Exploring Enterprise Mobility

Lessons From the Field

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Abstract: The mobile phone has received global attention as a consumer technology. However, we believe that mobile information technologies will play a significant role in organisational efforts to innovate current practices and have significant economic impact. The evolution of new ways of managing how people work together using these technologies will form an integral part of efforts to improve the efficiency and effectiveness of information work. This belief is, however, not reflected in the current selection of books and collections exploring the issue of enterprise mobility. The aim of this paper is to highlight some of the key challenges in the application of mobile information technology to improve organisational efficiency. This is accomplished through comparing and contrasting findings from a selection of 11 empirical studies of enterprise mobility with IT conducted between 2001 and 2007 at the mobility.lse.ac.uk unit. The paper argues that the debate so far has largely failed to embed glowing accounts for technological potential in a sound discussion of organisational realities. In particular, there has been a lack of balanced accounts of the implicit and explicit trade-offs involved in mobilising the interaction between members of the workforce.

Keywords: Enterprise mobility, empirical studies, critical issues

1 Introduction

Mobile technology has in general and the mobile phone in particular fuelled people's imagination by offering a rich medium for social experiments (www.mobilelife2007.co.uk). One of the persistent issues in the use of this technology is its ability to support users in breaking down temporal and spatial boundaries, for example between home life and work life. In this sense, one of the persistent means of mobile interaction in organisations is the privately owned mobile phone. However, the challenge to the traditional division between home life and work life emerging with industrialisation is only one of the barriers mobile IT require organisations and individuals to negotiate. Mobile IT is increasingly moving up on the lists of important technological concerns for organisations not only because it provides opportunities but also because the pressures on organisations to perform and to effectivise information work forms a rich substrate in which the technological promises can be cultivated. It is, in other words, a two-way street. When the first mobile phones were commercially introduced in the 1980s, they were only considered ones to be used in certain fixed locations outside the office, such as the car, a remote office or a building site (Agar, 2003). What we have witnessed the past few decades is a global experiment in joint technological sophistication and emerging interaction practices. As a result, it is almost impossible to find a business person who does not carry a mobile phone, and increasingly the phones will have personal computer capabilities for example supporting email and web access. The distinguishing characteristic of this socio-technical development is the joint forces of the technology being closly associated with the body and the variety of ways it supports remote interaction with others and with informational resources. As with any new technology, organisations need to establish how using the technology and associated changes to the way work is done can lead to improvements.

The aim of this paper is to contribute to the discussion of how mobile information technology can play a role in improving organisational efficiency by synthesising results from ongoing research efforts at mobility.lse.ac.uk since 2001. As part of our research we have conducted a number of in-depth studies of how organisations and individuals use mobile information technology. The research has been written up in various academic deliverables but we have so far not documented the important lessons learnt across these studies. This paper, therefore asks the question: *What are the organisational implications specifically related to the application of mobile information technology?* This question is explored through cross-analysis and synthesis of results from 11 individual qualitative research studies conducted 2001-2007. In our exploration we identify six essential aspects of organisational use of mobile information technology and discuss each in a section. Brief vignettes and context descriptions from 7 of the 11 studies offer rich examples throughout the paper of the diversity of situations in which mobile IT can be deployed to enable organisational

improvements. Due to space limitations all studies have not been included.

The article is structured as follows. Section 2 briefly outlines the research approach across the 11 studies included in the analysis. Section 3 discusses the choice of mediated or situated interaction. Section 4 explores the management of work in terms of organisational control or individual discretion. Section 5 discusses how enterprise mobility relates to choices between individual or collaborative working arrangements. Section 6 investigates the role of technology as either ubiquitous or opaque to the user. Section 7 promotes the distinction between the use of mobile information technology to cultivate existing practices as opposed to transformation of these practices. Section 8 Discusses how mobile information technology can either mediate encounters or more substantially support ongoing relationships. Section 9 Concludes the paper.

