be interviewed or video recorded. The issue of trust and accountability (in terms of the research subject feeling that they might have to declare in detail sources of work income and explain their work practices) was the main reason for these problems. Black Cab drivers dislike questioning, which can be understood given the context of their work in a cosmopolitan city such as London. They are still less open to detailed questions about their work practices, or to having their words recorded. The fact that the researcher was a post-graduate student at a London university such as the LSE, which has a reputation of being too "social", (one interviewed driver's words) made the task all the more difficult.

In the context of this research, it has been understood that the use of mICTs such as two-way radio circuits, computer-based booking systems, or GPS allocation, etc., implies some work association or organisation of some type; hence in the first instance the researcher approached established Black Cab radio companies. One of

the top-rated companies approached was Dial A Cab, in the person of its Chairman, Mr. Brian Rice, who offered considerable support for the completion of the fieldwork. This support consisted in the provision of suitable office space to complete the interviews and granting access to the company shareholders (Black Cab drivers) and staff (control centre, managerial, ICT support). The same applied to the Traffic Controller at Zingo, who provided the names of drivers willing to participate in this research.

Once such support was obtained for the field work, it was possible to overcome the problem of choosing individual research subjects based not on the criteria of being Black Cab drivers, but rather on the type of mICT those drivers were using to support their work. This allowed searches for potential interviewees to be made, rather than employing a random means of selection. All selected research subjects from the Black Cab associations participated in this type of research.

In the period of six months during which the interviews were completed, the researcher was able to observe, without herself participating, ways that the work of the Black Cab drivers is seen from the point of view of a control centre. Aspects of the sedimented working practices of Black Cab drivers that have been integrated – through the work of the ICT support team – into the company's mICT were also observed. It must be noted that this company has developed those mICT systems in-house over a period of 17 years.

The other drivers interviewed were from another Black Cab company called Zingo (the company name changed to ComCab Ltd. in 2006). This company used a mICT based on GPS location systems that will be explained in Chapter 5 in more detail. Black Cab drivers interviewed were able to trust the researcher. This was due to preliminary introductions to the research by people the drivers trusted (management, control centre staff). This introduction made the research work easier when exploring their working practices in detail. Observation notes were taken in an informal manner to support the contextualisation of the one-to-one interviews and dialogues, which are presented in the section below.

4.4.2 One-to-one Interviews and Dialogues

Using the methodological work of Sacks (1985) on interpretation analysis and

McCracken's (1988) four-part method of inquiry for long interviews, this research was designed as a set of semi-structured interviews. The topics discussed in the interview focused on widely known general topics but questions in relation to the research subjects' work and working practices, and the use of mICTs, were not standardised. The design took into account McCraken's proposal for a series of review processes when determining analytical categories and developing the interview design; this process is fed by analytical and cultural data obtained as the interview progresses. See diagram below in Figure 4.1.

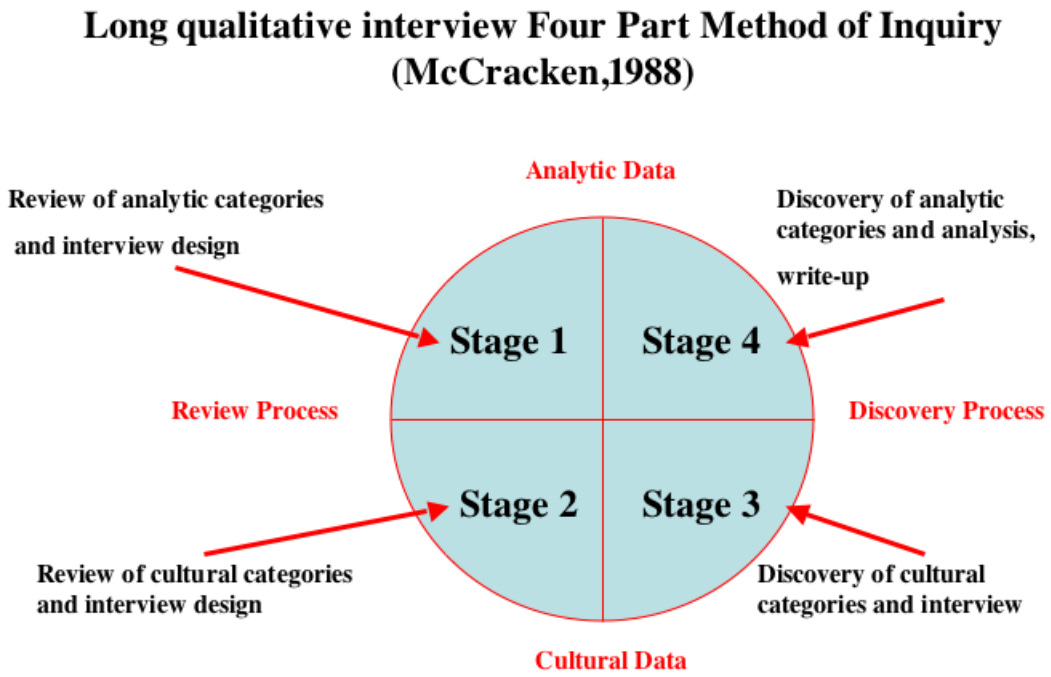

Figure 4.1: Long Qualitative Interview – Four Part Method of Inquiry

This research method supported the research plan for this dissertation, and the interpretivist theoretical framework well. In the preliminary pilot study it was possible to determine an important characteristic of my research subjects: their relationship with and perception of their work and what they actually do was very idiosyncratic and personal. Some research subjects were interviewed more than once: for the pilot and for the actual field work. The McCraken model provided great

help with the search for themes to be researched in the main study.

The introductory stage of each interview had the disadvantage of needing extra time to establish a link or bond of trust. Even when company directors introduced the researcher to drivers in one-to-one presentations, providing some background about the objectives of the research, this awkwardness persisted. It was needed for all interviews, and before being able to record any of their comments on a one to one basis (interviewer/researcher) to provide the research subjects with time to ask questions and to provide background information about the research, its motivation, plans of what to do with the recorded interviews, and the length of time required to complete the interview.

The methodology literature reviewed identifies an important challenge for the long interview: the need for the researcher to have some previous knowledge about the context and the interviewees, whilst keeping a distance from the research subject. This extra time is a very important factor to be taken into account when making the decision as to whether to participate. These preliminary conversations were useful to the researcher, and complementary to the McCraken method of inquiry, for allowing her to take some notes about the drivers' personality traits and idiosyncratic behaviour, and to identify possible problems that might appear later when processing the data. Black Cab drivers tend to be reluctant to talk about their work in very much detail, as the press sometimes publishes negative articles about them. The preliminary conversations were, therefore, important in gaining the drivers' trust and respect as a genuine researcher.

For this research, this has been achieved through ethnographic methods, in which the research subjects choose the units of analysis. As well as this, the interviewer needs to be able to create an atmosphere of confidence that enables follow up questions, to be a good observer, to trace cues and attune conversation to the topic discussed.

A concern during this stage of the research was how to attune the conversations planned, taking into account the fact that the research subjects in both pilot and main studies frequently switched between personal narrative and self-reflection. Ellis and Bochner (2003) warn about this issue and recommend a branching tree of options to stop the interview from stalling, and if necessary to reshape interviews "on the fly",

to increase the perceived reliability of the source data.

The main sets of interviews were conducted face-to-face in the calm and relaxed environment of an office space. There was coffee, tea or water for consumption. Once the Black Cab driver agreed that the interview could go ahead, a time frame would be agreed. The length of the interviews was variable – some are a little more than one hour, others 45 minutes. These variations are due to the specific requests of the drivers to be interviewed during a certain time slot due to overlap with other planned activities they had scheduled, such as maintenance to their vehicles. Research subjects were requested to turn off their mobiles or put them in silent mode to avoid unnecessary interruptions. All interviews were recorded, the pilot ones in tape format and the main interviews in digital format using a digital recorder. It took around six months to complete the recording of the thirty-nine interviews (including preliminary meetings and co-ordination time for interviews), and another six months to complete the transcripts. A list of the interviews as well as the initials of the drivers is shown in figure 4.2.

Black Cab drivers have different levels of education, social class, background and origin. Most of them stated during interviews how they perceived themselves socially. In the UK, and particularly in London, people tend to talk about their everyday activities with heavy London or regional accents and use special words or slang such as Cockney (original slang from East London). To add to this diversity, Black Cab drivers use special idiomatic expressions that are trade slang or colloquial English. For this reason, when the time came to do the transcription of the interviews, it was not possible to use voice recognition software to automate the process. The trial results from using such software needed so many revisions that it made more sense to employ a traditional process and manually transcribe the interviews by slicing the recordings. Obtaining a full transcription was a very time consuming process for most of the interviews, and in three, some sentences were almost inaudible, and in those cases they were transcribed as notes summarising the main subjects discussed.

No	Participant	Code	Interview (time)	Age/Sex	Years Experience
1	Driver	AG	1h 30m	Middle 50s/male	30
2	Driver	DH	65 m	Middle 50's/male	32
3	Driver	IM	55 m	Early 60s/male	37
4	Driver	JR	1h 10 m	Early 30s/male	13
5	Driver	PJ	1h	Early 40's/male	20
6	Driver	BP	1h 10m	Middle 40's / male	25
7	Driver	MT	1h	Early 60s/male	35
8	Driver	TB	1h 20m	Late 50s/male	30
9	Driver	DM	1h 10m	Middle 40s/male	27
10	Driver	MR-1	1h	Early 40s/female	< 1 year
10	Driver	MR-2	1h	Early 40s/female	Over a year
11	Driver	PG	1h 20m	Early 40s/female	15
12	Driver	JT	1h	Late 40s/male	27
13	Driver	LH	1h 20m	Early 20s/male	2y 3m
14	Driver	TC	1h	Early 30s/male	13
15	Driver	BG	1h 10m	Early 40s male	20
16	Driver	PL	1h	Late 30s/male	19
17	Driver	MS-1	1h	Early 30s/male	10
17	Driver	MS-2	1h	Early 30s/male	10
18	Driver	LR	1h 20m	Late 20s/male	3y 5m
19	Driver	SB	1h	Middle 30s/male	12
20	Driver	BF	1h 5m	Middle 40s/male	26
21	Driver	DL	1h	Early 40's/male	16
22	Driver	LM	49m	Late 30s/male	16
23	Driver	WK	1h 10m	Early 30s/male	11
24	Driver	JF	56m	Early 50s/male	4
25	Driver	BC	1h	Early 60's/male	33
26	Driver	DO	1h 10m	Late 40s/male	19
27	Driver	JL	1h 10m	Middle 60s/male	32 y 6m
28	Driver	DJ	45m	Early 40s/male	10
29	Driver	DD	1h	Middle 50s/male	36
30	Driver	SN	45m	Middle 50s/male	4y 5m
31	Driver	GM	1h 10m	Early 30s/male	4y
32	Driver	PS	1h	Early 40s/male	21y
33	Driver	RW	1h	Middle 30s/male	8
33	Driver	RW-2	1h	Middle 30s/male	8
34	Driver	RM	1h	Middle 40s/male	15
35	Call centre	GG	1.5hr	Early 30s/male	Non-licensed
36	Sup. Call Centre	PG	1.5h	Middle40s/female	Non-licensed
37	Management	TW	1.5h	Early 50s/male	25
38	Management	AE	1.5h	Early 50's/male	25
39	Senior Management	BR	3h	Late 50s/male	30

Figure 4.2: List of Interviews, Respondent Identifiers, Interview Duration, Demographics and Time for Licensed Drivers

For each interview, a process of identification and codification of the main subject discussed was undertaken, and notes were made cross-referencing information about their working practices with organisational issues. These are not quantitative notes; rather, they were used as references to analyse the contextual references used by the subjects of study (vehicle, radio-circuit, friends, other media, etc.) Since these drivers switch their narrative between personal themes (stories, sedimented work experience, etc.) and reflexivity (contextual and locational influence for the use of mICTs, awareness at work, etc), this method aimed to simplify the search for themes.

As the interviews progressed, and based on the dialogues and observations about their work that were completed, a number of concerns about the reliability of the data source were raised. It was then deemed necessary to verify the contextual and spatial aspects of their working practices, hence the idea of video recording contextual work using remote real time recording. The next section proceeds to explain this methodology.

4.4.3 Video Recording Contextual Work

Visual materials are often narrative in form. In the case of film/TV there might be a main script that tries to show the point of view of the film/TV director. The use of visual materials in the arts tries to capture or represent the artist's vision of what the visual piece is about. In scientific terms, social research tends to make use of video recording social studies in a less specific and exploratory manner. Video recording in research fields such as anthropology – the first social science to use it for that purpose – and other social sciences is well documented and video recording is now a common practice.

This of course would not have been possible without the technical advance of image processing, and in many ways contemporary electronic technologies continue to redefine the image and its social meaning (Harper, 2003). Video technology used for social research falls into three areas: as a tool used for observations (data collection and analysis), as a mechanism for giving feedback, or as a means for distance learning and consulting video conferencing (Rosenstein, 2002). In this research, the use of video technology falls into the first category.

Video observations give researchers a source of permanently revisable documentation from the field. Film can potentially capture valuable information concerning emotional and communication issues, allowing the researcher to deal with the 'what' as well as the 'how' of behaviour because it can capture an event in real time (Rosenstein, 2002). Video can be used in qualitative research simply for providing data or as a visual document for rich description. It also allows the researcher a 'gap' for distancing himself/herself from the data. There are concerns about the use of video recording in terms of representation and the extent to which research subjects will be aware of the camera recording their actions. This is also reflected in trustworthiness, interpretation and reflexivity. These last factors apply both to the subject of study and to the researcher.

The use of video recording for work studies can be traced back to recorded films used by early researchers in the study of movements and Taylorism aimed to improve timekeeping and time control. For those early experimental films, video recording is now widely used in many areas of social research. However, using cameras in offices or workplaces when recording working practices presents challenges of its own.

Ruhleder and Jordan (1997) describe some of the issues related to installing video cameras and trying to record in offices and again add to this research scheme. The many benefits include exposing mechanisms and antecedents for work, counteracting the bias of the individual (very relevant in interviews), the capture of complex data, and access to behaviour that will otherwise be invisible. The counterparts to these issues when such technology is installed in the office context include such areas as individual privacy, confidentiality and time consuming (from the researcher's point of view) techniques for analysis.

Researchers can project the problems identified at a static level (in an office) to a dynamic setting where there is a wider contextual area such as an organisation that is geographically distributed. In the case of this type of research, workers that are not only spatially but also contextually distributed with added temporality in their work practices can see the challenges. It should not be forgotten that when watching and recording people, interaction with mICTs is as important as analysing their perceptions and interpretations.

The use of video recording in social research studies of the use of cars for activities such as mobile offices, has led to the use of video cameras assisting data collection (Laurier, 2002, Eost and Galer-Flyte, 1998) using ethnography (the researcher in the vehicle) and/or ethnographic tools. In a more restricted setting such as the London Underground, drivers use video recording for work (Heath and Luff, 1999). The data obtained in such work was labelled dynamic because of the use of real time recording. It must be noted that one of the issues considered when recording is the presence of the researcher in such vehicles or areas where the work is carried out. For reasons that will be explained in the next section, this research had to approach the recording using remote recording – the researcher was not in the vehicle – and issues of training (the use of the camera, quality, etc) were as important to the research as those listed above.

To overcome this problem this research approached video recordings as part of a set of situated actions in which the levels of control and social identity as a context for behaviour at work are somehow known (Gauthereau and Hollnagel, 2005) but not determined in time and space. Hence there is an uncertainty in events, which the video recording complements. In doing so this researcher touched on the case for video analysis in a pervasive environment (Karunanidhi et al, 2002), and for recording mobile workers when performing mobile work we need to have perspectives and some type of mediated interaction (Dourish et al, 1996) to link the space of the research to the reality. Hence all the videos have a referential context beyond the realm of the video, which enhances understanding of the temporal and contextual conditions in which the video was recorded. In this way we reduce the participation of the researcher in the process to the minimum and let the camera act as a silent agent encoding the video data.

A list of all the recording videos completed for this research is presented at the end of this chapter. The following section explains how the data collection was implemented.

4.4.4 Practical Aspects of Video Recording: Using Remote Real Time Recording (RRTR)

Besides the theoretical aspects previously explained, and used for the design of the research methodology for this dissertation, some planning was necessary for the data

collection. The first issue arising when applying video recording to the research was one of data ownership and data distribution. These two issues are common to all research video recordings (Zelnik-Manor and Irani, 2001; Rosenstein, 2002; Spiers 2004). In this research a number of legal and human obstacles were encountered when implementing the video recording research solution.

From the aspect of legal requirements, the Black Cab service in London is a public service that is regulated by the PCO. This organisation is responsible for the drivers' accreditation or vehicle specifications, as it has as one of its core aims the improvement of system safety and security for customers and staff and services. From the point of view of human obstacles, during my initial enquiries into setting up the video recording montage many Black Cab drivers were approached and asked for their permission to obtain video recordings of their daily activities, but a strong resistance to the use of a camera in the vehicle was encountered. Amongst many reasons, the issue of privacy and data ownership arose, as well as the legal requirements they are obliged to follow. Thus the researcher approached the PCO, which provided the guidelines for compliance with privacy protection established in the Data Protection Act (1998), as well as PCO safety regulations. It was not easy to obtain access to someone who could provide this information in plain and clear English, so it took some time to discover how to work with the PCO.

The regulatory protection of individuals' images in the Data Protection Act requires individual consent on a one-to-one basis. If individuals are recorded in public by any media, and the contents of these media are broadcast to the general public on any other media, the individual image is owned by the individual. Hence broadcasting can only occur if there is a signed authorisation from the person concerned. This condition created a serious problem in the planned methodology: if a signed consent was needed for each person recorded, the real-time sequence of events recorded would be disturbed. Another problem was the issue of including the physical presence of the researcher in the vehicle at the time of the recording. The actual physical space for passengers will be limited, since there is no side seat next to the driver in the front of the vehicle, and the researcher would have been obstructing the work of the driver with her physical presence. Also the PCO, as the organisation authorising the montage of a camera in a Black Cab, was adamant that any montage

had to be checked by their Health and Safety inspectors to make sure it would not create any danger to the driver or passenger(s).

Limited by these constraints, the idea of Remote Real-Time Recording (RRTR) was introduced. The name refers to the parameters for the recording. It is *Remote* because the camera was mounted in the vehicle without the need for the researcher's presence. It is *Real-Time* because all events were filmed as they occurred. It is *recording* work, referring to the video recording. For the montage of the camera in the vehicle the following equipment was used:

Sticky Pod Set

This piece of equipment has been successfully tested and used to video record in vehicles in the USA, e.g. by the California Police Department when chasing criminals on the roads. It is an interesting device as it significantly reduces the vibrations from the vehicle movement during recording and it is highly flexible and the montage is straightforward. It was imported to the UK only for this study and no references have been found of it being used for research of vehicles in motion in the UK.

Multi-functional Digital Video Camera DV182

This camera was chosen for its lightweight and easy operation, as well as for its small size. The battery life is 2 hours and the camera has a good lens and sound card. The PCO was adamant that the recording setup must use a small light camera, to cover the safety requirement that in a potential accident or collision the camera would not catapult and injure anyone in the vehicle or surroundings. The final camera setup is shown in figure 4.3 below.

Figure 4.3: Sticky Pod and Camera Mounted in Black Cab Floor next to Driver Seat

The sticky pod is located in the floor of the vehicle next to the driver in the luggage compartment with the camera pointing to the driver. This solution was satisfactory to the PCO inspections in terms of a physically secure, stable and private solution for the montage. Since this research is focused on the actions of highly mobile workers, and the aim of the recording was to be able to show edited videos to the research community, it was decided to record the driver's activities and not to focus the camera on the passengers at any time. However passengers can be heard talking to the driver. Thus by means of this decision, the issue of the Data Protection Act requiring personal authorisation for usage of the video data was solved, eliminating any hesitations from the driver in authorising his own image for distribution.

4.5 Data Interpretation Techniques

In IS studies the qualitative difference between IS theoretical research and IS practice requires convergence in case studies in which interpretation analysis is predominant (Markus, 1997). This convergence can be achieved by taking into account the fact that qualitative studies with an interpretive edge provide a powerful method of analysis using iteration. Exploring the data, describing the data contents, ordering the findings, and explaining the results and matching them with the theory are processes that are revisited several times throughout the research (Miles and Huberman, 1994; Klein and Myers, 1999). There are of course important considerations to take into account when following this methodology.

In this section, the data collected from the case study is described using the interpretive approach. From the analysis of transcripts and video, the researcher was able to interpret the contextual (personal and organisational) and spatial (location and use of mICTs) reality of the research subjects. Being an iterative process, at the start of this research the chosen theoretical framework focused on the social networks theory aided and/or supported by mICTs, which were important in establishing the links between working relationships.

It was found during the data analysis that social network theory seemed less relevant as other themes rose in importance. There was an evolution of the conceptual framework where the sociology of work and organisational theory became more relevant.

In order to make sense of the data obtained, this interpretive approach opens up avenues for a process of discovery and serendipity that it is expected will be encountered in interpretive case studies. This research study is for this reason a 'revelatory case' for its findings and methods (Markus, 1997).

4.5.1 Analysing Transcripts

Using an ethnographic approach, I obtained from the completed interviews the categories and methods used by the research subject to describe their work, their use of mICTs, their working practices, etc. The interview transcripts were cross-referenced with notes taken on site by the researcher, in order to retain some of the details that have emotional elements attached to expression and communication, which can be found in the spoken but not written communication.

Parallel to this work some attempts were made to use a text analyser program and some time was spent researching Qualitative Software available for social sciences. After some trials, the choice was made to use the TAMS-Analyser for Mac. This program is open source and can also be obtained for Linux and Windows environments. This selection had no positive outcome. When attempts were made to analyse the text and identify the main topics intuitively, it was found that the results were very sketchy and did not reveal the richness of the text. This was in part due to the fact that the actual text contained many unreadable paragraphs not making written grammatical sense, and due to the semantic and semiotic differences to

Standard English that Black Cab drivers display in their everyday working language, which must be analysed by taking into account the contextual surroundings affecting the expressions.