2 Studying Enterprise Mobility

The mobility.lse.ac.uk unit was established in 2001 and has since been involved in a number of large qualitative studies of how mobile technologies are used in organisations for various purposes and with a variety of outcomes. Common for all these studies is in-depth qualitative enquiry either through qualitative interviews, direct participant observation, work document analysis, focus group discussions, or participation in projects as action researchers. The subset of 11 selected projects represent all of these data collection techniques. The aim of all the empirical efforts is to inquire into the specifics of how work processes and supporting technologies mutually evolved over time either by investigating the established arrangements or by participating in their initiation. The closeness of mobile information technologies to the body of the user and the the ability of the technology to converge various media are some of the features that make processes of experimentation and complex appropriation common phenomena. Although mobile information technology in some cases may stipulate precise work processes and thereby be less open for users engaging in experimentation, there will most often still be some room for manoeuvre as individual seek to meet their specific needs through the technology in their own preferred ways. The increased use of mobile technologies have further fuelled the discussions of technology and business innovation as conversations, networks of influence (Fontana and Sørensen, 2005; von Hippel, 2005; Haddon et al., 2006). Precisely for this reason, in-depth qualitative methods can serve the valuable purpose of highlighting the specific to understand more fundamental principles. If the technology was quite simple and would only be used for exactly the purposes intended by the designers, macro-perspectives emphasising general trends would be more appropriate.

The 11 in-depth qualitative studies included in this paper all sought to investigate the specifics in the challenges of organisational adoption of technology. Table 1 highlights the studies, which contains a variety of jobs, for example modern professionals mostly working

on their own in and around Tokyo, Middle-East bankers, Black Cab drivers in London, police officers, health professionals, executives and delivery drivers. For each of the studies, key references are indicated for readers with further interest in studying the details.

Whereas each of the studies applied its own set of theoretical assumptions and associated frameworks to analyse and understand the detailed data collected, this paper will seek to draw out more general themes across these detailed studies. The aim has been to identify key-decisions of specific relevance when seeking to improve organisational performance with mobile information technology. There are of course a range of issues that always will be of interest in any type of technological intervention. As these, however, are discussed extensively elsewhere, they will not be discussed in this paper. As a result, the paper will present a fairly high-level view of very deep analyses in each study. Clearly, given this initial cross-analysis of a large number of individual research studies conducted by a group of people over a six year period, and given that the aim of this effort has been to identify major themes for discussion and not to formulate in-depth theoretical contribution, the result can be characterised as primarily representing richness of worldly realism as opposed to tightness of scientific control (Mason, 1989). We have tried to draw out issues of general importance and interest to the readership of both academics and decision makers rather than focus on providing specific in-depth academic debate.

Much research has the past decades sought to explain the role of IT in organisations and quite often this has resulted in generic observations with little theorisation based on the specific characteristics of the IT artefact under consideration (Orlikowski and Iacono, 2001). Clearly, some general socio-technical considerations will appear again and again independently of the specific technologies sought adopted in organisations, for example, issues of organisational implementation, problems of ensuring that work processes and new technology engage in mutual adjustment etc. However, the aim of this paper is to explore some of the key-issues of particular interest when using mobile IT. We wish to begin the process of unlocking the organisational opportunities and challenges of mobile information technology. We essentially ask the question: *What are the organisational implications specifically related to the application of mobile information technology?*

The field-studies of mobile IT outlined in Table 1 has been synthesised into six aspects of particular relevance for the organisational use of mobile IT. We have identified six distinct aspects where the role of mobile information technology must be subjected to organisational design or experimentation. These six aspects relate in general to the understanding of use, adoption and impact of services at the individual, team and organisational level according to Lyytinen & Yoo's (2002) taxonomy of research in mobile information technology. In their taxonomy, Lyytinen & Yoo (2002) categorieses eight major categories of research of mobile information technology, or nomadic information environments as they call it. They

distinguish between the services and infrastructure levels across individuals, teams, organisations and across organisations. In terms of this classification, the six aspects identified through our fieldwork can be esplained and classified as follows. (1) **Interaction** as *situated* or *mediated* by technology explores individual level services impact; (2) the **management** of activities in terms of individual *discretion* or organisational *control*, which denotes the possible conflicts between services requitements at different organisational levels; (3) organisation of **collaboration** as *individual* or *collective* work relates to individual and team-level services opportunities with mobile IT; (4) the role of **technology** in everyday use as *ubiquitous* or *opaque* is concerned with individual services use and impact; (5) the **organisational opportunities** for either *cultivation* or *transformation* of existing working practices relates to organisation level services impacts; and (6) the inherent characteristics of the **services** provided through mobile information technology as either mediating *encounters* or *relationships* investigates the IT artifact itself and as such relates more to Lyytinen & Yoo's (2002) infrastructure level category of research issues.