To overcome this difficulty, most of the transcripts were processed unaided by software programs, in order to verify the main topics identified by the TAMS-Analyser. This exercise revealed that the software had missed important blocks of analysis. The simple method of printing the interview transcripts was used to complete the analysis. By careful reading and using marker pens and notepads, a detailed search for relationships between the text and the working practices described ensued. Special attention was given to paragraphs in the interviews where mICT usage was described either as an active or passive technology of iteration. This process was repeated more than once, searching for other issues such as emergent working practices and/or organisational practices associated with the use of mICTs.

A recurrent research query in interpretive analysis concerns the issues of meaning and interpretation (Walsham, 2002). A pragmatic approach to these issues was adopted in this research: the analysis was split into data sourced of data: interviews and RRTR, which complemented the lack of knowledge or experience in Black Cab work. Black Cab

4.5.2 Building RRTR Annotations

The issue of interpretation of meaning in IS research needs to be explored further in the contextual setting in which the data was collected. Besides the interviews, the use of RRTR potentially aided a better understanding of the contextual world surrounding the work of my research subjects. The use of video recording has issues of its own, such as the management and analysis of video data (Spiers, 2004). In every aspect of literature researched for the use of video recording in qualitative analysis, there appeared to be an underlying expectation that researchers must learn how to edit using the latest video editing programs, thinking that this would simplify research lives, and all analytical problems would be solved, but forgetting the value of the hermeneutical analysis gained from a more structured research methodology.

The approach chosen for this research, after trying some of the tools for editing data for analysis and dissemination, has indicated that the simplest way may be the best. The tool chosen was iMovie, a simple Mac based program that allows one to manage data in a way that has minimum interference with one's analytical thinking. The editing process includes taking notes, watching and re-watching the data, writing descriptive notes and linking notes to logs of contexts, and then correlating this data with interviews.

Figure 4.4: IMovie Console Panel for Digital Video Edition – Black Cab Driver receiving a request for work from voice call.

The aim as a qualitative researcher was to present video data that did not require the use of sophisticated video programs, yet which could still be managed and made understandable. Thus simple editing facilities were used such as titles and basic transitions between clips. The aim was to keep the program and its technology working in the background so that the analysis could reflect freely upon the data. Finally, sets of nine Quick Time videos were created. An example of how videos were edited is shown in Figure 4.4. A video will be organised into series of themed topics so they can be accessed easily during the analysis.

Through the RRTR annotations, the researcher was able to correlate the contextual and real-time experience of the research subjects when carrying out their everyday work. This process was not free of difficulties, which were encountered when learning to interpret the meanings of some of the dialogues. However, RRTR was an invaluable complement to aspects of the taxi driver work, whose meaning and relevance would have been difficult to grasp had it been based only on the interviews completed.

4.6 Discussing the Combined Methodological Approach for this Research: Interviews and Video in Mobility Studies

In all interpretive research there are shortcomings that arise from the research methodology itself (Shultze, Myers et al, 2000). The main shortcoming is the lack of attention to how the material collected is socially constructed, in terms of the links between the research subjects and the scene of the actions. For this research the layer of interpretive research *sensemaking* as expressed by Daft and Weick (1984) was acquired through the use of the combined methodological approach of interviews and Remote Real-Time Recording (RRTR). Using RRTR also helped to overcome the problem of observations, interviews and other forms of data collection in general based on ethnographic methods, where there is no possibility of revisiting the source data.

The researcher is limited by not been able to return and check original notes taken in the field against actual events, hence many researchers use triangulation (Miles and Huberman, 1994). Interestingly enough, triangulation can be obtained through the use of multiple reviewers for one data source. Since at certain stages of the video data collection, those videos were shown to the driver, and the questions were made to the driver in order to seek a better contextualisation of questions such as "what were you thinking when you did or said that" and by doing so it was possible to follow a deeper narrative that helped with the interpretation of the data analysis. The data sourced from the interviews, with its ethnographic bias, provided a strong source of categories and reflexive analysis as defined by the research subjects.

There is a seminal clarity in the ability of a researcher to be free of variable

definition and categorisations, letting the research subjects do the work. Naturally, the transposition of the elements observed using interviews and RRTR requires a complex research set up – from the researcher's point of view – but one that yields rewarding results. The apparent asymmetry of the data obtained leads one to identify the organised situated choice and the emergence of working practices, and helps to understand the role mICTs usage has had in the changes to these working practices. The interviews provided a rich source for idiosyncratic behaviour, as well as helping to explain organisational issues linked to the use of mICTs.

Another common criticism of the interpretive approach is that given the emphasis on how the researchers' analysis developed over the course of a research project, interpretive research is presented as data driven instead of theory driven. In this dissertation, this relative shortcoming has been addressed by adopting a theoretical research framework in which the sociology of work theories is related to mobility studies, as well as to organisational studies related to situated choice. In so doing, an open channel for further research can be explored.

Discovering variables and *sensemaking* of the world surrounding highly mobile workers is part of this process. As the research progressed, it became more important to question some of the core issues identified in the interviews. The relative priority of certain issues over others raised persistent questions: do they make sense? What about the things that are not mentioned but are nonetheless implicit? RRTR helped to make sense of the issues related to improvisation and moods that conventional IS research generally does not take into account when making its analysis (Ciborra, 2001). In the interviews some choices that were described could only make sense as practices emerging from the use of mICTs if the researcher knew the contextual and spatial references. To understand how situational and planned acts arose from the data elements and case study narratives, a phenomenological approach was needed. Since as a researcher the only proof of the events was the videos, a level of empathy to the working world of the driver was used for *sensemaking* of their world.

In a second stage of revising the analysis, in which this dissertation sought to organise the narratives into a coherent story, a number of thematic topics and recurrent themes were found. Because of the idiosyncratic behaviour of the research subjects at work, the process of inferring how to make use of such patterns and

relationships, items and categories, and the links between those categories and classes was a very challenging task. Recurrent narratives had a variable level of personal interpretation and reflexivity. This reflexivity is important when identifying trends in the data, illustrating the working practices and the organisational issues researched.

4.7 Conclusions

In this chapter, the methodology used for this research work has been outlined and described, and we have attempted to point out its limitations and complexity. Some of the methods used for this research analysis are for the first time used in combination to form a coherent piece of research in mobile studies. Hence this is a potential contribution to the methodology practice used for current mobile studies.

The combination of ethnographic methods with an interpretive research approach, as well as superimposing a phenomenological interpretation for the temporality of context onto the usage of embedded mICT technology, has been a complex task. As presented in Chapter 3, social science researchers are confronted with the epistemological dilemma of the source and location of knowledge. Were meaning and interpretation contained in the codes and cultural norms retrieved from the working practices of Black Cab drivers or were they influenced by the mICT use?

This research was enriched through the use of RTTR. A list of the videos recorded for this dissertation can be found in Appendix 1. The analysis was able to reflect the reality narrated during the interviews and complement the knowledge of what happens on and off camera. Had a conventional path been followed, the human factor in the decision making process of everyday situations would not have been taken into account and the study of the emergence of new working practices, in which loose organisations, awareness, interdependency, and collaborative practices evolve in a dynamic and complex context, would not have been possible. This chapter has described the sources for collecting the qualitative data and the analytical techniques used in this dissertation.

In the next chapter, the theory described in Chapter 3 and the methods of Chapter 4 are combined in order to present the analysis of data. Since the 'how' and the 'what'

questions have been outlined it is now time to find the answers to those questions and in so doing perhaps to raise further research questions. Hence the findings that emerged from the empirical work completed will now be presented.

CHAPTER 5: DATA ANALYSIS

Embodiment is the property of our engagement with the world that allow us to make it meaningful

(Dourish, 2004)

The structure of this chapter will follow the theoretical framework described in Chapter 3, mirroring in the analysis the relevant theory. The distribution of the analysis is a descriptive model of self-referentiality as described in Figure 3.2, which includes working practices and mechanisms for choosing work, the mediation of mICTs for mobile work, and the organisational forms emanating from such practices. This analytical model uses interpretative analysis and ethnographic methods to discover the situational and contextual relevance of mobile working practices engaging with technology. These findings will be used in Chapter 6 to explain the effects of mICT on highly mobile work and the organisations that support it.

For the organisational narrative of this chapter, an overview of how Black Cab work can be understood by taking into account planned and unplanned work, awareness and collaboration at work concepts, with a self-referential perspective of this work, is presented. The chapter will examine organisational aspects related to this type of work, bringing them towards a state of conciliation over temporal situations. Such working situations, which are heavily mediated by mICTs, are also contextualised by self-referential work. This examination will be followed by an overview of two organisational models: centralised and loose agile mobile organisations for Black Cab work. Finally, a summary of the main findings concludes the chapter.

5.1 Understanding Black Cab Work

Previous research into taxi work as described in Chapter 2, and in particular studies of Black Cab work, have focused its interest on the use and knowledge management of the "Knowledge" as the fundamental working practice tool for understanding this

type of work. Such analysis makes assumptions about how this knowledge is already embedded in the working practices for traditional Black Cab work. In this section we will argue that such assumptions require complementary concepts in order to be able to fully understand Black Cab work. The concepts complementing self-referential work include awareness and collaborative work, and planned and unplanned work. These complementary concepts later contribute to an understanding of the shift in working practices that mICTs have contributed to since their intervention in the working world of Black Cab drivers.

5.1.1 Black Cab Work: the Individualised Work Unit

Traditional Black Cab work has been described as reliant on a visual awareness of spatial surroundings, and mental knowledge tools such as "the Knowledge" to perform everyday work routines. The discussion in this section focuses on workers with a strong individualised conceptualisation of their definition of what their work is, where this work unit has special characteristics. This type of work is in most cases performed on an individual basis, and cabbies tend to experience the effects of isolation at work studied by Heath and Luff (1999) for drivers of the London Underground (LU) network.

LU drivers develop working practices similar in complexity to those of, for example, pilots in cockpits. The similarity of their working practices can be compared to other skilled occupations, in which a high level of concentration and planning at work is needed. Take for example the case of aircraft pilots, who have to study the air route and make informed choices before taking off, and also, for managing diverse cockpit equipment as well as simultaneously keeping the vehicle under control (Adams and Pew, 1990), have developed several complex working practices. Thus, there is a narrative when trying to describe such working practices that is centred primarily on the driver.

Work, if described by a casual observer, is usually abstracted to the concepts of job description, roles and tasks. However, when looking into what is actually accomplished, when, how and why, without including the self-referential descriptions of mobile workers, it is difficult to understand what work is actually being executed and how. Overall, this dissertation presents a rich tale of how this work is done, with a strong interest in developing research methods relying on

ethnographic methods and phenomenology using Remote Real Time Recording (RRTR), which as Suchman (1987) notices, *in other words, is not their own, but that deployed by members of the society in coming to know, and making sense out of, the everyday world of talk and action*.

An important aspect of self-referential work in Black Cab work is the understanding of the spatial context the cabbies refer to when at work. This space is not a physical space but an interpretative space in which, when describing the space in which work occurs, there are embedded routines, work cycles, disturbed by interruptions, customised by preferences, changed by improvisation, in other words an interpretative world that is highly idiosyncratic. This interpretation is also extended to time, where the daily routine is not a continuous but rather a discretionary series of periods, and at all times are subject to a social context, and are therefore further fragmented by unexpected interruptions. Examples of this behaviour can be found in the Prologue and Appendix 1 of this dissertation.

Once the weekly RRTR was completed, a 30-minute post-recording session was followed with the cabbie. A selected set of video cuts were pre-selected for discussion with the driver and discussed in order to clarify the meaning of the actions observed. The cabbies' answers were always self-referenced, bearing a response to his need to juggle his social time with work. For example, if he had decided to continue driving after a job was completed, or perhaps had a passenger on board bound for an agreed destination, he might choose to socialise by talking to his wife and friends while driving, chatting about planned activities or catching up with events of the day or perhaps just listening to the radio. He has no control over who can call him, besides screening the call numbers (if displayed) on the screen of his mobile phone. Those interruptions can occur whilst driving, and take the form of calls or text messages.

When this type of self-referential work is interpreted by an observer, it is necessary to take into account the relative perception used in the narrative of event. This led us to seek other dynamic factors affecting the decisions made by the cabbie, developed further in this chapter.

5.1.2 Contextual Categorisation of Black Cab Work

The introduction of mICT devices into Black Cabs started with ordinary car radio, used to listen for news, weather and traffic reports. All the Black Cab drivers studied used the radio on a daily basis during their working shift. Furthermore, the cabbies interviewed valued the information provided by the radio; their comments highlighted the importance of using the live radio for developing awareness of what is going on around London. Unless there is a special reason for the radio to be switched off, for example when it disturbs a passenger, most cabbies will listen to it at varying levels of volume during the day.

It is interesting to note that the ordinary car radio defined as a *mobile device* is not seen or perceived as affecting their vehicle control, nor the practical aspects of dealing with passengers such as getting the destination address, claiming a fare, or giving a receipt for their transport services. The radio broadcast is listened to with speakers rather than headphones, and is controlled from the vehicle control board. For example, drivers engage in social acts while at work such as answering radio quizzes, which are commonly regarded as an embedded social practice for entertainment, in which the device is used as an active media for communication.

In the case of other mICT devices such as mobile phones, GPS systems and computer booking systems, this perception varies greatly. The use of such devices seems to demand a greater engagement on the driver's part. Hence there is a trend to change working practices associated with the use of those devices. The public transport law emphasises safety practices, focusing on the driver's skills on the road ahead to avoid accidents of any type.

From this point of view, the use of mICTs has to be tested and safety-proofed before deployment in the vehicle to reduce any working practices with a computer booking system that might create distractions to concentration on the road. The PCO has for example restricted the use of hands-free phone devices to tested and approved models of mICT devices. However in practical terms, a mixed result is visible: Black Cabs have a particular design aimed at providing great comfort during the long working hours – most drivers do a 12 to 14 hr shift – and to this end, the design includes a control panel, in which are embedded or attached as many mICTs devices as the driver considers suitable.

The story of mICTs implementation in vehicles is well documented in London. Early adopters of this technology in Britain in the 1950s included the travelling car repair services (such as the Automobile Association or the Royal Automobile Club), taxi firms (particularly in London, such as Radio Cabs), and industrial companies whose facilities were dispersed widely and in far away places such as Esso Petroleum Ltd. (Agar, 2004). These mICT devices were radio-based and had a limited range of operation or batteries with a short life; in the 1960s and 1970s the use of mobile phones in motor vehicles was considered a luxury item suitable only for the very wealthy. The widespread adoption of mobile phones or cell phones is a more recent affair – the first mobile phone, appearing in 1983, was the Motorola DynaTAC 8000X.

In current times, the advance of technology has generalised the use of GPS devices such as TomTom integrated into traditional radio circuits, enhancing the possibilities for information that drivers can use for everyday work. Pioneers of the current booking systems starting working on such systems in the early 1990s and some companies – e.g. Dial a Cab – keep a number of in-house developers to make continuous improvements to the systems in use. The next section aims to explain in further detail how, based on the data collected, such work is performed on an everyday basis.

5.2 Working Practices With Computer Booking Systems

Black Cab drivers' spatial awareness is greatly increased by the use of the computer booking mICT. Cabbies' shift work is divided into slots of time in which different events occur when "at work"; those slots are defined not only by the driver's moods – the human factor – or planned strategy for work, but also by the role mICTs play in providing new work, their awareness of their contextual setting and the situational work available.

Once work has started cabbies find a rhythm of driving between different destinations. Passengers board and descend from the cab. The cabbie might accept a new job from the mobile ICT and perhaps use the time waiting for it to start to call a friend, which in turn might lead to a plan to meet for a break. Before the job ends,

the cabbie might start glancing at the street in search of passengers looking to hail the cab, or turn their mobile ICT on to show the system that the vehicle will soon be available. The possibility of external social interaction, especially via the mobile phone, is omnipresent. Some cabbies make a rule that if they cannot identify the caller, they will not answer the phone, the logic being that being that if the person calling needs to talk to them, they will leave a message. If there is no answer phone or voicemail, it is expected that the caller will try again.

In this respect the driver is managing his social time. If the driver wants to be in touch, a simple way to ensure they are contactable is to switch off the answer phone on their mobile phones. It was surprising to discover that many drivers did not consider the idea of using the call display feature, perhaps the most important feature of their mobile phones. If they had been able to identify the caller they would have been much better able to manage interruptions and stay in control of their time allocation.

There is also the issue of social accessibility attached to the situational acts whilst "at work". This varies widely between individuals and can even be termed idiosyncratic; depending upon the driver it may or may not be acceptable to answer calls while at work. Some drivers will only answer calls if there are no passengers on board; if the driver must accept the call, then the call tends to be brief and the conversation is held in a low voice. Other drivers have no inhibitions, and unless they are told to quieten down or stop talking, will chat incessantly.

The issue of who is entitled to interrupt cabbies' workflow also depends on how many people the drivers give their numbers to. Some drivers only had 20 or 30 numbers in their SIM card, and stated that they would commonly call 10 or less. If an "unknown" caller is displayed to these drivers, they will not take the call unless it is displayed several times in succession, as it might then be seen as an emergency. In most cases they are labelled as sales calls or calls from people drivers do not want to talk to, as work is more important. Hence it is generally considered acceptable to be interrupted by the numbers that are most used and recognisable; despite this, drivers might have their own rules about how and when this can be done.

One driver for example said that his wife had a more expensive call tariff than his

(his calls were free up to a limit) but she used the phone very little as she was concerned about health issues associated with mobile phones. If she wanted to talk to him, she would ring and let the ringer ring twice before putting the receiver down, which was enough for him to see that it was her calling. He would then return the call on her landline and speak at no cost.

Drivers also tend to make calls for other reasons such as boredom, and here the drivers who work on night shifts struggle the most to deal with the social acceptance of calls in order to keep their social associations alive. Drivers working at night have large (and sometimes limitless) packages of free minutes on their mobile phone contracts and would talk for long hours to colleagues, partly to keep their concentration during the night but also because they are the few people eager to engage in conversations at that time.

One driver explained that after 11pm he could not call home because he knows his wife will be asleep, hence he would call his fellow cab drivers and talk about what was going on in the streets, news of the day and other issues to keep him focused on his job until the end of his shift.

Black Cab drivers develop mental schedules of what they want to do during their working shift, but if the level of obtainable work is low, either because no jobs are available from the mICT or because they find themselves in a place where it is difficult to obtain work, then other mediated ways of dealing with information about where to go and what to do might arise. Drivers do not like to admit that they might be in a disadvantaged position due to lack of experience, as they are then confronted by the issue of "losing face" both to other drivers and themselves, and it is important as one driver said to "keep the ship afloat and not to sink for lack of direction".

Uncertainty about obtaining work is actually felt more acutely because of the excess of information: the driver has "knowledge" about which places he can be, as well as access to mICTs (phone, computer cab system), where information about the location of other drivers, expected waiting time for a new task, and other information is available. Despite the many paths to obtaining work that could be taken, it is still sometimes in short supply. As times passes on, if a driver fails to get enough runs, he might decide to just "call it a day" and end the shift. To use and manage all the

information sourced from the systems, drivers have to engage themselves in the use of mICTs and learn to balance the working practices they are used to with the new ones emerging from the use of mICTs. Orr (1996) mentions "the fragility of understanding and the fragility of control", achieving control by community (replacing control centres with advanced technology such as intelligent GPS, which allocates work by closest distance to passenger by mICT) and "sharing the tools" (or the information about work that is contextual) as in the virtual queue that is available in some of the computer cab systems.

This shift from a real to a virtual context contributes to the transfer of sedimented working practices to those supported or aided by mICT. Virtual queues allow drivers to know their position in a queue whose length is not known precisely, and the motivation to stay in the queue is the display screen's indication of the driver's proximity to the allocation of work. Some drivers, following this approach, prefer to work only from the computer cab system. The driver will input the vehicle's location into the system and park the vehicle in a convenient zone such as a cab rank, and wait until he gets a job. It appears that this working method is adopted by drivers who have a distaste for driving around with an empty vehicle in off-peak hours.

Drivers tend to regard the computer booking systems available on the circuits as imperfect and with room for technical improvement. Their main concern is not how the system looks but how the work is allocated. If there is the slightest suspicious that the system is not "fair", drivers will leave the circuit, or start taking action to make sure the system is "corrected". This has led to the most recent type of Black Cab work allocation system, in which these virtual queues do not exist.

5.3 Working Practices with GPS Bookings

GPS systems offer a wider range of sources for seeking work, but drivers have to juggle a number of factors when deciding whether or not to take jobs. However the use of mICTs is part of a continual search for improving efficiency when drivers want their working practices to become more dynamic. Afifi and Weiner (2004) point out that workers primarily try to cope with their working practices by aiming for efficiency of some kind. In the case of drivers, efficiency refers to the perception of their ability or the ability of a target object (mobile ICT) or person (themselves

with the Knowledge) to produce a successful outcome: in this case to obtain jobs. The drivers are aware that this can only occur when there is fluid communication between themselves and the mICTs they engage with, such that they have the necessary skills for completing the communication tasks involved in the information management process of the mobile ICT. This relates to the context of information management for gaining work practices understanding.

Other targets in efficiency also exist, but have a lower priority, such as ability and honesty in their work aided by the mobile ICT tools (Hsiao et all, 2008). Ability is understood as the level of ability of drivers using mICTs. Honesty refers to computer systems offering fair chances for allocation of work. For example virtual queues are ordered by the timestamp of the cab log in the system and not on human choice at the control centre, which could be influenced by friendship between the driver and the controller, or other human factors.

GPS systems have arrived in force since 2000 in London, and their increasingly popular use is seen as a threat to the requirement for Black Cab drivers to be qualified with the Knowledge. This has been discussed in previous chapters. These GPS systems are added to the control panel of the vehicle and depending upon the model, they can have voice command or show maps as the route is displayed. A Black Cab control panel equipped with all these mobile devices makes the panel look like something out of an aircraft cockpit (Adams and Pew, 1990), in part because of the lack of a plan showing how these multiple mobile ICT tools can be integrated, but also due to the personal preferences of drivers.

Some of the more experienced Black Cab drivers – around 20 percent – interviewed for this research have used mobile phones since the late 80s and early 90s without much thought about their use in their everyday working practices. Thus they considered it to be an interesting gimmick but not as something that would shortly have an irrevocable effect on the way they conduct their trade. In fact the size and lack of portability of these devices was seen as a significant deterrent to their practical everyday use. Cabbies started to show an interest in using mobile phones as a tool for replacing the calls they had to make from landlines once in a while. Previously, when they needed to make a call, some time had to be spent finding a suitable place to park their vehicles and seeking a working telephone box. Using a

mobile phone solved this need in a straightforward manner. Black Cab drivers could simply stop their vehicles in any safe location and make their call(s). For these early adopters of the technology the mobile phone was a portable device, but it was always – and often still is – used statically, mainly to prevent the risk of road accidents.

However, as time passed, mobile phones were made smaller and cheaper, and their use and later that of GPS systems was generalised to all members of society, without excluding members of the London Black Cab drivers' community. As a result of this increase in usage, concerns have been raised about the use of mobile devices whilst driving. Echoing these concerns, the driving authorities imposed a ban on the use of hand-held mobile devices whilst driving some years ago, following a prevailing trend in other European countries.

It has been proven that the use of hand-held devices reduces the level of concentration of the driver of a vehicle in motion. In the case of professional drivers such as Black Cab drivers, the enforcement of this ban is very rigorous, at least in theory: a driver found using his mobile phone by the Transport or Metropolitan Police can lose their most valuable work asset (besides their vehicle): their green badge, besides being penalised with points on their driving license. However, this law enforcement is not as rigorous in practice and drivers can still be seen using handset devices to make calls. The debate about whether more rigorous procedures are needed to enforce this law remains open.

Two-way radio circuits have historically been one of the first means for co-ordinating the allocation and distribution of work. All two-way radio circuits had a control centre or dispatch centre responsible for handling the calls from prospective passengers. However, two-way radio systems implemented in the early 90s and earlier presented serious problems of coordination between the control centre and the drivers. The most common mistake was that the control centre would accept a telephone booking, and then a broadcast call to all the taxis in the area where the passenger was waiting would be made. Many drivers chose to answer the call at once, creating mixed channels of communication; it was also necessary to repeat instructions or addresses to the driver many times, who in some cases had to make notes on paper whilst driving.

In ergonomic terms an extra device was added to the vehicle control panel. Drivers used the two-way radio systems with loudspeakers so it would not affect their control over the vehicle, but drivers still had to adjust controls manually in order to switch between the normal radio and the two-way radio. In the early 90s, mobile phone sellers started providing car kits to allow the mobile recharge of phone batteries; this kit contains a special plastic or metal support. Such aids are very popular with drivers. The adoption of this device has been controversial as this car kit is an extra item added to the control panel in the car that needs to be kept in sight whilst driving. It has become socially acceptable to use mobile phones when driving only if there is some sensible safety policy in place.

Two-way radio circuits have in some cases replaced centralised coordination with micro-coordination using mobile phones, which is especially popular in small cab companies due to the cheaper running costs as well as better reception. In their everyday working practices, Black Cab drivers have to overcome lack of trust in the control centre or other drivers' willingness to take jobs. On some occasions, when a radio broadcast is made, some drivers will broadcast their physical location as closer to the passenger than was actually the case, in order to get the job. Dispatchers had a full overview of all the jobs entering the pipeline at the control centre, and had the opportunity to choose their preferred driver if they wished to do so.

The use of computer cab systems surged in the mid-90s, presenting a possible means for reducing the problems of coordination created by two-way radio systems when broadcasting work to a number of drivers. The software features and hardware stability of these systems has since advanced considerably. From an ergonomic point of view, another tool was added to the control panel in the car. Drivers use them at their discretion, largely at the beginning and end of a journey, or when stationary, with quick glances at the screen.

In figure 5.1 we have illustrated the traditional setup of Black Cab work against the other two systems currently in use. One is the computer cab system developed in-house, used by some of the radio circuits, the other the GPS location-based services that worked for a while in London and aimed to provide on demand services by requesting hails over the mobile network.

Traditional Black Cab without mobile ICT (computer or phone support). The panel shown is the factory delivery drivers get when buying a new Black Cab.

Setup for dispatcher based system by the addition of a mobile ICT that works as communication device, computer booking system and GPS information system

Setup with automatic matching of customer and cab with a private mobile phone, one for work use, and a mobile billing system connected to a GPS network

Figure 5.1: Three Examples of Variations in the Installed mICT in Hackney Cabs (Source: Elaluf-Calderwood and Sørensen, 2008)

5.4 Awareness and Collaborative Aspects in Black Cab Work

Traditional Black Cab work relies on visual awareness, limited by the range provided by the driver's eyes. This type of awareness could be described as a basic type of spatial awareness. The sharing of the physical space is a negotiating framework leading to combinations of other awareness types. Take for example this description taken for one Remote Real-Time Recording (RRTR) recording:

> "Cabbie is driving along, and looking to the GPS system once in a while, at the same time he is talking on the phone about other things other than business – first of all to a friend regarding brake pads on the car being worn down because of the turbo, then to a colleague/friend/another cabbie regarding avoiding Canary Wharf due to congestion and roads been closed. He chats about mobile phones: he has two mobile phones – one with 3 network, one with T-Mobile which has 3000 free minutes, and then a land line, so he never runs out of talk time. He ends that call and he is seen making another call. He starts talking to his wife on the phone. At all times he keeps searching visually for passengers. Finally, he gets a passenger to be taken to Sloane Square. While he drives, he is seen cursing other drivers on the way. Finally finds number 3 Sloane Square and drops his passenger."
>
> IMG_0001.AVI-14112005 (Appendix I)

There are several types of awareness displayed in the description above. In the first instance there is the spatial awareness of visually scanning the roads surrounding the vehicle for new passengers; this spatial awareness is dynamic and changes over time as the vehicle moves on. In the second instance there is a virtual spatial awareness provided by the GPS system, which provides the "potentiality" for obtaining work. In the third instance there is a physical referential awareness acquired by talking to fellow cabbies, obtaining or providing information about places to go or not to go – a micro-coordination of some sort – that is again dynamic: take the example presented in the prologue of this dissertation, conditions at that moment in time in Canary Wharf are subject to change as the day goes on. In the fourth instance there is passive awareness emerging once the cabbie gets a passenger in: to get along with the job, the cabbie needs to take a privileged position in the traffic – hence the cursing or swearing described – in order to complete the job.

The cabbie has developed some rules of negotiation to mediate between the communication levels presented in this work. These rules help him to deal with the spatial and temporal context. The sharing of the physical space is a negotiation framework in which temporal complexity is mixed with renegotiations of priorities in time and space. Intuitively those rules of negotiation seem to be embedded in the working practices the cabbies follow. However a closer looks shows a more complex picture. Awareness of this type of mobile work does not seem to be of one single type but of many different types, depending upon what is happening at work. Nevertheless, when a driver was asked about how the use of the Knowledge influenced the situation, the answer given was: "where I decided to drive, I know it is a good place to be during the day, actually when I took the passenger, because I knew where I was, I elaborated a mental route on how I could get to Sloane Square in no time, that will be good in money for me" (Driver LM).

Black Cab drivers' work in this contextual setting has an intrinsic relationship with idiosyncrasy. The Black Cab driver experience, either obtained (The Knowledge) or accumulated through work (work experience) is a pool of resources to handle situations at work that require improvisation. Idiosyncrasy as well as improvisation and knowledge are useful tools when the choice between planned acts and situation acts is complex, determining in most cases the choice of work. There are two main

situations for acting when seeking work, and according to the work by Suchman (1987) these are planned and situational acts.

Planning implies a degree of detail in the preparation for an intended act: for example, choices for start and end of shift, choice of days of work, or primary zone of work. Situational acts are more a resource of action, in which the locations and opportunity determine the action. Idiosyncratic work allows the worker to carry out tasks in an ad-hoc, unstructured fashion, using their own spatial awareness to organise and give order to apparently random tasks. Organised work requires some collaboration between distributed workers, possibly co-ordinated or controlled by a central authority.

The case for collaborative mobile work is based on increasing all these types of spatial awareness. At certain times of the day or in certain places around the city changes in the sources and amount or work available can occur. A common situation cabbies encounter is the lack of work available on the streets due to temporal decreases in demand for their services. Drivers' experience of the city, added to the Knowledge, can help them decide where to be at such times and increase their changes for getting work.

For the less experienced driver, such situations demonstrate a low level of awareness about where work can be found, which can be enhanced by supporting mobile work with mICTs. The use of mICTs as a source for obtaining work increases awareness by giving drivers a spatial and virtual contextual setting to refer to when seeking new work or task allocations. This is achieved either because they find out how many other drivers might be in the area where they are, in which case they organise their work by being assigned a virtual rank number, or else by reducing the need for visual searches on the road by resorting to micro-coordination in which jobs are sought and taken by moving the driver physically closer to the client.

For cabbies, this way of working is a relatively new working practice, where collaborative work can be seen as being affected by issues that are derived from the handling of the work distribution and the use of mICTs. There is also the *problem of interaction that arises from recognize* [recognizing] *the action of other* [cabbies] *as the expression of their underlying* [work] *plans* (Suchman, 1987). Hence the

following section will deal with what is described as planned and unplanned work in Black Cab work.

5.5 Planned and Unplanned Cycles and Rhythms in Black Cab Work

There is a natural need for individuals to have a temporal regularity, built up around the environment they live and work in, which helps develop some sense of orderliness. In previous sections, it has been explained that many events might occur as the cab driver moves around the city during his/her shift. Those work dynamics are diverse and idiosyncratic for an observer, but what is certain when observing this type of work is that cabbies develop spatial and time routines of some type for their work.

These work routines present a social paradigm and are even ironically contradictory for the researcher. When interviewed the majority of cabbies expressed their dislike for "office work routine" or "8 to 5 o'clock work". Overall they expressed dissatisfaction with the idea of getting entrapped with routines. When interpreting these views an *observer takes some sequence of actions as evidence, and then forms hypotheses about the plans that could motivate and explain those actions* (Suchman, 1987). The planned act for these drivers is not to have a regular specific routine, but to allow a significant margin for improvisation in their daily routines. However as time and working practices become sedimented, all drivers seem to fall into some kind of routine that can be limited to time, but can also be spatial (certain places, at certain times).

Thus, cabbies assemble a loose set of plans about where they will drive to carry out their job. These plans are exposed to particular levels of uncertainty, in terms of places and times for the work to be completed. Uncertainty can be understood in two ways. The original meaning is lack of information about work available in the streets, as there are no assurances that the planned route(s) will provide the needed work. A second meaning is an overload of information due to systems interaction. In this case the cabbie has choices: visual recognition of the streets, mICTs, the Knowledge, and dealing with all those sources of information at all times when seeking work.

Furthermore, plans are affected by the unplanned; this seamless change leaves the mobile worker reliant upon the habits or routines that are self-created and that accommodate his own personal circumstances and the need to find a balance and rhythm in the work that is done in such a temporal context. This fragile balance is challenged by uncertainty and equivocality (DeSanctis and Monge, 1999). Equivocality, understood as ambiguity, can also be seen in the existence of multiple and conflicting interpretations about an organisational situation, even if predominantly self-referential for a single orientated task job. We can also ask ourselves if the contextual and relative environments in which mobile work occurs have a different type of time that is based on the technology itself.

If time is considered in the elaboration of planned and unplanned acts, then what converts such plans into cycles and rhythms of work? Orr (1996) suggests that it is difficult to acquire an explicit representation of work that matches the reality. When cabbies were interviewed and asked to describe their work shifts and what constituted them, this problem is very evident. Even given the differences in starting times and break times, drivers tend to base their choice of route on obtaining passengers to hail as soon as possible after starting work. After this, the schedule and route become unpredictable. Either the computer cab system or their own expertise provides a continuous flow of work, ideally a streaming non-stop flow of passengers getting in and out of their vehicles whilst at work. The plan is converted into rhythms of worked, demarcated by unpredictable interruptions.

Drivers have diverse choices for starting and ending their shifts. Work is primarily obtained by driving around the city with a planned route that is modified either by improvisation, idiosyncratic behaviour, or experience and knowledge of the roads. Job allocation occurs by direct contact with passengers asking for a street hail. Visual contact is made with the user and dialogue to establish the destination is necessary at the start of the job. Cabbies then decide the route they will follow and put the meter to run. Depending on their need to earn money, and how busy the roads are, cabbies might decide to take one or many breaks from driving, stopping at ranks or parking their cars.

A cabbie was asked for example to refer to the idea of estimating how long it would take for another job to be assigned by the system. The reply was:

> "Only one. Yes. Umm. If you are within 15min of your destination, there is a facility on the terminal, which is call "soon to clear". Right? If you are within 15 min of your destination, you can do a soon to clear into that zone, and you join now the electronic rank, and you work your way out through the system. Now if we are very busy and all the other cabs have been knock off the top of the system, you come up top of the rank, now when you clear your job, if there is let's say in the City a rail strike, there might be 50 jobs in the city, and 5 cabs, you got this little package that you are going to deliver in 5 min, so you can deliver the package, or you set the package down, you clear the job, and bingo instantly it will send you another job (the system). So you can only do one job at the time. I couldn't have a delivery sitting here with me and a passenger going somewhere else, in the back of the cab. The only situation anything like that will occur is if the passenger is going in a certain direction and "could you take this delivery onto". Right? Aha, but it will not be two separate jobs. It will be me going somewhere and taking this package somewhere else, (the passenger) please this is my contract "take this onto. Then it will do a delivery and a passenger." (AL)

These cycles of work can be seasonal or on a daily basis, and here there is a difference to the rhythms of work, which can change depending upon the activities in which the cabbies are engaged, as well as his physical and virtual location. As in the example, Black Cab drivers might be driving a passenger to a destination and receive or make calls to their friends or family, engage in some kind of conversation, put their mICT in the "soon to clear" mode, and hence be allocated to the mICT virtual queue for a new job, and communicate by SMS text messaging on the way.

Table 5.2 presents data collected from the two types of companies researched in this dissertation, and explained in Chapter 3, a list of self-organising structures, which are identified from the functionality embedded to Black Cab drivers work. Mobile work that is spatially aware, task based, planned or unplanned, cyclical and rhythmical. Black Cab

For each self-organising structure, the description stresses the skills, tools, and actions required to perform the work. The characteristics in the table refer to the perceptions drivers have on relation to the work they are performing. Learning to use or configure a computer system for the first time is in this type of work a process of trial and error. Drivers perceive a limitation in the optimum use of the system when it is not their primary activity to read or input data, and acknowledge the fact that practice and expertise enhances their chances to do a better job.

One major concern for drivers is who and how a computer system is managed, how the allocation of work happens, the criteria used to establish that allocation, and the feasibility of performing the given tasks. In the case of Company A, their computer system is reviewed and upgraded over time to include new working practices in the

system, changes, and any modifications to current work actions. This concern of management is also evident in the processes built for protection and fairness of the system.

Black Cab drivers are strongly motivated to increase their efficiency, achieved by optimisation of resources. This efficiency is understood as increasing their revenue, daily, monthly or perhaps seasonal. The better they understand such cycles, the more opportunities to improve their money returns there are open to them. The same can be said of how the evaluation is performed: knowledge of how to extract the maximum benefit from the system in order to increase profits is the driver of the controls and evaluations.

The last two categories in the table indicate the importance of the drivers awareness and contextual localisation at each stage of their work, when the mICT fails, or the data received in the cab is not reliable as contradicts what the driver can see around, the choices of work are taken based on criteria which have a externality to the use of the mICT. In summary, the table below relies on understanding situadeness and temporality for Black Cab workers or what Orr (1996) has called *the fragility of understanding and the fragility of controlling* their work.

Further analysis of these relationships is enhanced through the use of referential variables to temporality and situadeness for work and this discussion is presented in the following section.

Self Organising Structure	Description	Characteristics
Learning/Configuration: how easy to learn to use the system	Fully able to work on multiple platforms using mICTs. It might be error prone especially when required to perform dynamically.	It is self-adjustable, with dynamic integration and fast error correction.
Management: who and how system is managed	Able to distribute work when required. Distribution of work; one worker cannot do all the work tasks allocated.	Roles and tasks are continuously monitored to keep contextual and locational awareness.
Optimisation: general goals for using the system	Able to juggle between passive knowledge and active knowledge/awareness.	Mobile worker seeks opportunities to improve their own performance and efficiency
Evaluation: improvements that can be achieved by use	Problem determination / location times and places where work is plentiful and for how long.	Self-learning experience and increase of expertise
Protection: drivers assurances for a fair system	Competition / self-regulation / security	Contextual awareness through intensive communication
Awareness	Cannot rely from info only from information received from mICT	Proactive participation
Contextual Localisation	Dynamic processes using aided mICTs or manual input	Affected by accessibility (from a control centre), better with awareness

Figure 5.2: Self-organising Structures and Functionality in Black Cab work

5.6 Temporality and Situadeness in Black Cab Work

Relying on self-referentiality for describing Black Cab work risks overlooking the external reference to what actually constitutes this work. Trying to mediate or create a bridge linking the description of work to actual task in mobile work could help further to explain the idea. Attempting to describe work using solely those categories can exclude the situadeness of Black Cab work. Those concepts can be extended by examining the categories described by Lee and Liebenau (2000), making them

applicable to the working practices, supported by mICT, that Black Cab drivers actually do. Figure 5.3 below is the result of these applications. The parameters described in the table were encountered in qualitative format in the data collected.

Work variable	**Description**	**Black Cab driver working practices**
Work allocation / duration	Time dedicated to activity: is it solely dedicated to task.	By work allocated by mobile ICT network By workers choice or opportunity By external factors (home, other social networks)
Scheduling	Where does activity/task take place	By work allocate by mobile ICT network By workers choice or opportunity By external factors
Sequence	Order in which work tasks take place	Sequential Non sequential Parallel
Deadline	Temporal starting and ending point of work	Yes No Depends on task
Punctuality	Degree of rigidity to deadlines	As above
Pace	Rate activities are accomplished	External factors (traffic, passenger request) Workers pace (max number of jobs planned on a day)
Temporal buffers	Events that generate uncertainty	External factors (traffic, mobile ICT network down) Internal factors (Black Cab breakdown, sickness)
Cyclical	Regular recurrence of events at work	Yes No
Rhythm	Levels of intensity in being busy	Constant Periodical (day, week, etc) High Low
Time boundaries	Differences in the meanings of time	Yes No

Figure 5.3: Applying Dimensions of Temporality to Black Cab Work

In table 5.3 the work performed by Black Cab drivers is given a subjective interpretation by an external observer, which is the unit of analysis in the table. The question of how the mICT mediates in their work is seen as one in which, once the mICT is installed in the vehicle, mICT provides a way of keeping in touch with the temporal context of the events outside the cab.

The use of mICTs can be a source of interruptions or changes to their primary activity of driving or planned work. Cabbies are concerned about these changes, as it is necessary for them to establish some balance and control in dealing with them, in other words to attempt to embed them into their routines. Complexity increases as cabbies grow to rely heavily on such mobile devices for work, rules or policies enacted to govern their working practices aiming at such embeddedness.

Cabbies give many reasons that guide their actions and choices of work. The most important ones are cost based: saving petrol, maximising number of hails, and earning extra money. Great value is given to making the right choices at the right time. The location and time of the driver are very important when about to make a choice. Thus, there is a rediscovery of planned situadeness in Black Cab work linked to these types of improvisation at work. In some ways this *management of the unexpected* in relation to temporality can be summarised in the phrase "I do as it comes" expressed by cabbies during interviews.

Situadeness for unplanned work can be explained by the idea of spontaneous assignments in which all working conditions change at once or when spontaneous assignments occur in which work conditions change parallel to the task being run. This can be expressed by the phrase *improvising acts or choices of work* in Black Cab work. Improvisation in the world of the cabbies consists of procedures, methods and systems that are there “ready for hail” to be taken or grabbed sometime, somewhere. Ciborra (2006) presented the idea of improvisation as one that opposes the slow, judicious decision of a planned act, and that retains qualities of suddenness and extemporaneousness. Because the event is of short notice there is extemporaneousness in the actions taken by the driver. This idea is expressed by the multitasking nature of Black Cab drivers’ work (driving, using mICTs etc).

There are two states in which a Black Cab driver can obtain work: it can be

stationary, because he or she is on a break or the vehicle is parked in a taxi rank, or it can be in motion because the driver is looking for work. In both cases, changes to this status are mostly unplanned, and change occurs because of contextual and/or temporal situations arising.

In the following section the role of mICTs in integrating such idiosyncratic work practices for Black Cab work will be analysed from an organisational point of view in which the integration of the use of the mICT becomes relevant to understanding the shift in working practices already happening to this type of mobile work.

5.7 The Role of mICTs in Creating Dynamic and Temporal Organisations in Mobile Settings

Until now, the analysis has focused on the Black Cab driver as an individual unit that seeks, distributes, and self-references his/her work. The use of mICT has enhanced the driver's awareness of where to get work, but has also raised organisational issues about how those mICTs will be managed, maintained and how work allocated is organised.

For cabbies, it is the case that their work had a low level of interdependency prior to the intervention of mICTs, hence the need to have a formal organisational structure has been a voluntary choice urged by the need to increase opportunities for obtaining work. Even more, these mobile workers could be seen as a self-organising system that is not regulated by others – especially in its everyday routines – but that is highly adaptable in its behaviour and able to negotiate memberships, based on contextual settings.