3 Interaction: Mediated or Situated?

Vignette Study 1: It is 4pm in the afternoon in Japan. Hiro, the CEO of a small company developing various digital services for Internet-enabled mobile phones and television, walks down the main street in Tokyo's Akihabara district. He is engaged in one of his favourite past-times; to find inspiration for new services through immersing himself in Tokyo street-life. He observes what people do, what they buy and wear. Being in the field of the Japanese consumer is a source of inspiration to Hiro, and he characterises this behaviour as "being analogue" as opposed to surfing the Internet for inspiration. Wandering the streets of Tokyo is an important way for him to get new ideas for his company. The company only employs around a dozen people and he is the hub of most activities. Whilst traversing through Tokyo as a mobile age flaneûr he is therefore subjected to a massive amount of requests for interaction through emails and calls to his mobile phone. He uses a phone that was specially customised for him by one of his client companies and it is set up with a complex arrangement of alerts and ring-tones depending on who seeks his attention. (Study 1 in Table 1)

Context Study 1: There is a long tradition of employment in large organisations as the predominant strategy for Japanese professionals. For cultural reasons it is not seen as acceptable for individuals to unsolicited engage in promotion of own services. If an individual contractor needs work, the work will largely have to come through requests from others. This is quite contrary to other cultures, such as in North America, where it is seen as quite acceptable to openly offer ones services. However, both cultures lead to a significant amount of time spent socialising and networking to secure future earnings (Nardi et al., 2002; Kakihara, 2003b). This implies that work for small organisations and for individual professionals primarily is found through social relations and as direct results of past projects. The trend of increased flexibility for a small proportion of Japanese professionals mirrors developments seen elsewhere with organisations seeking to manage risk by relying on itinerant workers of various kinds (Malone and Laubacher, 1998; Laubacher and Malone, 2000; Barley and Kunda, 2004). Through a range of mobile information technologies, the 63 modern professionals studied, managed to create competitive advantage through situating themselves where work was needed at the same time as they could engage with important clients and collaborators whilst away from the office. Most of the people studied were intense laptop and mobile phone users.

TABLE 1: Characterising the 11 selected field studies.

#	Workers	Year	Location	Method	Extent	Topic	References
1	Professionals	2001-2003	Japan	Interviews	63 interviews	Mobilisation of interaction for modern Tokyo professionals	(Kakihara, 2003b; Kakihara and Sørensen, 2004)
2	Bank executives	2003-2005	Middle-East	Interviews	102 interviews in total for study 2, 3 and 4	Mobile technologies for bank executives	(Al-Taitoon, 2005)
3	Mobile support centre	2003	Middle-East	Interviews & Support ticket analysis	102 interviews in total for study 2, 3 and 4 plus 10.000 support tickets analysed	Challenges of running support function for global mobile professionals	(Al-Taitoon and Sørensen, 2004)
4	Off-premises foreign exchange traders	2004-2005	Middle-East	Interviews & observation	102 interviews in total for study 2, 3 and 4 plus participant observation of traders	Discretion and control in mobile working for off-premises foreign exchange traders	(Al-Taitoon, 2005; Sørensen and Al-Taitoon, 2008)
5	London taxi drivers	2004-2007	UK	Interviews & observation	35 interviews and 14 hours of video-taped observations	The choice of location as core business strategy and the role of mobile technologies in pooling resources and informing individuals	(Elaluf-Calderwood and Sørensen, 2006; Elaluf-Calderwood and Sørensen, 2008; Elaluf-Calderwood, Forthcoming)
6	Police officers	2002-2006	UK	Observation, interviews & focus group	200+ hours participant observation with 40+ officers and managers. 20+ interviews	The rhythms of interaction with mobile information technology by operational police officers	(Sørensen and Pica, 2005; Pica, 2006)
7	Health professionals	2002-2005	UK	Action research	15+ people participating in project	Supporting situated and remote learning for medical professionals (Perioperative Specialist Practitioners) with mobile information technology	(Wiredu, 2005; Wiredu and Sørensen, 2006)
8	Security guards	2004-2005	UK	Action research	350 hours of meetings, interviews and observation	Real-life experimentation with RFID (Radio Frequency ID) enabled mobile phone technology supporting new ways of working	(Kietzmann, 2007)
9	Industrial waste management	2004-2005	UK	Action research	350 hours of meetings, interviews and observation	Real-life experimentation with RFID enabled mobile phone technology supporting new ways of working	(Kietzmann, 2007)
10	Delivery Drivers	2006-2007	UK	Observation & interviews	50+ people participating in interviews and participant observation	Establishing IT mediated control of work tasks with low degree of discretion through enterprise infrastructure and mobile information technology	(Boateng, Forthcoming-a)
11	Professionals	2002	UK, USA	Interviews	16 interviews	Investigation of how mobile information technology still fails to become ubiquitous in the work of professionals	(Sørensen and Gibson, 2008)