This type of organisation cannot be expected to be less of a challenge to more conventional management approaches. Work in which knowledge is important for achieving success is already considered complex. Mobile work also presents challenges to such approaches. It is difficult to realise the aims of monitoring performance, providing access to IT tools, and offering guides to good practice. Al-Taitoon (2005) found that the use of mICTs leads to a compromise in working practices, which are loosely associated to allow discretion in choice for mobile workers. This discretion is based on a social paradigm in which the knowledge

worker is able to make choices of which work to take and which work not to take. Scenarios might occur in which this balance leans towards the technology instead of the mobile worker.

A good communication arrangement between workers that does not strain the organisation structure, strategic alignment and vulnerability assessment and contributes to enhancing trust is seen as valuable. The implementation, maintenance and enhancement of mICT systems can demand a share of economic resources that was not required pre-mICT intervention. Joining efforts seems to make sense. Furthermore, even the lowest level of mICT support defines the creation of temporal and dynamic organisations that cannot be managed using conventional management wisdom, and it is still an open question how these agile organisations will develop and how flexible their working structure can be in order to fulfil the requirements of their members.

These organisations are dynamic and flexible, and contextually related to a nominal membership or virtual list of available members. If these organisations also have other temporal characteristics such as flexible criteria for joining, membership might keep pace with continuous change. This change can be contextual, locational and/or cyclical. Most conventional organisations experience episodic attempts at organisational change that show that they are unable to keep up with change, sensemaking of time and evolution in structure.

This change in working practices can be split into two parallel layers: in one layer, some organisations look at the macro level as repetitive, embedded in routine and inertia with occasional episodes of revolutionary change. In the other layer, some organisations encourage more detailed ongoing adaptation and adjustment. The organisations that survive the change over time are the ones in which planned change and planning is a response to a rapidly changing future, promoting sensemaking of the difference in experiences between the macro and micro levels of relationships in the organisation and its members.

In summary, Figure 5.4 presents the main differences between conventional or static organisations and dynamic/agile temporal organisations that are more commonly seen through intense technology mediation (virtual offices, mICTs, etc). The

comparison between the two types of organizations relies on the categories taken from Suchman work applied to the particular context of Black Cab work: planned acts, awareness, situated plan, strategic plan, technology role, additions to those categories are the chance to succeed and the emergent practices product of the mICT intervention.

	Static/ Conventional Organisations	**Temporal Organisations**
Planned Acts	Method driven, working practices are procedural and flexibility is monitored	Insight driven, working practices are flexible and changed according with needs
Awareness	Focus on solving immediate problems, resources are planned and distributed accordingly to medium and long term plans	Focus on problem-solving with given access to unconditioned time or temporal resources
Situated plan	Tends to elaborate rational plans. There is low tolerance for ambiguity	Tends to embrace uncertainty and high tolerance for ambiguity
Strategic plan	Knowing about the future	Improvising the future
Technology role	Knowing about (content based)	Active dynamic orientated knowledge
Change to succeed	Deliberate, wilful compulsive action	Spontaneous, effortless, dynamic orientated
Emergent practices	Reliance on sense making	Reliance on presence

Figure 5.4: Organisational Structure vs. Choice of Work (Extended Concept Based on Purser and Petranker, 2005)

Intuitively it could be inferred that highly mobile workers with a low degree of interdependency might prefer to belong to or join temporal organisations such as the ones described in the table above on a need on demand basis. In the case of Black Cab drivers that need on demand is driven by the need to increase the number of paid journeys travelled or fares received, hence achieving more revenue. Interdependencies do not 'emerge' without the active, socially conscious agents who construct the relationships through their actions (Karsten, 2003). There are clear advantages for this type of mobile worker to enhance the opportunities for obtaining work through organisational spontaneity and new emergent interdependencies created by the technology. One of these advantages is the access to the information

provided by these organisations. Mobile workers engaging in the use of mICTs learn to balance the working practices used with the new ones emerging from their use.

However, there are issues when trying to understand the control of this fragile balance, for example achieving control by communal sharing of resources. This might include, for example, replacing control centres with advanced technology such as intelligent GPS allocating work by closest distance to passenger using Mobile ICT or just establishing working practices that enable that sharing to happen. The term *sharing the tools*, or the information that is contextual to that particular type of work, is embodied in the idea of the virtual queue that is available in some of the computer cab systems. A virtual queue emulates inside the computer booking system a list of cabs available to be allocated work. The order in the list is based on a timestamp assigned at the time the Black Cab driver log in the system and defaults the status of his vehicle to ready to accept a new job.

Organisations in which reconstruction of structures, reconfiguration of working methods and versatility in their response to customers needs are the norms have helped cabbies find support for their working practices, as well as embedding – at different working levels – the use of mICTs. In the following section we will discuss, based on Company A and Company B described in this chapter, the two types of agile organisations primarily supporting Black Cab work.

The development of these organisations has not been without problems: they mirror the idiosyncratic self-organising structure mobile workers using mICTs have for working functionality. Highly mobile workers will stay associated with a temporal organisation for as long as it can offer work, for which its organizational characteristics make it the most suitable organizational form to work. This situation differs greatly from the case of freelancers, police officers, and stock exchange workers, who have longer-term goals and perceive association or membership of any agile organisation as a more stable and two-way compromising situation. Workers primarily try to cope with their working practices by aiming for efficacy in their work.

5.7.1 Centralised Agile Organisations

From the data collected using the RRTR methodology, the working practices with a centralised organisation have special characteristics that are illustrated by the paragraph below sourced from a RRTR recording on a daytime shift:

> "Driver is on vehicle in motion, that seems to be moving very slowly, driver seems to be extremely bored, starts making phone calls, not one, but three times until he gets an answer and starts talking to another driver, the driver observed talks about his location, and contextual situation (lots of traffic, moving slowly, not a very good day, few passengers (punters). But not only that the conversation is mixed with comments about family, things they do at home, health of the children, parties, or life. As the conversation develops driver repeats locations (places) that his interlocutor seems to be telling him to go to. At some point in the video the driver agrees to a meeting with the other driver and on a set of lights changes direction and tells a time he will be meeting the other driver"

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It can be deduced that the cabbie recorded was successful in obtaining work. On some working days this is an occasional happening, a case of the situational act overlapping the planned schedule and the strategic plans the driver started his working day with. It also displays a good example of a driver's awareness of how to select which choice to follow. In parallel, the driver seems to allocate time to communicate socially (family, friends), in no particular behaviour pattern, embedding such communication into their working routine and cycle. Moreover, the drivers do not seem *to make a distinction as such between social time and work time.*

The GPS here is used as a way to reduce the virtual queues. Access to job allocation is instantaneous. Work is allocated to the driver closest to the passenger. The phone ringing indicates a new job waiting to be taken. Choices are made both by the traditional method of looking for street hails and the opportunities brought about by the GPS system. Black Cab

The first case study is Company A. This company has been working in the Black Cab market for thirty years or more. It has a well-established reputation with its users and the general public. In its legal formation, Company A works with a shareholder/co-operative model of ownership. All licensed Black Cab driver members of the company are entitled to a share of the company and voting rights at Company A's Annual General Meeting. Membership is available by invitation only, but any licensed Black Cab driver can apply for a "presentation" to a Company A committee, which evaluates the driver's professional behaviour and reputation. If the

three members of this committee agree about the applicant's qualities, then an invitation to join the company is issued. Currently, there is a waiting list of two years for "presentations". The reason for this long list is that the company has a policy of only taking new drivers if the company management feels the company resources can provide enough work for all current members as well as cope with the IT systems demands.

Company A's business strategy is to provide an "A" class service to the service industry around the City of London (banks, FTSE 100 companies, etc), West End Theatre Land, and well-off London areas such as Kensington and Chelsea, Mayfair, and Soho. The "A" class parameter is understood as a top quality service in terms of reliability, punctuality, clean service, etc. It is in the interest of current members that new members embed their working practices in their code of conduct, which distinguishes them from other companies providing the same services. In fact Company A considers the minicab business a serious competitor to some of their market segment. All Company A members are required to work a minimum of 30 "jobs or runs" a month. There are no timetables to enforce in everyday work. Currently there are two thousand or so driver members of this company from a total in London of around 30,000, as per the PCO website (2006). Company A has found that the demand for work exceeds their current capacity at peak times such as Christmas, yet there are seasonal low periods of demand. Despite this, the rate of business never drops below 6,000 jobs per month.

The computer booking system has two main channels for inputting information: one is for entering available work that is submitted either when customers contact the call centre or when bookings are made online, and the other channel is for the drivers to input their availability for taking jobs. Job allocation is automatically completed by the systems, whilst there is a manual option that is only used for special accounts or circumstances. A limited mapping functionality and backup radio communication are also present. Drivers call this mapping GPS, but it is actually a static set of maps used to help drivers refresh their Knowledge when unsure about a street location. Recent software developments have added a safety button, which can help locate the vehicle by GPS in case of an emergency.

New Black Cab drivers joining Company A pass through a period of training in the

use of the system, first in the office, then on the job. All new drivers get as much *refreshment training* as they need. The call centre offers radio support if needed. Most drivers have stated that on average it took them between three to fifteen days to get used to the booking system.

A customised computer is installed in the vehicles by a special workshop. This computer has a touch screen as seen in Figure 5.5. The installation of the mICT takes a whole day. This time is known in the trade as *downtime,* and is used to train the drivers in the use of the system. If a software or hardware failure occurs, the units are replaced. Software upgrades can be performed over the network and are scheduled at off-peak business times. Drivers are reluctant to take downtime, hence the importance of minimising those times. Upgrades are carefully planned and completed in stages.

Figure 5.5: Current Black Cab Cabin with Company A Computer Booking System

The photograph for Figure 5.5 was taken in a North London repair workshop where the computer cab systems are installed in the vehicles. Beside the driver's seat is the mobile recharging car kit. The mobile kit was already in place before the installation of the new system. It is not uncommon for a driver to have more than one mobile phone, hence using two chargers in the control panel (not visible). The computer screen is a touch screen that provides simple and clear commands for usage.

The computer booking system keeps a record of transactions completed while the system is on. It is used to provide detailed accounts to the company, customers and Her Majesty's Revenue and Customs. It has a touch screen facility and the screen

automatically goes black after two minutes if not in use to reduce drivers' distractions. Its design is still under development and there is still plenty of room for improvement in the HCI interface.

The driver indicates his/her availability for work by manually inputting the vehicle location. In the Company A computer system, London is divided into zones by postcode, and does not use GPS for vehicle location. The reason behind this functionality is not a lack of technical capability but a decision to give room to choice based on drivers experience: a driver can input a code zone before he/she reaches the area, whereupon he/she is assigned a number in the virtual queue in the system, and makes an estimate, based on his/her "Knowledge", of how much time it will take to drive into the zone. Whilst this is happening, their number in the virtual rank reduces as jobs get allocated. By the time the driver reaches the zone, they will have first place in the rank and will be able to take a job. One of the most important features of the computer system is that drivers can see their rank number and how many other drivers are in the queue, with the assurance that there is no preference in the selection of drivers. This feature reduces competition between drivers for job allocation. They are all served on a first-on-arrival queue order.

Once a job appears on a driver's screen there are three options: acceptance of the job, rejection of the job – and in that case the driver is put at the bottom of the virtual queue – and if the driver is on a job and close to finishing it – the computer allows an estimate of five minutes for full availability – -there is the third option of temporary acceptance of the job. To give fair and equal chances, the details of the job only appear once it is accepted. These details are point of collection, intermediate points of stop, final destination, and special services.

Company A is able to provide several Black Cabs to account customers on demand simultaneously. In periods such as railway maintenance (usually at weekends), a railway company can request a number for Black Cabs on the station(s) in which the railway work is being undertaken, aiming to provide a transport service for train passengers to their final destinations. Depending on where this work is, Black Cabs might be assigned to the work, aided in their bookings by the computer system – the system has a limited range within the London Metropolitan Area plus some extra areas – or be managed by a controller or marshal using mobile phones in situ.

Drivers need a controller, a communications liaison, who provides information about how many trains are still to arrive, passengers, destination, etc. The controller is able to set up a temporary organisation, which provides basic planning to serve as many of these "*specials"* – jobs as possible.

Most drivers tend to use the control (call) centre as an aid (support) for their planned or unplanned work. The call centre staff includes licensed Black Cab drivers that have chosen to have a desk job, candidates preparing for the Knowledge examination, and auxiliary staff. There is always at least one person in the call centre that has the Knowledge and can provide specialised help or support if necessary to the drivers. It is not uncommon – since the Knowledge requires constant practice – that drivers forget a street or a route if they are not working in that area all the time, thus they might call other drivers using their mICTs or the call centre to ask for help in finding a street or for directions getting there. The company and the drivers are eager to continue improving their current services and trials are undertaken to enable new services through the features on newer mICTs.

5.7.2 Loosely Agile Organisations

The second case study was Company B. This company was a relative newcomer to the Black Cab service market – around two years old at the time this research started in 2004 – and had an innovative approach to booking taxis compared to the other radio circuits in London. The company was privately owned by a group of venture capitalists, and there was a significant investment in GPS state of the art technology in the company. Their business model was based on giving customers the opportunity to book taxis using mobile phones and talk directly to the driver, eliminating the call centre. The main idea behind this business model was to give customers the assurance that a cab would be found quickly. The mICT installed in the Black Cab has a GPS system connected to it. Each time a customer calls from a mobile phone, the approximate position of the customer is supplied by the mobile operator and input into the Company B GPS system. This system keeps a dynamic record of all Black Cabs in the area, and using a special distance algorithm established which cab was closest to the passenger, redirected the customer call to the cabbie, who spoke to the customer, and obtained the details for the collection point, delivery point, etc.

Membership of Company B was a subscription-based model. A driver could join the service by paying the installation costs for the cab GPS equipment and paying a monthly fee for using the service. The monthly fee did not entitle them to free calls but a special flat reduced fee was provided to members. During the Company B adoption campaign to increase driver membership, the installation and monthly fee were set below the real operational costs. At its peak the service had around 800 Black Cab vehicles serving the company, although this number was below their expected forecast of the 2000 drivers needed to provide a good service. Due to the shortage of drivers, Company B experienced a decrease in the quality of its services, with many calls left unanswered or cancelled. In 2006 the company was purchased by a major electronic booking operator that consolidated the company's GPS state-of-the-art technology into their operations and the service described has been included as one of the operational forms to book a cab but using a call centre. There are also plans to try the business model in suburban areas where cabs are very difficult to find, perhaps as a more sophisticated minicab service.

Drivers could choose to reject a call if they were assigned a job by the system but the minimum number of jobs they needed to complete in a week in order to keep their membership valid was set at 10. Some basic training in the use of the credit card system was provided, but the driver was left to work his planned routine as he wished. There were limited cases for coordinated work as the company did not focus on the account market, but was in direct competition with drivers not associated with radio circuits. The service was a success at nights and weekends in Central London, when the demand for cabs exceeds the supply.

However, there were operational issues that made the system vulnerable to internal and external competition. Drivers will for example arrive to the location and find out that the passenger had taken another cab that arrived first. Drivers from the same company and in the same area will not respect the booking order and take the passenger on arrival. There were no assurances the passenger will be in the location described, and the cabbie took sometimes the wrong passenger, someone that wanted the cab but went to a different final location.

During slack periods in cabbies' work, there is a drive to search for work by whatever means is available. The mICT is then used as a tool to tap into the wider

networks that are not accessible to a driver if not linked to the world, especially with drivers who make little use of mICT. When drivers who recalled times before the use of mICTs were asked to compare the two types of work, most drivers accepted that mICTs are an important aid to finding work.

Cabbies pointed out that there are also seasonal cycles the availability of work; for example during Christmas, there is an abundance of work, and computer cab companies struggle to get enough drivers committed to take their work as they are in high demand on the streets; these are balanced by low seasons for revenue such as January to February and August, times when customers either reduce their use of taxis after the festive season or they go on holiday with the family. In those times, mICTs are very welcomed by drivers, as they produce a source of income that would require a lot of effort to obtain if just relying on work that can be found on the street. Even experienced drivers can struggle.

Black Cab Company A relies on a computer booking cab system, where the system's functionality and processes determine the dynamics of work. The system provides support to drivers in case of danger; they can also help locate a passenger, manage accounts, keeps records for the Inland Revenue, take and process payments. These types of aids to Black Cab work originated in the creation of semi-formalised organisations of associated drivers, legally constituted, which are enormously valued by the drivers.

The centralisation process of this type of organisation is represented by the role of the control centre in managing work. The control centre monitors all the activities listed above but is also the physical point of reference for these mobile workers. It is also a centre for socialisation and a way of keeping a wider visibility of what is going on in the Black Cab market without compromising individuality and freedom.

5.7.3 Summary of Centralised vs. Loosely Agile Organisations

Cabbies are very reluctant to compromise their revenue to comply with a certain organisational set of rules, even if they are in a shareholder or "citizen" position to express and vote for internal change. During the field work the researcher encountered drivers that swap between cab circuits every two years in a constant search for the circuit that can offer the best source of work. One driver for example

mentioned the case of one circuit he used to work which was closely linked to the night works that London Underground carries out; the company had special contracts to transport staff at 4am in the morning from LU stations to their homes. This driver saw this type of work as a steady source of income that he relied upon; when the contract went to another company he left the circuit and moved on.

Company B is the type of organisation where membership is based on rules. The use of the GPS system is neither manned nor centralised; work that is requested gets immediately distributed to the drivers. The GPS computer system potentially knows – with relative accuracy – the cabby's position, but this information is not used for keeping a regular control of what work is being done. Company B's model is such that their revenue is in part created by the charge they request from cabbies for using their services, and their requirements to work for a minimum number of jobs per month. Drivers are free to enter and leave the system as they wish. However if they choose not to take any jobs from the system they are not penalised.

It is generally easier to leave Company B's circuit if dissatisfied. Even if the control of the company is quite centralised, membership is evenly distributed. The drivers in circuit B make an exchange in keeping freedom in their daily working practices, but giving up control in the direction and management of the overall company. This is not the case in Company A, where taking the computer system off the cab takes a longer time, and there is more participation in the everyday decisions of what happens to the company.

Company A might function as a loosely agile organisation on certain occasions. One of these occasions is when there is "marshalling work". The control centre for Company A will broadcast a message to all cabbies online in Company A, requesting volunteers for a specific job, like collecting passengers during the weekend from stations where the railway is closed because infrastructure maintenance work is planned.

In some cases the train operator companies have negotiated with Company A a flat fare to be paid for each passenger transferred by cab between two stations; what is important for Company A is to find enough cab drivers who will be on time in the place where they are requested, and that the flat fare covers the drivers' costs against

their *normal* working time fare. If they meet these two conditions, the time of the service provided is predetermined: it can be hours, a day or a weekend, with the membership managed locally by a marshal and not by the central computer system. This marshal will be a cabbie with experience, and he/she will proceed to distribute the work using mobile phone, pen and paper.

The point made here is that this type of collaborative work produces an agile organisation with a specific aim, but once the aim is completed, the drivers go back to their *normal routines*. They continue using the computer cab system, and the work completed by marshalling is considered as another way to earn extra money.

Some cabbies that just joined Company A mentioned that they have worked for other radio circuits in an informal way. Some cabbies will join a radio circuit for short periods of time – knowing that the circuit has a special project on hand, like night work for LU – that assigns work primarily using mobile phones for communication, working in a way that resembles a mini-cab company, and continue their association with the radio circuit while there is enough work, subsequently working as a freelancer until another report – from friends or another cabbie in the social network – might announce that another circuit is short of drivers. Drivers that do not feel committed to a single company tend to prefer this type of work.

Figure 5.6, presented below, summarises the topics discussed in this chapter. It gives a general overview of the types of services provided by Black Cab drivers, distinguished by the type of mICT support used. All those services have common characteristics including working shifts, type of control centre, minimum number of rides needed to keep membership in the company, type of computer login and/or availability of the system, resting periods, virtual queuing, types of job allocation, reasons for rejecting a job, potential to execute parallel tasks, types of communication channels, GPS or mapping facilities, GPS monitoring and tracking, and text query facilities. By examining how these characteristics are manifested in the company, a complex figure for this type of work can be sketched.

Some of the categories feature more prominently in one of two types of services, others are independent of the type of service, and some are unique and specific to a type of service. The role of mICT can be customised through the working practices

chosen by the driver. Overall the mICT seems to have a positive effect as far as the driver is allowed to make the final choices of what work to take and when.

In the analysis section of this dissertation (Chapter 6), the results of this table will be discussed with respect to two categories: the individual and organisational levels.

Category	Non-supported by mICT	Computer based booking system	GPS booking System
Working shifts	Selected by driver	Selected by driver	Selected by driver
Control centre	Not available or none	Yes. Operations and job allocation are manned	No, fully automatic. There was a small technical team checking IT systems
Minimum rides	Not applicable	30 per month	10 per week/month
Logging into the system/availability on the system	Not applicable	Update by area/zone location is done by driver	Driver location is determined by GPS
Resting periods	Chosen by driver	Chosen by driver	Chosen by driver
Virtual Queuing	Not applicable	Driver is allocated a rank number that creates a virtual queue position	No queues. Each call to system determines approximate location of drivers
Job Allocation	Drivers hail street selection	Rank number based	GPS shortest distance to driver
Rejection of job accepted	Drivers hail street selection	It can be done. However driver is immediately penalised with the highest rank number in queue	It can be done. Driver is not penalised
Parallel task execution	Drivers are free to do what they want according to their own criteria	Drivers can accept a job from system if near completion of current job	Drivers can use their criteria and be transport a passenger and a parcel to two different final destinations
Communication Channels	Very limited as vehicle must be stopped to enable communication to outsiders	Mainly to control centre using two way radio or mobile phone	Directly to customer by mobile phone
Map facilities	Using the "Knowledge"	Digital map with search facilities provided	No map. Some mobile phones used by drivers had digital map libraries
GPS monitoring/tracking	Not applicable	Control centre systems have the facility but it is only used in case of dispute or emergencies	Systems track vehicle location at all times
Text query facilities	Not applicable	Drivers can contact control centre by text either from computer or mobile phone	Texting is not used

Figure 5.6: An In-depth Analysis of Working Operations in Black Cab Work

5.8 Summary of Findings

The analysis presented in this chapter leads us to query the role mICTs have in creating a shift away from a self-referential type of work that is mutually dependent and based on contextual and temporal awareness, in which mICTs not only mediate but create new working spaces for cabbies. Describing this type of work using temporality is helpful and supportive in presenting the case of the types of organisations that are supported by mICTs and which can reflect the dynamics of this type of mobile work. Figure 5.7 illustrates the differences and similarities between traditional Black Cab work and mICT support work.

Traditional Cab Work	**mICT Supported Work**
Low level of organising mutual interdependencies	Dynamic organisation of mutual interdependencies in order to pool resources for everyone's benefit
Regulated business with little competition	Regulated business with increasing competition from minicabs utilising mICT to gain competitive advantages
Drivers engage in idiosyncratic behaviour	Idiosyncratic behaviour moderated according to constraints imposed by mICT and associated organisational procedures
High degree of physical mobility exclusively informed by immediate experiences	High degree of physical mobility both informed by immediate experiences and by access to remote information
Work highly situated	Enhanced situadeness of work through continuous negotiations of situations against information about alternatives
Self-referential work with drivers deciding themselves where and when to work	Multi-referential work as mICT offers opportunities to coordinate efforts
The Knowledge is main information source	The Knowledge supported by mICT
Drivers alone when situated in context	Drivers engage in very light collaboration in context

Figure 5.7: Contrasting the Traditional Arrangement of Taxi Work with Modern Practices Utilising Mobile Phones and other mICT (Source: Elaluf-Calderwood and Sørensen, 2008)

The use of mICTs seems to cultivate an effective real-time collaborative environment for call operators and taxi drivers, which results in a considerable improvement in Black Cab services in terms of time required for reservation processing and vehicle dispatching. It also equips cab companies with comprehensive data for operations management and strategic planning. However the ergonomics of human-computer interfaces, together with the environmental factors in relation to dispatch operations must be examined in order to achieve the expected capacity of the system.

In this chapter a strong emphasis has been placed on showing the importance of self-

reference in understanding how this type of mobile work is performed and analysing the work routine of cabbies, finding the disruptions caused by the use of mICTs, then discussing the existence of factors influencing the relationship between mobile workers and the mediating role of mICTs in obtaining work. Unlike other studies of mobility at work, the study of Black Cab drivers' use of mICTs can be compared to well-defined work practices that were mobile but executed without the aid or support of mICTs.

The mediation of mICTs in cabbies' working practices shows some very interesting paradigms in the social aspects of mobile work. First, the mobile user mediates his/her use of the mobile ICT based on their perception of its efficacy or success in supporting or aiding their work. Second, there is the social paradigm inter-relating the mICTs' aid during working time with the cabbies' off-work time. This paradigm is evident where both working and off-work times co-exist in parallel, integrated in the cycles or rhythm of the planned or situated mobile work.

This complexity gives an insight into how location-based work can integrate with time-based work through diverse factors. Working practices that existed before mICTs have been modified through an apparent diversification of knowledge resources, but this situation has produced the contradictory effect that Black Cab drivers compete for work against drivers using GPS units as their unique tool for work. What the testimonials of Black Cab drivers tell us about mobile work is that it failed to change their core work practices but it did make work practices more accessible to others that were less qualified, but had the tools to perform some aspects of the job.

Work that is planned can also be analysed from the angle of relating work routines to cycles and rhythms that can be found in mobile work and the impact these have on how mobile workers relate their cognitive experience of work to their life. As well as establishing this link between working practices, factors influencing choice of work, and cycles and rhythms, we have been able to relate these concepts to the use of mobile ICT technological time and the social time of the mobile worker. In some ways, mICTs are used as corrective tools for work activities within a domain, and their use has a reflective input into how work is defined and chosen, creating a symbiotic relationship between mediated and non-mediated mICT technology users.

The popularisation of mICTs in the form of GPS, mobile phones and/or electronic booking systems interfacing with knowledge management systems ("The Knowledge", experience on the job) present an interesting case for study. Black Cab driver work was already mobile and time flexible, with high levels of improvisation, before the introduction of mICTs. The study of this type of work requires a revision of the research approach and its methods. Understanding this type of work and the impact mICTs have on the change in working practices and choices of work has led to complementary definitions in the area of temporal behaviour and task-based work, which are required for work in mobile settings. The aim has been to make an association between temporality, uncertainty, work variables and the use of mobile ICT. To this end, reflecting upon the driver's everyday experience illustrated how these elements combine to influence some types of mobile work, and also virtual work environments.

A major cause of concern from the drivers' point of view is the direct effect the use of GPS systems might have on the requirements of performing cabbie work. There is a de-skilling process that has been caused by technology, which might in future lead to a shortage of mobile workers able to do the work without mICTs, thereby reducing the choices of both drivers and their passengers. Mobile ICTs can be used to enhance the current work practices of Black Cab drivers, allowing us an insight into how technology can enhance their opportunities to improve their work choices.

The extension of the concepts of temporality of work links to the ways in which mICTs merge the work domain with the variables contributing to the choice of work. Cabbies are professional workers: to obtain the best choice of work, either as planned or situational acts, they need to process several sets of data from many sources using best practices that are highly idiosyncratic and individual. The question remains as to whether the use of mICTs by mobile workers with a knowledge base will tend to deskill the worker, or instead raise the level of expertise needed to do the job?

CHAPTER 6: DISCUSSION

A space for decision and action is created, which was latent or constrained before the impact, and waits to be filled. Ephemeral organizations emerge to fill that space and take that chance.

(Lanzara, 1983)

Unlike other types of mobile work, in which the support or aid provided by mICTs has defined new working practices to be followed by workers, Black Cab work has a long history of well-defined working practices with minimal mICT support. This historical referential background, which is not shared by other types of mobile work, is not as well documented or easy to comprehend. Black Cab work has been, and remains, supported by memory based tools such as the Knowledge, micro-coordination procedures using basic tools such as pen and paper, and locational co-ordination using stationary or landline phones. In recent times working practices have changed due to the introduction of mICT devices into Black Cab work. However, the ways Black Cab drivers use mICTs tend to extend, rather than replace, their contextual and situational awareness, which remains one of the main tools for finding work available on the streets.

The analysis section in this dissertation highlighted the importance of self-referential perception for executing this type of mobile work. Self-referentiality as a semiotic term has been described and defined for this type of work in the context of this dissertation. By studying the evolution in working practices, mediated by the use of mICTs, work that was self referential requires now a multi-referential perception, which will be explored later in this chapter.

The consequence of this change has been a shift in the modus operandi of Black Cab work towards providing dynamic and flexible forms of organisation where the technology can be put to use in supporting new working practices. In these new organisations the domain specific and task orientated nature of mobile work determines flexible organisational structures, sharing activity life cycles with short or

temporal time periods (Saunders and Kreps, 1987; Lanzara 1983). Furthermore, the role of these organisations in enabling the formation of alternative strategies for development and adoption of mICT in mobile working practices (Lippert and Davis, 2006) is an area to be discussed, taking into consideration the contextual and situadeness aspects influencing the choice of mobile work.

In this chapter, we first discuss the contextual choice of mobile work, in which choices between planned and unplanned work are made. The research framework we have drawn on is the one presented by Suchman (1987). Contextual awareness is presented as theoretically relevant to understanding mICT's contribution to the changes mobile workers experience in the perception of work. The gradual migration from self-referential work to multi-referential work experienced by the workers in the domain of study is aimed at achieving a better contextual awareness. This exploration takes into account how time as a socially deterministic factor contributes to a differentiation between the classes of task-based mobile work (Ancona et al, 2001). Further in this section, the discussion moves towards the organisational discourses surrounding the adoption and later embedding of mICTs in mobile work. Two layers of analysis are presented for this purpose: in the first instance, a self-referential level of change, and in the second instance, a level of skill change and the impact those two layers have on the organisational domain.

Lastly reflections on the ways in which mICTs provide challenges to skilled mobile work are presented. These consist in either the creation of opportunities for loosely agile organisations, able to cope with the temporal demands of this type of work, or in a challenge to the status quo of the semi-professional highly mobile worker, where knowledge is required to perform work. There follows a discussion of the roles of new types of organisation that are technologically driven but ephemeral or temporal in their form and organic functions, leading towards agile organisations. A set of final remarks concludes the chapter.

6.1 Situated Choice of Mobile Work

There are several aspects to be taken into account when reflecting on what influences contextual choice in mobile work. The tasks and routines of mobile work are different from stationary work, and the use of social resources is dynamic and

unpredictable (Tamminen et al, 2004). In event-led decisions, there are contextual references to mobile work, intermeshed with situational and planned acts (Suchman, 2007) to be taken into account. To cope with uncertainty at work, mobile workers construct personal and group spaces to work within, aided or supported by mICTs. In some cases the choices made lead to the development of tensions that are dissolved as mobile workers learn to build social solutions to the use of the technology, such as mobile multitasking and awareness (Schmidt, 1998).

Mobile work as a contextual choice presents the case for some type of co-operative or co-ordinated work that is developed across a common field of endeavour. The mode of interaction influences the progression from social practices to more systematic layouts in which the mICT becomes the central work tool (Carstensen and Sørensen, 1996). On the other hand, mobile workers deal with multitasking by taking either a self-referential or a multi-referential approach to their work. This approach is influenced by the contextual choice; Suchman (1987) proposed a research process where situated and contextual work are analysed in tandem,, when looking at the domain of mobile workers supported in their work tasks by mICTs. For mobile workers in this situated choice of work, time is another factor adding complexity to the analysis (Barley, 1988). Thus there is a great deal of discussion regarding the mobile research agenda for situated and contextual work.

To help understand the complexity of contextual choice the discussion is extended by presenting two sub-sections. Firstly we examine the self-referential and multi-referential approaches to mobile work, and secondly we consider situated choice in the context of time management.

6.1.1 From Self-referential to Multi-referential Mobile Work

This section presents a discussion of contextual work that is self-referential. Self-referential work, where there is a multi-referential perception of how this work has to be executed, differs substantially from the same work when seen in terms of completed tasks. The individual perception of how we present ourselves to the world matters very much in our private lives, and we carry this attitude across to our working lives. The more acutely this perception is felt, at a cognitive level, the better individuals deal with the world that surrounds them.

First at school and then at work, most of us, through a process of socialisation, learn to use multiple physical and social references that feed our knowledge of the environment surrounding us. This multi-referential process, at first conscious, becomes internalised and our minds learn to be unaware of it. The presentation of ourselves is a combination of both our perceptions and the references we obtain from the world that surrounds us (Goffman, 1959). In the case study this reflects on the development of a Black Cab drivers' sense of community that is a mix of real and virtual (Ross, 2007). The purpose of this is to share not only the secrets of trade through everyday aspects of Black Cab work that is not documented or regulated but also to contribute to making their work interesting and enjoyable.

When discussing everyday working practices such as highly mobile work performed by cabbies, this is of great importance. As seen throughout the previous chapters in this dissertation, their work has been called self-referential. It has been also said that this type of highly mobile work is very idiosyncratic and individualistic. Self-reference is expressed by the user in the choice of work, where they regard schedules that are not self-imposed as irrelevant. The self-referential status is only obtained because the worker has good situational knowledge or understanding of the context where work is executed, and this knowledge is therefore highly prized. Other types of highly mobile workers such as mini-cab drivers or maintenance engineers, subject to closer time management rotas, work in different situated conditions. Such workers are not able to impose the same conditions on their working hours, and hence their work is not self-referential. Their choices are not idiosyncratic or individualistic.

Another side of this self-reference is the low level of interdependency and group awareness that highly mobile workers need to do their work. If working alone, the exact position of other mobile workers is irrelevant; it matters only if the other workers are within the visual range of awareness of the situated worker. In this respect, Black Cab work differs from many other types of mobile work, in which there is a reliance on others to do the work (Olson and Olson, 2000).

This limited, node-based awareness, in which the worker is the node centre has a negative side-effect: the lack of understanding of external factors, such as congestion issues in the transport network, or areas where work is scarce, since there is no knowledge of how many other mobile workers are offering services simultaneously

and in which locations. Node-based work tends to rely on a central source of information and, to some extent, control. In this dissertation the view is to encourage the development of a strong counterweight argument, based on the fact that the mobile worker does not grant the management of his time to the control centre; he remains free to assess the quality of the information and directions offered, and tends to regard it more as a service to which he is free to subscribe and leave.

This finding agrees with the ideas of Lefebvre (2004) and Zerubavel (1981), expressed in their theoretical and philosophical work on the time boundaries of work in relation to the many aspects of human life. In this theoretical framework of analysis by these two social scientists, the particular rhythms in the work being executed and the success in obtaining work is measured by the self-referential mobile worker. The self-referential manner of working reflects conditions where organisational support is low, ephemeral or situational, and such work tends to be isolated and intensive. This is certainly true in the case of cabbies. It is isolated because of the lack of communication to the external world and its intensity is evidenced by the long hours declared in drivers' schedules. The lack of communication when driving in isolation (Heath et al, 1999) distorts, in some cases, the self-reliance on doing work.

For example, Black Cab drivers for many years underestimated the effect that the use of GPS systems or radio control circuits would have on the overall business of taxi work. As such mICT systems became popular and more widely available, and new sources for referencing work were sourced by such systems. Similar to the experience of UK police work (Pica, 2006), a multi-referential scheme of overlapping information is predominant in Black Cab work. This scheme applied to sedimented and established working practices offers a variety of selection for everyday work activities, from which cabbies choose what to do and when.

Taking into account the perspectives described above there are three main areas of impact found in the change from a self-referential to a multi-referential contextual and spatial awareness in mICT-supported mobile work. When applied to the domain of study the result is as presented below.

The first impact of mICTs on cabbies' self-reference was in the ability – either by a manned operator or by a system algorithm – to offer advice or to provide information to the driver if there were too many drivers in a zone and not enough jobs available or ready to be taken from the streets or the system, enabling the driver to move to a different zone in order to increase the chances for obtaining work. This is a significant change in how work is obtained. Drivers have to rely on a non-visual aid, outside the scope of their own physical capacity of observation, and to choose to trust the system or the operator and change their work plans.

The second impact of mICTs on cabbies' self-reference for choosing work was in the partial elimination of competition between drivers in the same circuit, leading towards work in a distributed non-collaborative virtual team. Since work is obtainable from the system, there is less pressure to compete against other drivers. A reasonable reliance on the system to provide information that enhances the referential settings of the driver is accepted or welcomed. Successful implementers of mICT systems in this type of work are the ones that have reduced the lure of competition between drivers by establishing systems use and working practices that are perceived as fair and free of preferential treatment by the drivers.

The third impact of mICTs is on the rhythms of work. Work has natural cycles that are determined by diverse factors (Zeruvabel, 1981). Research has shown that the lack of social interaction in self-referential working practices has somehow been mediated by the use of the technology (Liccopee and Smoreda, 2005). In the domain of study, cabbies are able to communicate with someone as they wish, and have based their communication preferences on their idiosyncratic behaviour in choosing work. On the other hand, there are many interruptions to concentration in their work, and strictly speaking the line dividing private time and public time at work (Zeruvabel, 1979; Hochschild, 1997; Bunting, 2003) has been blurred for these workers. Work breaks for example can now be easily co-ordinated by calls on mobile phones, and taken as situated as possible at different times of the planned working shift.

Furthermore, the ideas of time and space in which the rhythms of work take place are being changed (Adam, 2006) and will perhaps be better understood if the influence of individual idiosyncrasies or moods on such planned and situated acts is

taken into account, not only the layout of the research agenda provided by such choices (Suchman, 1987). Ciborra (1999) noted that these factors contribute significantly and are not always taken into account. For the mobile worker both sets of factors are embedded in the work process. Lefevbre (2004) explains that what he terms *rhythm analysis* thinks of space and time not as differently but as part of the exposition of the production of space.

6.1.2 Situated Choice and Time Management in Task Based Mobile Work

In the section above we presented a discussion of how temporality and situadeness in highly mobile work leads to a migration from self-referential to multi-referential awareness for working practices supported by mICT. Time and space have been described as merged attributes to mobile work, which add to the complexity of temporal strategies for the choice of mobile work. Thus in this sub-section we attempt to disaggregate the discussion into components that are autonomous enough to describe this complexity.

The apparent simplicity of drivers' work tasks is misleading. Partly due to drivers' idiosyncratic behaviour whilst driving and in part due to the introduction of mICTs to traditional working practices, simplicity is no longer the norm. In their working time, drivers attempt to maximise earnings during the time spent at work, and their aim is to make as many passenger trips as possible; time without passengers on board is onerous, and wastes resources. To deal with this time, largely spent searching for passengers, drivers rely on the use of a timetable for location and decision-making, which is repeatedly re-conceptualised over time. This situation is not particular to cabbies but has also been found in other drivers managing their time in their vehicles (Laurier, 2005).

The components of contextual and situated choice are time, planned work and situated work. Throughout this dissertation, it has been assumed that mobile workers are knowledgeable in their task routines and are able to achieve various levels of success when they manage their time in order to carry out their work. Managing time is a difficult occupation, since time is a social variable; time units have a different social contextualisation depending upon the individual. Additionally these workers encounter, in their everyday work, an absence of organisational support for managing time (Dubinskas, 1988).

For highly mobile workers such as cabbies, time is regarded as complex because of the individual variations in how they deal with time spent at work. Conventionally, time is considered a discrete variable that is event managed (Barley, 1998; Orr, 1996), but this assumption is put to the test through the use of mICTs as a mediating agent in mobile work. Hence, cabbies' perception of their work has also relied on this discrete concept of time, although the use of mICTs in this type of mobile work has created new opportunities to redefine time as flexible, and multiple activities can be contained in one time unit (Noss, 2002).

As was pointed out earlier in this chapter, highly mobile workers have choices influenced by time, cycles and rhythms particular to their working practices depending upon the type of work allocation. Lefebvre (2004) has made an analogy between the rhythms that are encountered in life and the natural cycles of life. Mobile work, like any work, has such sequences, rhythms and cycles. A simple cycle of work is found in the example of a cabbie working on a series of tasks, such as driving passengers around, but at the same time dealing with parallel events such as receiving calls from friends, or listening to radio reports.

It is expected that distributed actions will take place over different rhythms and cycles until a balance of what seems a natural cycle of work is obtained. Lee and Liebenau (2000) describe some of these cycles and actions as functions of how time is defined while at work. This seamless structure of highly mobile work assumes a minimum disturbance by internal factors such as tiredness, interruptions, or external factors. For example traffic congestion or hazard driving conditions influence the mobile worker's choice for situated work, either by changing physical location or choosing work from a different source to the one being used at that particular time.

Examples of these mobile work cycles are not limited to specific parts of the working day. Most cabbies, given the choice, will opt for a customised and flexible day of work where choices are made dynamically. Some might choose to work with an early start in the morning – around 4am – and finish their shift by the mid-afternoon (see table of working schedules in Chapter 4), in order to be able to do the school run at 4pm. Other work cycles, for example, consist of longer working hours with many short breaks, or at night between 11pm to 7am.

However, whatever the choice of schedule, what seems more important in such cycles is not when they are executed but the possibility of making the most suitable decision, and the nature of the situated act the driver is engaged in at the time the decision is being made. Some of these activities are distributed geographically and over time (Wiredu and Sørensen, 2005). Factors external to the main area of work – such as driving – affect the list of parallel tasks mobile drivers have to execute. Thus this act of choosing work is influenced by the events that are directly linked to the system such as good reception, system activation, managing the work, and external factors such as traffic congestion and visual awareness providing information to the mobile worker, which he or she is unable to acquire from the system.

The idea of time as a prime element of the worker's life that is self-managed is the antithesis to conventional ideas of time management, in which work tasks are laid out with the objective of reducing the time spent on performing the task (Thompson, 1967). This is because it is an assumption in this type of work is that the number of tasks completed within a certain time frame leads to efficiency and hence to optimisation of production or elaboration of service costs. Key to the ability to self-manage his own time is the worker's awareness of his own margin of error.

To explain this idea, let us consider a mobile worker with knowledge and experience of performing a task. The worker will, by way of reference, have estimated the conditions under which a certain job can be completed: the estimated time, the choice of route, and perhaps traffic conditions. These external factors are compared with the situational data the mobile worker is aware of as he/she makes a contextual choice of work. The chosen option is then compared to the situation of a "perfect world" in which all those parameters are optimised. Calibrating data obtained from an awareness of the surrounding world against "model" conditions leads to an idea of time management, which is one of the main differences between agile and conventional working practices.

For workers paid by time spend doing a task, it might be argued that simply executing as many tasks as possible within a given unit of time is the overriding goal. This is not so, however, in the case of cabbies, whose tasks have various and often unpredictable lengths, and for whom short distances can provide the situated opportunity to complete many jobs within a given period of time. If, on the contrary,

the length of the journey requires travel for a long distance, earning a higher fare, but at the destination the chance of finding another job is low, the work will not be favoured. Contextual knowledge influences the choice of planned work. Some types of planned work are preferred to others, depending on the knowledge the driver has of the environment or the context from which the job is chosen.

In the analysis it became apparent that even when the driver is continuously engaged in work, he is not free of the complexity resulting from the need to manage parallel events. Whilst on a job, the mobile worker is splitting his time into smaller units containing tasks: one to make or receive a call, another to check the system for further work, one for checking the route, etc. Most of these acts are unplanned, situated and contextual acts executed in parallel to the central activity linked to the mobile work. As is the case with time, analysing this type of work can lead to an excess of descriptive subcategories. But as Suchman (1994) explains, too many categories can disaggregate the objective of understanding the nature of the work.