One of the dominant themes often encountered when discussing mobile IT is the ability of this particular technology to offer the promise of mediated interaction transcending spatial and temporal boundaries. Paraphrasing Cairncross (2001), not only distance may suffer a sudden death, time may also be a likely victim. The so-called anytime-anywhere hypothesis emphasises the technological opportunities offered by the technology of allowing fluid interaction patterns unrestricted by the location of participants and by the necessities of synchronised interaction (Kleinrock, 1996; Kakihara and Sørensen, 2001). There are, however, serious reasons to establish this as only one possible implication of mobile IT, and one, which emphasise technological promises. In terms of organisational realities, many work activities can not simply be disassociated from spatial and temporal constraints. Work can be constrained in various ways, for example through the need for certain organisational resources to be available or it may need to be conducted at certain times. Spatial and temporal dependency and independency implies that embedding mobile technology in organisational contexts must consider to what extent the technological promises can be fulfilled in the particular context (Wiberg and Ljungberg, 2001). For almost all but a few of the professionals studied, our research has documented work that to some degree is bound by location and time. Police officers (study 6) engage in incidents when called. Taxi drivers job (study 5) is similar to locate exactly where and when work can be obtained. Delivery drivers (study 10) and security guards (study 8) have very little direct control over where they work. Health professionals (study 7) work where the patients are, waste management workers (study 9), where the waste is, and bank executives (study 2) occasionally where the clients are.

In short, distance matters (Olson and Olson, 2000) and mobile IT can not in general do much to change this, although it may make some of the situated interaction superfluous. What mobile IT often can do is to allow people to engage in rich situated interaction whilst remaining in touch with other remote contexts for their work. Even in cases where work tasks are purely informational and in principle can be conducted at anytime and anywhere, then resolving mutual interdependencies still critically rely on engaging inter-personal relationships. This makes face-to-face interaction much more effective for many situations, compared with mediated interaction (Olson and Olson, 2000; Armstrong and Cole, 2002).

Turning the argument around from one based on what technology can offer, namely boundary free interaction, to one emphasising what people desire, then the issue becomes much more complex. Viewed entirely from an individual point of view, the technology provides distinct opportunities for individual choice of who to interact with and from where. However, as all interaction is deeply situated in social and organisational practices, there will very seldom be an entirely free range of opportunities ahead but rather complex socially negotiated norms guiding the individual (Collins, 2004). The choices are conditioned by

traditions, power relations between initiator and recipient, practical concerns, the need to use organisational resources in the decision making etc.

It might be a more constructive view for the organisation to consider how the interactional context of its members can be viewed as an organisational resource of strategic importance and not merely a phenomenon accidental to practical information management constraints or individual preferences. Mobile IT implies the increased ability of organisational members to engage in mediated interaction in places of organisational importance whilst remaining in touch with necessary interactional contexts. Our study of Arabian banking executives illustrate this well (study 2). Bank executives would frequently find themselves engaging in negotiations with high-end clients about the services rendered and the client's financial arrangements with the bank. These negotiations would most often happen at the client's site somewhere in the World and the bank executives would then have direct access via Virtual Private Network (VPN) connections from their PDA's to the bank's internal systems in order to obtain up-to-date information about exactly how significant the client's involvement at that time was with the bank. Obtaining this information provided essential for the bank executives to get a good position for the tough negotiations with the client and allowed these to be done at the client's own location.