The contextual nature of an action is insufficient for it to be categorised in this way; it must also be purposeful, i.e. leading to an outcome that can be regarded as a work resource. For example, many drivers surveyed mentioned use of the mobile phone for talking to friends outside work. This activity is contextual, but does not lead to an outcome that can be said to form a resource. On the other hand, by talking to other drivers about traffic conditions, he may acquire a number of useful tips about the forthcoming trip, which can be aggregated to form a knowledge resource, useful, for instance, if the driver encounters congestion and needs to divert from his planned route. If only a subset of all the actions undertaken actually generates complexity in the job itself, this simplification aids to understand the choices taken by the driver

Paradoxically, mICTs are acting as implementers of conventional management tools over situated and unplanned work. Whereas drivers previously had no centralised control over their work, a mICT such as a computer cab system provides the interface and network to establish that type of control. Mobile bookings (as opposed to hailing) allow centralised decisions to be made, and individual decisions are no longer as relevant as they once were. Furthermore, the data fed to a computer cab system both by the drivers themselves and by roadside infrastructure such as traffic cameras allows centralised planning of routes, which are then displayed to drivers on

GPS systems. Compliance with a series of schedules and, to a lesser extent, adhering to a route, is often given more importance than flexibility over time and space. It is possible that this loss of autonomy will reduce drivers' motivation to collect information and make informed analyses.

Mobile workers are not aware of fixed parameters when planning work. Besides their chosen timetable for work, everything is negotiable and variable. Hence any study of this type of work must take into account *situated actions that create and sustain shared understanding on specific occasions of interaction* (Suchman, 1988) at work. Mobile workers and their interaction with the technology take on a situational approach, more realistic and relevant for interpreting what is happening at work. Many examples of how moods and improvisation dictate the rhythms of work (Ciborra, 2001) were encountered in interviews and RRTR recordings, which confirm this thesis.

Mobile workers and the rhythms they adopt in such situations can be compared with similar characteristics of this kind, attributed to jazz composition or musicians' careers (Weick, 1998). Jazz musicians have in-depth knowledge of their instruments and musical notes, but the act of creation of new music pieces is regarded as highly improvised, and is dependent on situated moods at the time the piece is rehearsed (Mirvis, 1998). In fact the creative process is structured in scales, bars, and finally rhythms (Abbot et al, 1990) with a higher degree of improvisation and reorganisation needed before a melody can be created.

The predisposition to look at work as an activity in which emotions are disassociated from the act of work and the organisational acts of work is unhelpful when trying to understand the layers of adoption of the technology that determine the dynamics of the work chosen and completed by the highly mobile worker. Besides analysing the factors affecting the choice of work, the need to understand spatial awareness or scanning for new work – a scarce commodity – has been a powerful reason for the adoption of mICTs in supporting this type of work. The rejection of work is random and contextually referred, and furthermore subject to re-assessment as work progresses.

This re-assessment occurs at certain periods of time, periods that are determined by

the social entities and the individual. The individual makes choices based on social entities (Noss, 2002). On the one hand, mobile workers are involved in reflexive planning and instantaneous reorganisation of their work. On the other, plans overlap and are continuously rejected and replaced by situated act choices as mobile workers go through the working day. Time has an impact on the organisational forms supporting this type of work, as will be discussed in the next section.

6.2 Organisational Discourses in Black Cab Work

At the start of this chapter a quote from Lanzara (1983) presented a basic idea for creating ephemeral organisations as a choice made in specific situations. Reflecting upon organisational discourses applied to the type of mobile work discussed is a difficult task in the domain of study. The modelling methodology applied to gain an understanding of the organising process is complex and difficult to describe. To understand the origins and maintenance of an organisation created to deal with temporal, or ephemeral situations, a model has been proposed by Saunders and Kreps (1987) describing those four states of organising applied to the history of emergent organisations.

Saunders and Kreps based their study on organisations formed rapidly to deal with disasters and emergencies. Whilst the domain of study is a different type of temporal situation, some of the principal findings of their research nevertheless help us to understand the emergence of dynamic organisations in mobile work such as the one described in this dissertation. As has been mentioned in previous chapters, Black Cab work is restricted to operations in a highly regulated environment. It is to be expected that the greater the degree of formal organising at the organisation's origin stage, the lower the degree of substantive rationality at the maintenance stage. Complexity is understood not in terms of the organisational structure, but in terms of the technical support that is needed to enable the use of mICTs for this type of work.

The development of structurational models of technology has generated numerous insights into the role and influence of technology in organisations. In those models technology is designed for embedding in the structure of the organisation but is then appropriated by users of the technology (Orlikowski, 2000). It seems to be that the more complex the environment in which a task is performed, the less the degree of

formal organisation. The change in the ways work can be obtained by cabbies, when supported in their work by mICTs, is challenging traditional working practices in this business. Organisationally speaking, as presented in this work, cabbies have evolved from a non- or very limited organisational setup to a complex and quite sophisticated level of organisation.

Compared to more conventional views of organisations in which the working environment and management is conceived of as linear process, in which tasks are executed one after other, and with longer horizons of time to measure results. When presented with a dynamic situation, the greater the time an organisation takes to start or respond to the new needs, the longer the chances this organisation will stand over time (Noss, 2002).

When analysing Black Cab work, the actions chosen seem to become parallelised within the present moment. The rules surrounding planned and situated acts of choosing work lead to a more reflexive type of planning, aimed at the reorganisation of resources and schedules in a flexible manner, meeting the definition of a fluid or dynamic organisation.

This subsection presents the organisational discourses discussion in two layers, one reflecting on organisational aspects of supported mICT mobile work, and the other the impact such support has on the skills required to do knowledge work.

6.2.1 Organisational Aspects on Supported mICT Mobile Work

In the particular case of organisations emerging from mICT-supported mobile work the question is why these organisations did not support mobile work earlier. In part this is due to the changing domain of thinking in terms of the relationship between movement and space, which leads to new kinds of spatial and situational awareness (Thrift, 2004). With mobile work that is highly self-referential, the use of mICT systems to support such awareness presents the worker with challenges to trust the system and to define his own identity and that of the organisation he belongs to (Kramer, 1999).

Trust, as a phenomenon, is very abstract. Like organisational identity, trust can be examined at different levels. Trust at the level of organisations refers to a collective

commitment and co-operation required to achieve organisational goals. At the individual level, trust affects the willingness to co-operate and to commit to organisational changes (Puusa and Tolvanen, 2006).

For workers protected by more traditional forms of employment, the changes or the prospect of socially integrated high technology in the workplace creates uncertainty. Zuboff (1988) found that workers feared the loss of their identities, of freedom and autonomy, and of well-defined rights and responsibilities. In other words, the definition of their work was left in the hands of their managers. Also those workers stated that in a fluid environment, which lacks clear job descriptions and contracts, they would lose the clarity of right and obligations that they felt they required to keep a sense of personal control.

Much that has been said about new forms of organising is derived from the use of new technologies (Brocklehurst, 2001), or from changes in the organisation requirements or status of work (Rubery, et al, 2002; Kallinikos, 2003), and when applied to these drivers, the choice of a formal organisation does seem to make the case of validation to justify its pursuit. Only when cabbies' dominance in the taxi market has been seriously threatened by companies relying heavily on less skilled drivers but supported by mICTs have drivers found the need to re-group and to create organisations that allow them to extend their tools for searching for work but at the same time keep their independence.

It is not completely true that there was no organisational layout before the implementation of mICTs in Black Cab work. By definition, this is a public transport service run by private individuals. The need to assure a common standard of the service for the benefit of the social environment – in this case, the city in which the driver operates, i.e. London – is important. This business trade or semi-professional activity is heavily regulated. This has been described in previous chapters of this dissertation.

However, the regulation applicable to the commercial activity of organisations has never been fully enforced when establishing Black cab circuits, nor have the everyday working practices been formally documented. It is a common practice in other types of work, in particular stationary work, for procedures to be defined

before the work is executed. Most cabbies when doing their work have come to believe that working in a self-referential way has been sufficient to retain profitability in the trade. The use of mICTs has changed this outlook significantly. Drivers that are less qualified can compete in niche markets with the Black Cab driver and offer stiff competition.

When first implemented for supporting mobile work, the use of mICT for micro-coordination work created the preconditions for the existence of an infrastructure, with its associated costs for systems design, implementation, maintenance and upgrade. These factors contributed to the formalisation of early organisations that appeared, reflecting the competition in the trade created by minicabs.

The use of mICTs in the ways described in this dissertation lead skilled workers such as Black Cab drivers to create working networks that they are able to join as they wish or as needs dictate. Drivers have choices for joining over time different networks, but not more than one at a given time. Membership has been described as a procedure consisting of two parts, firstly the actual membership application, and secondly the installation of some kind of equipment in the vehicles. Once these two preconditions are fulfilled, there is variable flexibility in the driver's choice of when to join the network. The activation of the membership is idiosyncratic.

Reflecting on this modus operandi, the driver as a skilled worker retains choice and freedom in making such changes. For new social organisations or working organisations in this case, factors allowing them to conform include the existence of a set of activities to be completed, a network to support the work and the definition of a job sets of tasks assignments (Brajkovich, 1994). Black Cab drivers have for a long time had a well defined activity or area of trade, a network to support the regulatory (PCO) and less glamorous aspects of their work (the Tea Houses), as well as a status definition of their role (the driver licensing process). However, and perhaps due to issues of trust, power and identity, drivers have been slow in creating organisations to reflect such a structure.

Trust, in its simplest form, depends on whatever service or commodity is supplied being equally and fairly accessible to all associated with the organisation, which leads to issues of power: conventional organisations tend to be hierarchical, which

then affects the decision-making processes within the group. Considering identity, drivers have at all times wanted to keep their own idiosyncratic behaviour defined by their preferences in work. Zuboff (1988) warned about the potential tyranny in a flexible and socially integrated organisation. By keeping their organisational level to the minimum, drivers try to maintain autonomy in their decision-making processes. Power is centred on individuals and not groups: when running the organisation, groups are likely to have their own agenda, which may not include support for individual cabbie work.

Aldrich and Ruef (2006) presented the case for ways in which organisations emerge and become viable social units. At early stages, nascent organisations attempt to collect resources and knowledge to start the viable organisation, and the way members are recruited and rewarded helps to create an organisational identity, power structure and working practices enabling the support of the work. In the context of this dissertation, and taking a contextual view of cabbie work, these organisations have been called dynamic or agile.

Their main role is to support cabbie work by providing technical or human resources for locating or assigning work. It is noticeable that these organisations have a flexible membership, since there can nominally be any number of drivers linked to or provided with a computer cab system, and as the system or its co-ordinator now has the power to prevent drivers dropping out of its control or ignoring its information broadcast.

The concept of driver membership has emerged from these dynamics; drivers join in order to benefit from the system because they perceive that by doing so, they will increase their chances for obtaining work. But equally they will drop out if they perceive that their chances for getting work are higher if they stop using the system. The technology allows such an easy swap in working conditions, although there are counter effects of this freedom in choice, as will be discussed in the section below.

6.2.2 The Paradigm of Changing the Referential Skills on Mobile Work

From one side, mICTs seems to have provided new opportunities to connect to the outside work and organise Black Cab work. There is, however, a less favourable side to the implementation of mICTs for supporting mobile work in cabbies. The trend in

working practices to automate search processes for speeding up the location of an address, when aided by tools such as GPS maps, seems over time to reduce the need for the drivers to use skills that are difficult to obtain, such as the Knowledge. On the one hand, knowledge management studies (Skok, 2003) tell us how powerful a driver's knowledge is when required to find where to go and when. Human memory, however, if not in use, can easily lose what it has acquired. In the interviews, many drivers mentioned that they are aware that they use the Knowledge less, and regard losing it as a long-term risk, as they will be unable to use those skills for work.

This situation of deskilling knowledge workers has taken place in many other occupations in the history of work, triggered either by changes to the working practices (Zuboff, 1988), by changes to the organisational forms of employment (Rubery et al, 2002) or a combination of these two factors. For example, take the case of the office clerk in the City of London. Zuboff (1988) describes the evolution and changes in the roles and activities an office clerk has been exposed to since the early eighteenth century, from a multi-cultural, managing, decision-maker employee – most clerks spoke several European languages, and were able to do accounts, office chores, trade, etc. – to our current twenty-first century view of an office clerk as someone who inputs computer data, involved only in back-end office work for a global network of which he is only dimly aware. The major changes in clerks' roles start with the automatisation of repetitive activities in their work task.

There are of course counter examples of successful processes of automatisation, for example the case of office secretaries. The general use of word processors in principle has reduced the number of documents to be manually typed. Most office workers now type their own documents and process them by email or similar collaborative tools. In some cases, office secretaries now have more responsible roles, in which they are in charge of work flow control, checking that all office documents are submitted on time or by a deadline, quality assurance control, activity coordination, and in small organisations sometimes invoicing and payroll.

There are now fewer office secretaries, but their role requires multiple skills. Thus this is the reverse of the clerical experience: the office secretary formerly required only basic skills such as handwriting, shorthand and typing to do their work. Now because of the technology those skills are not so relevant for the job but there is still

the need to have some kind of technology mediation. In fact their work is gradually becoming an interface between the technology and the users.

The situation of drivers is the opposite of that of secretaries. To do their job, these mobile workers have to be regulated and knowledge must be called upon for everyday tasks. The mediation of the technology seems to reduce the need for such skills in many ways. The degradation of skilled work, of course, occurs at a different pace and in a different manner, depending on the industry or the trade. These skilled mobile workers are embedded in a work process that from their point of view is an individual choice at all times. Skilled work can be satisfying because it is varied, challenging and creative. The autonomy linked to skilled work is being eroded by technology (Illich, 1977). At first the automatisation of chores seems to provide free time for other things that might or might not be work-related, but as the worker becomes dependent on the technology, problems mounted. Frustration at being unable to apply workers' skills to the job often provides motivation for finding other ways to use the skills. This is sometimes expressed when work skills are applied to other aspects of life, as is demonstrated, for example, in the amount of time cabbies use to talk to each other while driving.

The use of mICT as an aid or support tool for mobile work is a superficial way of making skilled work appear more meaningful by reversing the trend of compartmentalised work and giving workers more say about how to do their jobs. This is portrayed as having a positive effect on the management and a cost in the everyday running of operations. The main problem with this view, however, is that the use of mICTs has not solved the issue that people's abilities are not fully taxed. Keeping independence in the job might make it interesting but it would not challenge the relationship of the worker to the work process, nor alter the basic nature of that process itself. The problem remains that increasingly fewer skills are required in exchange for seamless efficiency in work. Will the balance between choice of work and work allocation be kept?

6.3 Dynamic Organisations and Supported mICT Mobile Work

Dynamic organisations have been presented as an attempt to answer the particular

dynamics of highly mobile workers supported by mICTs. In the case of Black Cab work these organisations are supporting the migration from self-referential work to highly networked and organised work. This type of organisation seems to be able to incorporate improvisational issues and knowledge into its mindset in order to carry out work (Weick, 1998). A willingness to forego planning and schedules in favour of acting on situated actions in real time is common to the everyday situations encountered by drivers.

In Chapter 5 the cases for centralised agile organisations and loose agile organisations were presented. In Company A membership is exclusive. Cabbies cannot belong simultaneously to any other radio circuit in London, hence drivers choose to work a combination of their own work obtained from street hails and work that is provided by the company booking system. There is constant monitoring of the quality of the service offered to customers, which are divided into two types based on their payment method: either account or cash/one-off-use based. Company A has account managers that liaise between the company and account clients to ensure a good service. There is a complaints procedure, and if accusations of driver misconduct are upheld, the maximum penalty is expulsion from the company. It is very unusual to leave the company and some drivers have been working for it for as long as 10, 15 or even 30 years. Company A's low driver turnover reflects its reputation as one of the fairer and best organised Black Cab circuits in London.

The rationale applied to the recruitment of new drivers also reflects upon the mICT deployment of their vehicles. Currently, the electronic booking system in use by Company A is an in-house development, and the technology patents are owned worldwide by the company, which has been able to provide technical and organisational advice to other similar taxi companies in Hong Kong, Sydney, New York, etc when installing similar mICTs (Munro, 2007). The system's historical evolution began with a modem two-way radio systems in the early 90s that was later converted to a computer booking system, evolving from a manned call centre to an online (web-based) application booking service. During the empirical research, information was gathered about Company A's process of producing requirements and designing the interface, which still keeps a number of in-house developers for R&D of the system.

In the case of loosely agile organisations, an external reason for the problems encountered was a rather unsuccessful recruitment pool within the Black Cab driver community. The number of drivers joining per month was small and threatened the business model, leading to the later sale of the company to a major operator. Driver members of this company were attracted to it by the apparent potential of the technology. They saw this as an opportunity to use mICTs with a low level of human interaction. One of the main criticisms of radio circuits is the lack of clear processes in the allocation of jobs to drivers. Drivers are always on their guard against unequal treatment. In terms of the organisation, there was a consensus amongst drivers that the business model was too hierarchical, and besides using the system they had little say in how the company was run.

An internal reason for the limited success was the way drivers took work from the streets. On many occasions a driver would take a job from the system and agree a time and place to collect a passenger. By the time the driver reached the location the passenger had gone, because a cab that had arrived earlier picked him up. This situation was very frustrating for the drivers, and became worse as the demand for cabs is greater than the supply. Passengers – especially women or those travelling late at night – are keen to take the vehicle that arrives first.

Another reason for drivers' lack of interest in joining the company was the apprehension of depending only on technology when dealing with practical aspects of their work. The use of GPS as the tool for the prediction of location reflects a low level of human interaction (Ashbrook and Starner, 2002). Drivers feel that their job is already isolated, and one of the advantages of being part of a radio circuit is that it facilitates the creation of a group identity with a smaller group of peer cab drivers than is generally the case in the Black Cab drivers' profession.

The degree of liaison between drivers on a computer booking cab circuit is variable but the conditions are definitely better than on a minicab circuit (no ownership of the vehicle, fixed income, etc). Some cab circuits charge for access to their systems with no minimum number of jobs to be accepted per month; in others the cab drivers have to accept a minimum number of jobs. One of the companies studied benefited from the minimum pool of available trips, as it allowed them to plan work with established partners such as companies or financial institutions. Some circuits pay

the drivers a “still fare” if the driver is allocated a job and has to wait for the passenger more than a certain time. This type of agreement is very much appreciated by cabbies and only a few cab circuits actually offer this type of deal, and application to join those circuits can take a long time as there is demand to get good and reliable drivers able to maintain the image of the cab circuit.

Here there is a case of cabbies taking their portfolio of Knowledge skills, putting it to use under different organisations without a particular preference in order to obtain work quickly, but neither being involved in working practice rules nor installing special equipment in their vehicles, nor having to report for extended periods to an administrative hierarchy. In the long term, the same cabbies that choose this type of work question its modus operandi as being too stressful and in some cases difficult to keep up with in terms of human resources (long hours, lack of proper breaks, etc.) that turns the idea of joining a company such as company A into a more attractive choice. Since they still can keep a great level of autonomy and obtain assurances of a minimum number of jobs per month, it allows them to keep a minimum profit base enabling them to make short and medium term individual life plans.

Furthermore, these mobile workers have a well-developed understanding of their knowledge resources, and are quickly able to identify changes in the environment surrounding them. Since Black Cab drivers are confident of their ability to deal with unanticipated change, trying to work on a rigid or formal organisational basis might result in failed expectations, creating uncertainty. The unexpected uncertainty leads to inefficiency or at worst paralysis and, in some cases, collapse of the organisation (Lanzara, 1983).

The migration from self-referential to multi-referential contextual and situated work defined one of the requirements for a dynamic organisation as the capacity to handle changing situations with a combination of specific abilities and attitudes (Blount and Janicik, 2001). It includes the ability to associate different contexts: the real physical world and the virtual one provided by the use of mICTs. The ability to extend a private life activity into a public domain, and the ability to respond in real time to an enacted environment are characteristics of this type of organisation (Brajkovich, 1994).

How is this reflected in establishing dynamic procedures for work? At the centre of this organisational evolution from the formal to the dynamic organisation is the adequate response to a situation (Aldrich and Ruef, 2006). Working procedures are then loosely left to "float" in the pool of situated work choices available to workers. Understanding and knowledge of the implications of each decision taken from both the dynamic and technological angle are tools for obtaining such an action. The dichotomy or duality in the mobile worker and the dynamic organisation are once again evident; the dependency on the use of technology such as mICT seems to restrict the worker's freedom of choice as well as limiting his knowledge requirements.

A positive aspect of dynamic organisations in terms of their contribution to understanding mobile work is the quick assignment and reallocation procedures for resources, either in human or machine form. These organisations are able to deal with seasonal changes in patterns of work in a better manner than formal organisations but this may, in some cases, require some effort. For example both Black Cab circuits struggle to find enough drivers to cover the minimum demands of the mICT systems during the run up to Christmas, when it is easier for cabbies to obtain work from the streets.

The case for dynamic organisations supporting mobile work is very much an open question. The answer has been highly dependent on the type of mobile work being supported, and how the dynamic organisation's structure is defined or evolves its own rules of membership and long term sustainability without failing, even if temporarily in the case of formal organisations. Furthermore, there is evidence that in the case of mobile work supported by mICTs, the dynamic organisation takes different organisational forms (formal, informal) depending on when the work is done. This characteristic leads to reflections on the actual role mICTs have in this type of work, as expressed in the concluding remarks of this chapter.

6.4 Concluding Remarks

This chapter concludes with some important reflections on the methods used for the analysis of the data collected. Under the ethno-methodological and phenomenological lenses of analysis, three areas of impact on the use of mICTs have

been found. These areas are used to emphasise the main research findings.

The first area of impact is reflected in the increased complexity of working mobile practices, in which there is an overlap between knowledge and mICT use. Black Cab drivers are constantly measuring their own knowledge of their trade against the information that is provided to them by mICTs as bookings, maps, routes, etc.

The second area of impact is reflected in the migration of the working practices from a self-referential to a multi-referential framework in mICT-supported work. The reliance on aided or support systems in the case of Black Cab drivers makes their everyday working practices less independent. Choices of work rely on multi-referential frameworks such as virtual queues in the computer booking system.

Finally, and perhaps opening an area for further research, is the challenge posed by the use of mICT in relation to mobile work that, before mICT, had well established working practices, both in organisational terms and in terms of skilled work in the light of technological interventions and generalised use. The organisational forms that seem to be more effective are the ones in which a balance between working practices, knowledge, and mICT use is implemented in working procedures. However, this delicate balance might change as mICT usage tips the balance to the side of the technology.

By taking a phenomenological interpretative approach to the new ways of organising work, that is to say the migration to a multi-referential platform of working practices, it has been possible to tap the dynamics of membership and teamwork. Such situated interpretation of reality enables workers to join the wider Black Cab network when needed or required.

Furthermore, the two concepts of needing and wanting are relative and kept in a fragile balance; the more the driver relies on the system, the less skilled he/she becomes; hence the freedom of choice to join at the time the mobile worker wishes is restricted by their empirical knowledge.

The notion of being and the presentation of oneself in everyday life (Heidegger, 1962; Lefebvre, 2004) are at the crux of understanding these mobile workers. Their work, from their own point of view, is reconstituted by situations and contextual

location in time. In each of these situations, their individual needs for work are being negotiated through technology in order to be balanced by the supply of work. Furthermore, drivers are encouraged to be actively aware of and to cultivate what were once weak ties and a low level of micro-coordination of other drivers' work. It is only through competition that there is a chance of obtaining success in the search for work.

It can be difficult to achieve trust in the mICT system and what it offers (Solana, 2001) if nothing similar existed prior to the intervention of mICT. The path somehow seems to point to building and supporting mICT systems with a high level of fairness and transparency in order to encourage adoption and satisfaction in their use by mobile workers. Trust is an important factor contributing to the adoption of a new technology at individual and organisational level (Kramer, 1999). This trust has a more prominent role when the competition – as is the case of the cabbies – is mediated by technology. As presented throughout this dissertation, a strong argument for accepting or adopting membership in a dynamic organisation is whether the mobile worker can trust the system with a degree of fairness in allocating work.

This is difficult to achieve, as the conventional organisational modes for work fail to reflect adequately the working dynamics of these drivers, who are used to flexibility and independence. The organisations that seem to support their work better are those that in their legal foundation fulfil all the established requirements, but still manage to work on a very loose basis, with voluntary rules of association. There are also few formal procedures to be followed to promote the everyday goal of focusing the management of these organisations on the collection and allocation of work.

In both organisations studied, the collection of work, from the drivers' standpoint, may be either indirect because work is input into the system by a call centre or computer based system, or direct in cases where the call is routed directly to the driver. The driver's main concern is the extent to which the allocation of work reflects their belief in trust and fairness. However control over when to accept or reject a job is something the drivers are not eager to give up. As Illich (1977) points out, skilled workers do not accept easily the deskilling of their work and can be quite vocal about it. Concerns are projected in terms of finding exchangeable or alternative

uses for the skills the workers have acquired over time.

In general terms, this dissertation proposes the idea that mICT, when used to extend physical awareness and the contextual and situated choices of mobile workers, creates the need for self-reliant and self-referential workers able to create organisations that can cope with their idiosyncratic behaviour, as well as support the demands of the systems put in place for doing the work. To reach this conclusion, this dissertation made use of an interpretive analysis that took into account the ethnographic methods results of direct contact with the drivers. Analysis of the results enabled the contextualisation of their work and a phenomenological approach to the recorded video data furthered our understanding of the situadeness of the environment in which the work takes place.

In conclusion this dissertation provides an alternative way of looking at the role mICT interventions have in Black Cab work. This view is free of one-sided views in which the technology use, aid or support has great importance in improving the working practices of mobile workers. On the contrary, there are already important indicators that technology might overtake and perhaps deskill the workers. In the long term there is a path in fragile balance between the demands for flexible organisations and the knowledge worker. The issue can be summarised by the question, how can the knowledge worker keep his or her identity without his/her working practices being replaced by the use of mICTs?

There are other mobile work occupations experiencing the same challenges presented by the technology. This situation is of major concern to other skilled workers and the organisations they work for that have experienced similar processes of automatisation. In focusing on a case study in which workers had well defined working practices and knowledge to do the work not assisted by mICTs, the problems and challenges of the situations encountered resemble those encountered by workers and organisations in other trades and professions that formerly engaged in stationary practices but which have since implemented mICTs.

The role of technology as a mediator in the task of distributing mobile work to provide ubiquitous services is not a static but a dynamic one and its significance becomes relevant when working practices reflect that dynamic role.

The next chapter concludes this dissertation by providing an overview of the main arguments discussed hitherto. This is achieved by first summarising the contributions of this dissertation to current mobile and information systems research, secondly, by pointing out deficiencies of this study, and finally by providing a research path for future research in the area of mICT support for mobile workers and dynamic organisations in general.

CHAPTER 7: CONCLUSIONS

In this unpredictable, uncontrollable world, understanding is as problematic as control, and the tenuous nature of understanding is a threat to control.

(Orr, 1996)

This final and closing chapter aims to summarise the contents of this dissertation in an attempt to answer the research question in the domain of study. The chapter is divided into four main sections. The first section presents an overview of the dissertation. It is followed by a presentation of the contribution the research has made to the theory, methodology and practice of IS research. The third section examines the implications of the research approach in terms of the limitations to the research design and the adequacy of the research framework. The final section explores the potential scope of future research in this area of study.

7.1 Overview of the Dissertation

This dissertation started by explaining the motivation and scope of the research study. The use of mICTs by highly mobile workers – such as Black Cab drivers – with self-referential working practices is causing organisational change. Yet to date, analyses of such cases of mobile workers have largely focused on the knowledge these workers had before the use of mICTs. The dissertation has stressed the socio-technical aspects of mobile work and has been critical of the impact of mICTs on mobile work.

In Chapter 2, the dissertation first explores the existing literature identifying core issues surrounding situated acts due to planned or unplanned acts or organisational settings supporting such type of work. This is problematic and highly challenging due to the idiosyncratic nature of the work done by Black Cab drivers. To overcome such a challenge, this dissertation has adopted an interpretative approach, with a phenomenological intake, to the understanding of work and mICT technology.

Hence by building up from the many theoretical aspects related to mobile work, the

theory was assembled to determine the relationships between time and space, self-referential and mutually interdependent work, mutual awareness and collaborative work, temporality, cycles and rhythms of work, and organisational issues in Black Cab drivers' work. Based on those aspects an interpretative model for mobile work is proposed, which aims to acquire a phenomenological understanding of such a type of work as seen in Chapter 3.

The research plan was developed and explained in Chapter 4. It draws on ethnomethodological methods for observation and interpretation. Innovation in the methodology took the form of the use of Remote Real Time Recording (RRTR), which adds value to the methods by using a phenomenological approach to understand the motivations and underlying issues of these workers.

In Chapter 5 of the dissertation, a description of Black Cab work is used to introduce the relationships between the contextual and situated choices of work. A very detailed description of working practices, both aided and non-aided by mICTs, complements the chapter and is shown in a comparative table of working practices, which helps to position such work. In the analysis section, the high order model presented in Chapter 3 is explained in detail. This leads to a discussion of the evolution of the service provided by mICT-supported mobile work, in terms of the shift from self-referential work where drivers decide where and when to work, to multi-referential work where mICT offers opportunities for the co-ordination of efforts.

Finally, Chapter 6 presents the discussion of the discourses developed over the topics of self-referentiality and organisational evolution, leading to reflections on the role technology has had in changing the nature of the work undertaken by Black Cab drivers.

7.2 Contribution to the Information Systems Field

This dissertation makes a number of contributions to the Information Systems field of research, and in particular to the study of mICTs and mobile technology. It focuses its contributions on the dynamic aspects of Black Cab work that can complement other types of highly mobile work. The findings of this study are based

on the phenomenological input to the ontological framework in which Black Cab work is performed. Employing RRTR to complement this methodology is a novel method for recording data on the move while at work.

7.2.1 Theoretical Contributions

This dissertation assesses the wide and diverse range of mobility studies that address the relationships between mobile work and the use of mICTs in everyday tasks. The main framework for the work presented has been the contextualisation of mobile work using a phenomenological approach in order to draw the emphasis of the domain of study away from knowledge and knowledge management issues (Skok, 1999 and 2007) and into the more complex and blurred spaces of mobile work that is situated and contextually dynamic.

From that perspective, the theoretical framework has used in-depth studies in CSCW (Schimdt, 1998; Olson and Olson, 2000; Dourish 2001) and phenomenological research approaches (Suchman, 1987 and 2007; Pica, 2006) to establish the main areas of research relevant to the domain of study. The product of this elaboration has been a theoretical model of mediation (contextually and situated mICTs) that was presented in section 3.5.2 of this dissertation. The elements of this model have been identified in the empirical research undertaken, from which important conclusions have been drawn.

The idea of placing the mediation of mICTs in a contextual and situated framework is not new to IS. However, the study of the paradigms related to the variables involved in highly mobile work are an alternative theoretical methodology that can benefit the field of information systems when it is concerned not only with a research epistemology but also with the ontological nature of the work undertaken in this type of mediated environment.

The exploration of the notion of being by means of rigorous research method employing a phenomenological approach has brought to light a richly detailed picture of the impact of mICTs on the transformation of the pattern of association of individuals from one of generally loose ties to that associated with the new organisational forms supporting their work. In organisational studies this avenue of research has been under-explored and this dissertation has aimed to contribute to an

understanding of the scope and limitations of those approaches.

7.2.2 Methodological Contributions

This dissertation takes as its premise the idea that in order to understand the domain of study in terms of roles, functions and organisational issues, it is necessary to take the research subject's voice as the main source of information. As explained in Chapter 4, a combination of ethnomethodological research with Remote Real Time Recording (RRTR) methods was used. In doing so the source of data collection has been shifted to the workers themselves and their perspective of daily work.

There were many challenges in obtaining the data and in codifying and processing the information. However the information collected provides a unique and original set of data about Black Cab work in a period of significant transition from a job relying on primary knowledge to one dependent on mICTs, where the demand for workers' skills such as the Knowledge are reduced.

Since this dissertation has tried to keep the interpretation of the data as close to the original source as possible, discretion was used in describing and processing what is quite apparent in mobile work. When interpreting self-referential work, it was necessary to take into account the relative perception of the observer used in the narrative of events. Certain aspects of the narrative were given greater emphasis: those that were seen to describe the evolution of new working practices, of new spatial and virtual identities reflected in the awareness of the work performed, and of new organisational forms.

7.2.3 Practical Contributions

Due to the support provided for the collection of empirical data by some of the Black Cab communities in London, early partial reports on the work completed have been published in the form of articles and book chapters (see Appendix) addressing particular areas of the data collected. The tables presented in Chapter 5 (5.5 and 5.6) are a novel and new form of analysis when comparing the different operational models of Black Cab work and received interesting and complementary comments when presented to the cab companies' management teams.

Most of the ideas discussed in the dissertation have been exposed to discussion at

managerial level in one of the companies providing computer cab booking systems and also presented at conferences and seminars. Some of the analysis work was published in collaboration with other researchers at the LSE and other universities (see Appendix 2).

This interest in the research is a significant indication of the importance of mICT research work in environments such as those of highly mobile workers, where there is a need to understand the evolution in the concept of what work is, its limits and boundaries.

7.3 Implications of the Research Approach

This research draws on the expertise of a wide body of research in mobile studies. It has already been highlighted throughout this document that there is no unifying theory of mobile studies, and there is a diversity of methodologies in use. These two factors have posed a positive challenge for the research agenda in this dissertation.

7.3.1 Research Design Limitations

The most difficult area to overcome in this research was that of methodology. The choice of ethnography and RRTR somewhat limited the scope of the data collection. In the analysis of the interviews and observations, finding the relevant categories was a challenging task. The volume of data had an adverse affect on the time and effort dedicated to its interpretation, which could have been amplified had an attempt been made to reconstruct mobile activities out of the situated event.

The author of this dissertation has hardly any experience of driving in London and like many Londoners started this research with a somewhat naïve view of what Black Cab work was and the context in which the work is done. It took a considerable amount of time to establish strong and significant relationships in the Black Cab community that were reliable enough to allow the research to be carried out.

Moreover, in order to understand contextually what actually happens in the situated everyday work of the research subjects, there were a number of legal, physical and methodological constraints to overcome. This was achieved by a combination of

insight and progressive creative thinking. This led to the empirical development of RRTR as a complementary method for the collection of the data in this research.

The volume of data collected implied that the process for data transcription and codification took a considerable length of time (nearly 12 months). This delay was to be expected since it is a common issue in this type of ethnomethodological research. In theoretical terms the use of an interpretative phenomenological approach for the analysis appears to have been the correct choice for the research; however some limitations are listed in the section below.

7.3.2 Adequacy of the Research Framework in Future Research

The theoretical framework did not adopt a single or primary voice for framing the research questions. Ambiguities were often observed in the conflicting interpretations about an organisational situation, even if predominantly self-referential for a single orientated task. Such contradictions could not be resolved using only an ethnographic approach, leaving many theoretical avenues unchallenged, and open to future research.

In terms of presenting a model for Black Cab work mediated by mICTs, further philosophical work in the model might be required to interpolate relationships to some of the boundary elements of the model. Relying on self-referentiality for describing Black Cab work has risked overlooking an objective view of what actually constitutes this work. It simplifies some of the core issues affecting mobile work that is mediated by mICTs, but at the same time it offers the possibility for the model to be extended to other types of mobile work.

The model of interpretation proposed applies exclusively to environments in which the self-referentiality of the worker is challenged by the use of mICTs in working practices and organisational forms, yet even in such environments workers still revert to self-referentiality, unmediated by mICT, in order to progress in their work. The scope of the model is therefore restricted, and there is room for it to be extended.

7.4 Areas of Future Research

This research is placed in the context of a number of studies of work and mICT interventions undertaken at the London School of Economics and Political Science by the Mobility Group (http://mobility.lse.ac.uk) since 2001. The primary agenda of this research group has been to establish an overall appreciation of the macro- and micro-dynamics of mobile work mediated by mICTs.

This research takes the first step towards research into the evolution of working practices of semi-professional workers, from requiring a high level of skill to a significant depreciation of that skill level, and perhaps over time to the complete transfer of such skills to the embedded mICT tools used to support their work. This is a rich area of exploration in terms of the sociology of work, which is needed in order to understand the effect of computing artefacts on the nature of work, effects already envisioned and denounced by Illich (1977), and further articulated by Zuboff (1988) as a fundamental change in the social considerations of what work is and how it is done.

There have been many studies of working practices from the perspective of management, but few have included self-referential work. There is a rich area for research exploration in terms of the sociology of work applied to this type of work, which is closely aligned to socio-technical studies aiming to understand the effect of computing artefacts on the nature of work, first proposed by Zuboff (1988), and later explored by Suchman (1987, 2007) and Orr (1996).

This research has also opened another research avenue by taking into account the effects mICTs have on well-established working practices, not only in creating a shift away from a self-referential type of work, but also in creating new inter-worker relationships and changing the perception of work, as well as radically altering the organisational forms that can be used to support this type of work adequately.

The implication of the social changes associated with the shift in the balance of knowledge from the worker to the mICT artefacts provides another important field of research: the ways in which changes to work requirements will affect the workers and their idea of their work. Furthermore, the long term impact of those changes on

the structure and requirements of the work need to be studied.

As mentioned in 7.2.3, there has been significant interest in this research as part of the work on mICTs, which is likely to encourage the allocation of further resources to explore this important area of mobility and mobile studies from the socio-technical point of view.

APPENDIX 1

RRTR SAMPLES OF RECORDING DESCRIPTIONS

Week 24 Mar 2005	IMG_0002.AVI	Driver driving along. Listening to radio and flicking between mobile screens.
	IMG_0003.AVI	Driver driving along. No phone calls. Radio on, passenger on board.
	IMG_007.AVI or Long_ride.AVI	Passenger in the back of the cab asks where to be dropped off. Passenger is let off and asked if they require a receipt. They do not. Driver drives on with the radio on. Voice of controller comes on the radio with another fare. Passenger is picked up and dropped off without requiring a receipt. Then the voice of the Zingo controller comes over the radio giving him a fare with the password William, and is told to pick up the passenger outside 27 Kensington Gardens. When he arrives at the address taxi driver calls the passenger to let him know his Zingo driver is outside. Picks up passenger and drives on. No phone calls.
	IMG_008.AVI or Zingo_booking.AVI	Taxi driver driving along with music blaring on the radio. Call from Zingo controller saying he has a passenger reference Nelson. Driver talks to passenger and is told to pick him up at 1Alma Terrace. Driver says he'll be there in four minutes and that he will call him when he is outside. Drives on.
Week 07 Apr 2005	IMG_0001.AVI	Start of tape is him talking to a colleague about how to get somewhere. Conversation lasts for nearly all of the tape which is nearly ten minutes. Gets out of his cab at the end of the tape to help a passenger with their luggage.
	IMG _0002.AVI	Driving along during the evening as it is dark outside. Makes a phone call to his friend which lasts for the rest of the tape which is nearly three minutes.
	IMG _0003.AVI	Again it is night time. He's talking to a friend/colleague on the phone about which areas to avoid due to traffic and which areas are busy. Talks of his schedule the next day and how he plans to go to the airports. This one conversation lasts for the whole tape which is just off ten minutes long.
	IMG _0005.AVI	Driving and looking for jobs from the street as well as looking to GPS anxiously seeking work.
	IMG _0006.AVI	driving along before searching for work from streets and system.
	IMG –0008.AVI	Again he is driving at night whilst talking on his blue tooth to a friend/colleague.
	IMG _0009.AVI	Again is driving at night. Says he has to do a text, and that he has put it on the thing where you just press a button and it works out what word you can use. Stops for a moment to do the text and then drives on. Few minutes of him driving along before he starts talking on the phone to one of his colleagues. Stops and lets his passenger off without hanging up the phone and then continues the conversation as he drives off. Conversation lasts for virtually ten minutes. Stops to pick up a passenger from the street - few minutes of him talking to his customer about where to go. Picks up phone conversation where he left off. Conversation lasts for the rest of the video which is just over another eight minutes as he is driving his fare to where they want to go.
	IMG _0010.AVI	driving along at night with the radio on in the background. Passenger on the back. Checking traffic.

Week 12 Apr 2005	IMG_0001.AVI	Very brief take of the driver getting ready to start work.
	IMG_0002.AVI	Driving along fiddling with the radio until he decides to ring his wife. Tells her he left about ten minutes ago and that he should be home about 1- 1.30pm. The conversation lasts about five minutes or so with his wife before he hangs up and continues driving. Drives for a few minutes without making a phone call and smokes a cigarette. Calls his friend May and leaves a brief voicemail. Only a couple of minutes before he makes another phone call to a colleague. This one lasts about four minutes before he hangs up saying he will speak to his friend in a minute due to the fact that his friend has come through from the 3 tariff on the T Mobile. Says in a moment he will switch off his Bluetooth on his other phone and switch on his blue tooth on his T Mobile phone. Picks up a passenger from the street who wishes to go to Euston. Puts on the radio and switches over his Bluetooth. Then speaks to his friend he was speaking to earlier on the T Mobile phone which is cheaper. Tape cuts off.
	IMG_003.AVI	Answers a personal call from one of his colleagues where he talks about where he is and what the traffic is like. Opens a can of drink when stationary and carries on driving whilst talking to his friend. On the phone throughout the tape which lasts nearly three minutes.
	IMG_004.AVI	Short video driving and listening to the radio.
	IMG_006.AVI	Driving along in daylight. Less than a minute and a half before he calls his brother whom he chats to for nearly eight minutes before hanging up. Less than a minute goes by before he says he is about to do a text message. He does this as he is driving and it takes about five minutes as he is driving along. During the tape which lasts twelve minutes, eleven minutes of it is spent with him on the phone, talking to his brother and sending a text message.
Week 28 Apr 2005	IMG_0001.AVI	Small take in of driver getting ready to work. Checks if mobile is in place.
	IMG_0002.AVI	Driving along with his blue tooth in. Adjusts his headset and checks GPS. Music on the radio. Telephones his wife to tell her he left the house fifteen minutes ago and left the kids playing Playstation in the bedroom. Says he'll be home about 1.30pm, and then starts talking about a delivery they are expecting and the painting he needs to do in the house. Driving along with his blue tooth in. Then he makes another personal call to a friend of his and leaves him a voice message. Calls another friend and starts chatting to him. Laughing and talking on the mobile. Swaps phones as his friend has come through to the 3 tariff on the T Mobile. Says that in a minute he will switch off the blue tooth on his other phone and switch back on his blue tooth on his T Mobile phone. Picks up a passenger from the street who wishes to go to Euston. Starts to adjust the radio so he can listen to the traffic news. Keeps on driving with his passenger in the back whilst talking to his friend on the Bluetooth about the state of the traffic and last night's football match.
	IMG_0005.AVI	Driving along with his blue tooth in. Calls a friend and leaves a brief message that it's Ronnie calling and then hangs up. End of tape.
	IMG_0006.AVI	Driving along whilst fumbling about for his blue tooth. Just tape of him driving, no phone calls.
	IMG_0007.AVI	Tape starts with him talking to one of his friends on the phone. Conversation goes on for the whole of the tape which is nearly ten minutes before it cuts off.
	IMG_0008.AVI	Drinking coffee stationary.
	IMG_0010.AVI	Driving along listening to the radio whilst having a personal conversation with a colleague on his phone. Talking about how phones have gone down so much in price and how the technology is improving so rapidly. Hangs up and continues driving.
	IMG_0011.AVI	Starts with him driving along talking to a friend on the phone about some of the stupid drivers he has encountered recently on the road. Conversation lasts for over eight minutes before he hangs up. Immediately makes another personal phone call to his wife. During the whole tape of nearly thirteen minutes he is on the phone with personal phone call

	IMG_0015.AVI	Starts the tape by saying he has just received a text message, which he replies to once he is stationary for a moment. Says he's just switched on his 3 phone as it is not free on his T Mobile yet and is free across all networks. Switched from his Nokia phone to his 3 phone which is Motorola. Says his 3 phone is a touch ring so is very easy to use. Makes a very quick phone call on his 3 phone. Answers another personal call from his wife after saying he hasn't quite got the answer machine sussed out on the 3 phones. Conversation lasts bout seven minutes. Drives along for only a few minutes before he rings his wife again. This conversation lasts for the rest of the tape, which is over twenty-five minutes, and he is still on the phone when he drops his passenger off and collects the fare from them of £10.60. Then he makes a phone call to the company who is supposed to be delivering the trampoline for his daughter's birthday, which was supposed to be delivered today but wasn't. This call lasts nearly ten minutes before the tape cuts off.
Week 26 May 2005	IMG_0001.AVI	Taxi driver driving along rather rapidly when he receives a text message. Then the video just continues showing the taxi driver driving along.
	IMG_0002.AVI	Shot only of taxi driver driving very quickly.
	IMG_0005.AVI	Shot of driver driving along with his phone in his right hand and using only his left hand to steer the vehicle.
	IMG_0006.AVI	Taxi driver again driving along with his phone in his right hand and his left arm balancing on the steering wheel. Calls are unrelated to business – his wife about the shopping and his friend about golf. A couple of beeps on his phone also signifying he has received a couple of text messages.
Week 16 Jul 2005	IMG_0001.AVI	Driving along and putting on his blue tooth at the same time. Goes straight through to directories and asks for the phone number for a Mrs Beryl Langford in Drew Gardens, Greenford, Middlesex. Keeps driving the cab whilst getting a pen out. Speaks to Beryl and says she left a message and what can he do for her. Arranges to be with her at 9.00am to 9.30am Sunday morning, and he will give her a call when he is on his way.
	IMG_0003.AVI	Driving along for only a couple of minutes before he makes a phone call regarding fees for one of his children's activities. Stops and jots the figure down on a piece of paper, which works out to £395 for six months. Tape stops.
	IMG_0004.AVI	Driving along with the radio playing in the background. Stops and picks up a female customer who wants to get to London Bridge, and wishes to be dropped at Green Park underground station. Continues driving with the radio on softly in the background. Makes a call regarding his son's judo class. The next call he makes is to his wife at home to let her know he has found out about the judo classes and what they will cost. Talks to her for well over five minutes before the end of the tape.
	IMG_0005.AVI	Only driving for a couple of minutes before he makes a phone call to his wife regarding family issues and events. Talks to his wife regarding up and coming family social events for the entire rest of the tape, which is close to twenty minutes.
	IMG_0007.AVI	Zipping a cold drink while waiting.
	IMG_0010.AVI	Right at the start of the tape he calls a colleague up and talks to him for the whole of the tape, which is twelve minutes, nearly from the beginning to the very end of the tape.
	IMG_0011.AVI	Driving along chatting with his colleague on the blue tooth about how little traffic there is on the roads and how badly people are driving on the roads. The conversation lasts until the end of the tape, which are twelve or thirteen minutes at least.
	IMG_0013.AVI	Telephone rings and it is one of his mates calling. Laughing and chatting to his mate while driving along. Trying to figure out the quickest way to Kings Cross. Can hear his friend talking to him as well via the blue tooth. The whole tape of ten minutes involves this conversation with one of his mates. At the end of the tape he gets a pick up over the radio and says goodbye to his friend.