The distinction between situated and mediated interaction can be further qualified in distinguishing between two types of mediated interaction - local mobility and remote working. Global virtual teams or traditional telecommuters engage in remote working either across continents or from a home-office. Activities can, however, also be conducted through locally mobile working within a restricted domain (Luff and Heath, 1998). Whilst the locally working person may elude fixed location, he or she will be assumed to remain within close proximity, for example a building. Here, the defining characteristic is the ability to contact an individual through a pager, mobile phone, tannoy system or by other means and as a result summon this person. Doctors and nurses engaged in healthcare work is a good example of local working and study 7 illustrated how constant engaging in activities to serve the purpose of a remote quality assurance participant easily got in the way of this kind of working. Remote workers will be working from fixed office arrangements and will therefore typically be available through ordinary desktop communications channels such as email and telephone. Mobile working is, however characterised by the combination of local mobility and remote distribution, and marks a significant increase in complexity. The mobile worker is potentially neither able to quickly be summoned, nor is he or she possible to pin down at fixed remote locations. Taxi drivers, lorry drivers, and travelling sales people are all examples of work that traditionally has been mobile seen from the perspective of others who collaborate with these.

4 Management: Control or Discretion?

Vignette Study 6: In the South of England, two police officers, John and Mary, are driving at high speed towards a domestic disturbance incident mid-morning. Whilst driving to the incident they are heavily engaged in two important tasks. One is to ensure that they arrive as fast and as safe as possible. The other is to ensure that they have as much information about the incident they very soon will be attending. They drive at high speed with the loud siren and blue blinking lights through a small town. They are in constant touch with the control room and arrange for a range of information about the incident and past incidents at the same address to be streamed from the control room to a small computer in the car. This enables one officer to read this information out to her colleague driving and they discuss the situation ahead trying to form a good idea of what risks may be involved and how to prioritise their effort. As they arrive at the scene, they stay in constant touch with the control room. Mary calls the neighbour reporting the incident from her mobile phone to get further information. (Study 6 in Table 1)

Context Study 6: The two-way radio system was first time used outside the military by the Chicago Police Force in the 1930s Prohibition period of emerging organised crime (Agar, 2003). Since then, police forces across the World have embraced mobile voice and data-services as means of collecting intelligence, distributing information to officers in the field and for co-ordination of efforts. Most mobile IT is therefore naturally not organisationally transformative but rather finds its own place in the mobile ecosystem within the limited space of the police vehicle or on the police officers' person. Mobile IT serves an essential purpose when operational police officers engage in incidents, or rather before and during engagement. The situation ahead is often characterised by a high degree of uncertainty and the technology allows officers to draw upon mobile data and interaction with control room and others in their assessment of the risk ahead. A core consideration with time- and safety-critical work is the rhythms of interaction with technology and the right-time, right-job attitude to technology as opposed to the view that the technology is ubiquitously available and needed anytime, anywhere. Police officers need to actively engage with the incident and not stare into screens.

Mobile IT brings with it the potential for connecting people and resources separated by time and distance. It therefore brings with it the essential discussion of remotely exercised control versus the potential for further individualising discretion. This relates to Zuboff's (1988) distinction between the use of information technology as means of *automating* work processes and thereby driving discretion out of work, as opposed to *informating* work by providing rich information allowing for discretionary localised and contextualised decisions. The underlying assumption of process automation is the viability of characterising work in terms of business processes that can be made explicit, negotiated, and subjected to re-design. However, for some work domains, traditionally the work of top-executives, professionals, and artists is most often not assumed to be subject to this kind of formalisation. Here the individual or small group of collaborators are perceived to exclusively exercise professional judgement and discretion in their decision making. Sørensen & Gear (2007) report from a legal firm where the CIO argue that the legal professionals do not accept that their work can be characterised as a business process. Instead, they only acknowledge the individuals professional discretion and cultivation of clients as the lowest level of formalisation of the legal work process.