	IMG_0015.AVI	Right from the start of the tape he is talking to a colleague/friend via the blue tooth as well as addressing certain comments about what route he is taking to the customer in the back of his cab. Talking to his mate continually on the blue tooth as he drives, gets himself a sip of soda and lights up a cigarette. After twenty-five minutes he is still talking to the same friend, which is nearly up until the end of the film. Just at the end of the tape he stops for a fare and tells her it is no smoking in his cab – she still gets in.
Week 15 Sep 2005	IMG_0001.AVI	Calls his friend Grant and leaves a voice message. Then calls up another friend/colleague and starts chatting to him. Drives along chatting to his mate on the blue tooth for the whole rest of the video, which lasts for seventeen minutes.
	IMG_0012.AVI	Just a minute of him driving with the radio on in the background.
	IMG_0013.AVI	Having a cold drink and talking to friend about the weather.
	IMG_0014.AVI	Clear view of his mobile phone in its stand on the dashboard of his taxi. He is trying to find out how many free minutes he has got left.
	IMG_0017.AVI	Drives along for less than a minute before making a phone call to his wife, which lasts for nearly seven minutes before he gets a fare coming through Zingo. Stops speaking to his wife while he talks to the Zingo customer but keeps her on the line at the same time. Hangs up with his wife after ten minutes, which is a minute short of all the tape.
	IMG_ 0018.AVI	Driving along with his mobile phone in his right hand. Once he has adjusted his blue tooth you hear him having a conversation with one of his cabbie friends which only lasts for five minutes. Stops to discuss routes with the passenger in the back of his cab as well as telling his friend Trevor how to get to a certain place on the telephone. When stopped at a red light he puts on his headset and speaks to his friend Alan about playing football on the Wednesday. This turns in to a detailed conversation regarding all aspects of football. The telephone conversation lasts for over twenty five minutes.
	IMG_0019.AVI	Driving along whilst trying to put his headset on. Calls a friend who he hopes he hasn't woken up. Chats to his mate about the service about to be done on his cab. Talks to him for nearly seven minutes before he hangs up and it is the end of the tape.
	IMG_0020.AVI	Start of the tape he is talking to a colleague on the blue tooth when he gets a call through Zingo. Apologises to his mate for this and continues chatting. After nearly seven minutes he arrives at the destination where he is to pick up his Zingo customer. All the time he is still talking on the blue tooth. Then he manages to have a conversation with his mate on the phone at the same time as with the customer in the back of his cab. Still doesn't hang up until a minute from the end of the tape, which is twenty-two minutes long.
Week 14 Nov 2005	IMG_0001.AVI	Driving along and talking on the phone about other things other than business – first of all to a friend regarding break pads on the car being worn down because of the turbo, then to a colleague/friend regarding avoiding Canary Wharf, and then he refers to telephones in that he has two mobile phones – one with 3 network, one with T Mobile which has three thousand free minutes, and then a land line, so he never runs out of talk time. Then he starts talking to his wife on the phone when he gets a fare to take someone to Sloane Square. Here him cursing other drivers on the way. Finally finds number 3 Sloane Square and drops his passenger.
	IMG_0002.AVI	Again driver driving along talking to a friend about his daughter's birthday. Picks up a fare, somebody he appears to know as a regular customer, who wishes to go to Marchmont Street near the Brunswick Centre. He then slows down to drop his passenger near the roundabout so he can walk through, but the passenger wishes to stay in the cab and be driven round. Drops his passenger off and takes the three pound forty cab fare from him. After this he drives off and continues to have another personal conversation with another friend about his wife's blue tooth

	IMG_0003.AVI	Driving along talking on the phone to a friend about phone contracts, particularly the T Mobile contract for business customers only which is £15 a month plus VAT for 3,000 free minutes for the same tariff during the day as the night which is good as he has been working a lot of days recently. Recommends that his friend goes into the shop to purchase the phone as you have to show proof that you are a business customer. Says he will get rid of his 3 phones when his contract is up as most of the people he knows are T Mobile. Mentions that when his friend was over visiting from Greece recently they chatted on the phone together so much that his T Mobile bill came to £130, which was quite a shock, Mentions the phone you get with the contract is the new Nokia and that it puts ones mind at rest knowing that the bill will be always £15 a month as it would be impossible to use up all the free minutes particularly as a lot of the people he talks to are other T Mobile customers or land lines. Finishes conversation with friend and continues driving.
	IMG-0004.AV1	Again driving and talking to a friend on the phone about how good the T Mobile contract is – he has now got rid of the 3 phone, as 80% of the people he knows are T Mobile anyway. Tells his friend how this new business contract with T Mobile has really taken the pressure off. As he has been working quite a lot of days recently it is good that the price of calls doesn't vary in the day or in the night. He then mentions that you also get 100 free texts with the package, a saving of £3.00 a month, and that international calls are only 50p a minute also.
Week 17 Jan 2006	IMG_0001.AVI	Talking on phone, personal call. Describes his journey around Grays Inn Road and then through Kings Cross. Keeps driving and talking to his friend on the phone. Fare comes over the radio. Drives off to pick up passenger, whilst making a business phone call.
	IMG_002.AVI	Talking to passenger about where they want to be dropped off. Drops off passenger, tells him the fare is £7.20 and asks if he wants a receipt. Gives him his receipt and drives off. Puts on headset for telephone, and plugs in his other phone, which has some free minutes on it. Makes a personal call to a friend. Has his blue tooth on his other phone. Phone call goes on for over fifteen minutes. Voice of controller comes over the radio giving him a fare in Neasden. Makes another phone call to a friend and leaves a message. Then makes another phone call to another friend and leaves a message saying he'll call back later.
	IMG_0003.AVI	Cab is stationary waiting for a client. Drives off whilst talking to the customer. Comments on a driver who cuts straight through everyone and is now three vehicles ahead of him. Plans to work until about 3pm. Starts talking about a fare that was sick all over the back of his taxi, and then wanted to carry on. He got a £53 tip, but that ruined his night. Hope it smells all right for his customer, and says today he is going to get the carpet steam cleaned and if it still isn't good enough he'll get a new carpet. Talks about two people he picked up on the Uxbridge Road who had walked all the way from Acton who gave him £25 as they were so grateful someone had picked them up. Stops and helps his customer out of the taxi with her luggage. Picks up another customer and starts talking to them. Most of the rest of the video is just him talking to the customer in the back of his cab about general things - no mention of mobile phones.
	IMG_004.AVI	Little happens except a call from Zingo that is missed out.
	IMG_0005.AVI	Driving along with the radio on softly in the background. Passenger in the back. Texting as driving.

APPENDIX 2

LIST OF PUBLICATIONS

Articles in Conferences / Workshops

2008 Elaluf-Calderwood, S *Contextual and situated mobile work - A delicate balance on the choice of work: The Case of the London Black Cab Driver*, EGOS Colloquium 'Upsetting Organizations' in sub-theme Sub-theme 27: Spatial Mobility and Mobile Technology at Work: Examining the Dark Side in Amsterdam, 10-12 July 2008.

2008 Sørensen, C., A. Al-Taitoon, J. Kietzmann, D. Pica, G. Wiredu, S. Elaluf-Calderwood, K. Boateng, M. Kakihara, & D. Gibson: *Enterprise Mobility: Lessons from the Field.* Information Knowledge Systems Management Journal, vol. 7, no. 1 & 2 - Special issue on Enterprise Mobility, pp. 243-271.

2006 Elaluf-Calderwood, S *The case study for Black Cab Drivers: Recording Mobile settings and Mobile ICTs interaction at work* – Royal Geographical Society-IBG Annual International Conference, London.

2005 Elaluf-Calderwood, S and Sørensen C, *The Knowledge and The System: Support for London Black Cab Work*. IFIP TC8 Working Conference on Mobile Information Systems (MOBIS) Leeds, UK

2005 Elaluf-Calderwood, S Kietzmann, Jan and Saccol, Amarolianda Z *Methodological Approach for Mobile Studies: Empirical Research Considerations*. Conference Proceedings 4th European Conference on Research Methods in Business and Management, Paris, France.

2004 Elaluf-Calderwood, S and Sørensen, C - *Mobile Work-Mobile Life*, 5th World Wireless Conference Proceedings, University of Surrey, UK

Book Chapters

2008 Elaluf-Calderwood, S and Sørensen, C *From independent to interdependent collaborative work: The role of mICT interventions in Highly Mobile Work*. Mobile Technology/Work: Changing Patterns of Spatial Mobility and Mobile Technology Use in Work (Book Chapter). Donald Hislop (Editor), Sheffield University Management School (To be released for sale in July). Routledge.

2006 Elaluf-Calderwood, S and Sørensen, C *Organizational Agility with Mobile ICT?* The case of London Black Cab work. Agile Information Systems (Book Chapter), Kevin Desouza (Editor). Elsevier.

Peer blogs about this research work

http://liftlab.com/think/fabien/2008/01/18/organizational-agility-with-mobile-ict/

APPENDIX 3

PUBLIC CARRIAGE OFFICE BLACK CAB REQUIREMENTS (SOURCE: TRANSPORT FOR LONDON ONLINE)

1. Becoming a Driver

   As a licensed driver you can be a self employed business person with the freedom to work as and when you wish on a 24/7 basis, 365 days a year.
   Alternatively, many licensed private hire drivers enjoy the benefits of being employed by a licensed operator. This flexibility affords the opportunity to have a worthwhile career to meet your own personal circumstances and requirements.
   By becoming either a taxi or private hire driver you can play a part in delivering safe, reliable and integrated transport to all those who live in, work in or visit London.
   The opportunity to have a career as a licensed driver in London is open to all and TfL is particularly keen to attract people who reflect the diversity of London's population

2. Applications

   An application form is required, which can be send to the address of the driver using an online form. Further information can be obtained at:
   Call 0845 602 7000 (8am to 5pm Monday to Friday except bank holidays)
   Fax 020 7126 1897
   Email enquiries@pco.org.uk

3. Requirements

Categories	Taxi	Private Hire
Minimum Age	21	21
Character	Enhanced CRB check	Enhanced CRB check
Medical Fitness	DVLA Group 2	DVLA Group 2
Route finding skills	Learning the 'Knowledge'	Map reading and route planning skills
Driving ability	Full DVLA, NI or EEA driving licence DSA Taxi Driving Test	Full DVLA, NI or EEA driving licence 3 years driving experience

3.1 Age

To be a licensed driver you must be at least 21 years of age. There is no upper age limit, provided you meet the other licensing requirements.

3.2 Character

The Licensing Authority has to be satisfied that the drivers it licenses are safe, honest and trustworthy. Therefore every applicant is the subject of a criminal record check before being licensed. This is done by asking you to obtain an enhanced criminal records check from the Criminal Records Bureau, an agency of the Home Office. We will also look at your driving licence to see if you have any driving convictions.

Having a driving or criminal conviction will not necessarily prevent you from becoming licensed - it depends what the conviction was for, the sentence imposed and how long ago it was.

3.3 Medical Fitness

Taxi and private hire drivers are professional drivers carrying passengers for hire and reward. The Licensing Authority has determined that for this reason a higher standard of medical fitness is required than that needed for a standard DVLA driving licence. The standards applied, called Group 2 Standards, are those required for drivers of large goods vehicles, buses and coaches. The standards are based upon DVLA Group 2, and are similar to those required for drivers of large goods vehicles, buses and coaches.

If you apply to be licensed you will be required to prove your medical fitness by undergoing a medical examination with your GP. It is difficult to cover all possibilities, but certain conditions such as epilepsy, poor eyesight, insulin treated diabetes and serious heart problems could result in an application being refused. If you are in any doubt about a condition you have, you may wish to consult your GP before you apply.

3.4 Route finding skills for private hire drivers

Because private hire journeys are pre-booked, private hire drivers have the opportunity to plan a journey in advance. Therefore they do not need the detailed knowledge required of taxi drivers. Nevertheless, if you wish to be licensed as a private hire driver you will need to be able to demonstrate a range of route finding skills such as map reading and route selection, which allow you to plan a journey.

3.4a Route finding skills for taxi drivers

As taxis can be hailed in the street with no advance warning of where a passenger might want to go, a taxi driver must have a thorough knowledge of the capital. It is for this reason that taxi drivers have to learn the world famous 'Knowledge'.

If you want to be an All-London taxi driver you will need a detailed knowledge of all the streets and places of interest in central London with a more general knowledge of the major arterial routes throughout the rest of London.

If you choose to apply for a suburban licence you will be required to have a detailed knowledge of your chosen sector along with a more general knowledge of central London.

Once you have studied your chosen area you will be tested on your knowledge by PCO examiners in a series of examinations.

How long it takes to complete the Knowledge is dependent on your ability, effort and commitment. On average, it takes four years to be licensed as an

All-London taxi driver, two years for a Suburban driver. However, many applicants complete the Knowledge much quicker than this. This may seem like a long time but the rewards to be gained once you are licensed make it worthwhile.

You can apply to start learning the All-London Knowledge from the age of 18. Suburban applicants cannot apply until they are 21.

3.4b Route finding skills for private hire drivers

- Because private hire journeys are booked, private hire drivers have the opportunity to plan a journey in advance
- They do not need the detailed knowledge required of taxi drivers
- If you wish to be licensed as a private hire driver you will need to be able to demonstrate a range of route finding skills such as map reading and route selection, which allow you to plan a journey.

The PCO has accredited a number of assessors and topographical testing centres.

A licence will not be granted without proof of topographical skills.

3.5 Driving Ability

All licensed drivers must hold a full DVLA, Northern Ireland or European Economic Area (EEA) state driving licence.

The other EEA states are: Austria, Greece, Malta, Belgium. Hungary, Netherlands, Cyprus, Iceland, Norway, Czech Republic, Ireland, Poland, Denmark, Italy, Portugal, Estonia, Latvia, Slovakia, Finland, Liechtenstein, Slovenia, France, Lithuania, Spain, Germany, Luxembourg, Sweden.

To obtain a private hire driver's licence you will need to have held one of the above licences for at least three years.

As a taxi is a purpose built vehicle that has different driving characteristics from a standard car and has special features to assist people with disabilities, if you want to be licensed as a taxi driver you will need to take an additional driving test in a licensed taxi.

If you have a disability you can still become licensed as either a taxi or private hire driver but you may have to have your driving ability assessed independently, in a suitably modified vehicle if appropriate.

4. Licence Types

4.1 Private hire vehicles

Private hire vehicles can only be booked in advance through a licensed private hire operator. Widely referred to as 'minicabs', private hire vehicles also include executive cars, limousines and chauffeur services.

Private hire drivers are not restricted as to where in London they can work as long as they only undertake bookings made through a licensed operator.

Everyone who drives a private hire vehicle in London needs to obtain a private hire driver's licence.

4.2 Taxis - All London or Suburban licences

A taxi 'plies for hire' and can be hailed in the street. Alternatively they can be found waiting at a taxi rank. The majority of taxis can carry 5 passengers and all are wheelchair accessible. The fares charged by licensed taxis are regulated by TfL. Taxis are also known as 'black cabs' or 'hackney carriages'.

If you want to ply for hire as a taxi driver you will need to obtain one of two types of taxi driver's licence - all-London or Suburban.

4.2.1 All-London

The driver is licensed to ply for hire anywhere within the Greater London area. If you wish to work as a taxi driver in central London or at London Heathrow Airport you need an All-London licence.

4.2.2 Suburban

The suburban area of London is divided into nine sectors as shown below. The sectors are based on borough boundaries and suburban drivers can ply for hire only within the sector(s) for which they are licensed. Drivers may add additional sectors once licensed.
If you are thinking of becoming a suburban taxi driver you need to make an informed decision on your choice of sector. You should ask yourself the following questions.

- Are there too many drivers in my chosen sector?
- Is there enough work in my chosen sector bearing in mind the number of licensed drivers?
- Would I be better choosing a sector with fewer drivers?

You are strongly advised to find out as much as you can about your chosen sector before applying. This can be done by observing taxi activity at different locations throughout the day and week, and by speaking to working taxi drivers.

5. Fees (prices for 2008)

5.1 Taxi Driver Applicants

- Written Test Fee (prior to Knowledge appearances) for All London applicants only £50
- One-off Knowledge of London appearance fee for Suburban Applicants £150
- One-off Knowledge of London appearance fee for All London Applicants £200
- DSA Hackney Carriage driving test (including wheelchair test). Normal hours (Monday to Friday 0900-1700) £68/ Evenings and Saturdays £82.50

5.2 Private Hire Drivers

- Private Hire Driver licence application £105
- 3 Year Private Hire Driver Licence £157

Other fees:

- Taxi Drivers
  Taxi driver application fee £50
  3 Year Taxi Driver Licence £199
- Taxi Vehicles
  Taxi Vehicle Licence Application and Inspection £107
  1 Year Taxi Vehicle Licence £71

- Private Hire Operators
  Private Hire Operator Licence Application £703
  Private Hire Operator 5 Year Licence (standard) £1,707
  Private Hire Operator 5 Year Licence (small) £550
  Private Hire Operator Licence Variation £25
- Private Hire Vehicles
  Private Hire Vehicle Application and Inspection £82
  1 year Private Hire Vehicle Licence £27
- Other fees
  Enhanced CRB Disclosure application fee £36

5.4 Medical examination

The medical report cannot be issued free of charge as part of the National Health Service. The applicant or licensee must pay the medical practitioner's fee, unless other arrangements have been made
On average between £60 and £120

6. The Knowledge

As a licensed taxi driver in the Capital you must have a detailed knowledge of roads and places of interest in London - the 'Knowledge'.
How many of the routes (runs) and places of interest you need to know will depend on whether you want to be an All London or a Suburban driver.

6.2 All London driver

You must have a detailed knowledge of London within a six mile radius of Charing Cross. There are 320 runs which you need to know as well as places of interest and important landmarks on the routes.
The part of your brain associated with navigation will grow as you learn the Knowledge.
On average it takes an All London applicant 40 months to learn the Knowledge and pass the exams.

6.3 Suburban driver

As a suburban driver you must know between 30 and 51 runs in detail, depending on your chosen sector. You will also need to know places of interest and important landmarks on the routes.
On average it takes a suburban applicant 36 months to learn the Knowledge and pass the exams.

6.4 Learning the Knowledge

Before starting to learn the Knowledge you will be invited to the PCO for an introductory talk. Here you will be given a copy of the famous Blue Book (the Guide to Learning the Knowledge of London) plus advice on how to learn the Knowledge.
To help you learn the Knowledge there a number of independent 'Knowledge schools' throughout London that provide teaching and support services.

6.5 Did you know your brain will grow?

The part of your brain associated with navigation will grow as you learn the Knowledge and then put it into practice. Your grey matter will literally enlarge and adapt to help you store a detailed mental map of the city.

6.6 Passing the exam

When you have learnt all the runs you can attend the PCO to be examined on the Knowledge. The examination system consists of

- A basic written examination
- A series of one-to-one interviews, called 'appearances'. You will be given the start and finish points of imaginary taxi journeys and will have to describe the shortest route between them.

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