The independent Tokyo professionals in study 1, the bank executives in study 2, and the London taxi drivers in study 5 are all examples of domains with a high degree of individual

discretion (Kakihara, 2003a; Al-Taitoon, 2005; Elaluf-Calderwood, Forthcoming). The security guards in study 8 and delivery drivers in study 10 are examples of work with a very low degree of individual discretion, where work is largely sought stipulated in detail by procedures and supportive information technology. The highly managed work of, for example security guards (study 8), can be further improved by not only using mobile technologies to speed up communication between mobile security guards and centralised management functions. It can also strengthen the automatic relationships between the physical environment and the information tasks through RFID technology automating the recording of positions converged with mobile phone technology automating the transmission of location-data (Kietzmann, 2007). We have also (in study 10) seen how organisational infrastructures in detail organising mobile tasks centrally can support the detailed organisational management of mobile work activities (Boateng, Forthcoming-b).

Vignette Study 10: At Foods International they distribute everything needed to run small restaurants and fast-food outlets. Jason works as a delivery driver for the company and he has, as many of his colleagues, only worked there for a relatively short period of time. However, the systems he relies on in his daily work delivering food, drinks and other goods to the customers is designed to guide him through his working day. In the course of performing his duties, Jason relies on the strength of technology mediated interaction, to update him on the readiness of customers to collect their orders and any road diversions or blocks on his routes. If he finds a customer's shop closed at the time of delivery, Jason uses the company's mobile phone to find out from Customer Service the whereabouts of the customer. The answer would determine if he will have to return at a later time with the customer's purchased order. However, sometimes when a customer is not available to take the deliveries, Jason may decide to either park near the shop and wait, or to pass by at a later point on his delivery round, by which time the shop will be open.

Context Study 10: As the example above, this one is concerned with work characterised by a low degree of discretion, which to a large extent is controlled remotely by schedules or direct managerial intervention. This study demonstrated the use of mobile IT integrated with an extensive organisational infrastructure. Mutual interdependencies between delivery drivers and those who take orders from customers, those who find the items in the warehouse, and those packing the lorry for delivery are largely mediated and stipulated by the organisational systems. This illustrates the strength of an integrated stationary-mobile work support system for not only supporting highly distributed activities but also for being a viable tool to further to further limit individual discretion side by side with systems-based stipulation of activities

It is, however, dangerous to assume that a particular type of work does not rely on individual discretion on a daily basis. Emerging contingencies may occur and dealt with but never reported elsewhere in the system. The formalised model collectively assumed may in fact not be an appropriate formalisation of what goes on. Even if it may have been at some point, then localised improvisation and subtle changes to the way work is done may have altered the reality of how work is done but not the formalised assumption held about it. Schmidt (1993) reports from a manufacturing study where a Kanban implementation, supposedly entirely automating the flow of parts in an assembly line, was subjected to frequent discretionary decisions explicitly breaking the principles of the formal process in order for the system as a whole to deal with emerging constraints. Kietzmann (2007) documents how industrial waste

management drivers (study 9) found it problematic that management would get detailed information about the movement of waste barrels and used this information incorrectly to derive implications for further decisions as they did not have a full overviews of constraints. Boateng (Forthcoming-a) shows how delivery drivers use their initiation, judgment and negotiation skills to avoid parking tickets by persuading parking attendants from issuing parking tickets in the course of delivering certain customer orders. Management have little idea as to how delivery drivers deal with such unforseen and emergent issues yet it never undermines the fact that delivery drivers are not inactive and unprepared in meeting the pragmatic exigencies relating to their work.

The business cases for mobile information technology supporting work with no discretion and for work with an abundance of discretion can be fairly straightforward. In the former the impact can be made subject of direct calculations of increased efficiency of work as it can to a large extent be externally represented. In the latter, the executives and professionals affected will be the senior decision makers and therefore not really need any business case or at least highly valued knowledge-workers whose time is considered valuable and the organisational willingness to invest in supporting work therefore quite high. The issue of understanding the value of mobile information technology is clearly in the large segment of work that both is subjected to some form of control, but which also relies on significant individual discretion. Studying operational police officers demonstrated some of the issues involved when work is a complex mixture of discretionary choices organisational co-ordination, and occasional strong centralised control (Manning, 2003; Sørensen and Pica, 2005; Pica, 2006).

Vignette Study 4: It is 6pm somewhere in the Middle-East and one of the traders from a large Arabian bank is eating dinner with his family in a restaurant. He takes a short break from the discussion of what his children has done in school as he checks his trading pager, a Reuters SmartWatch, to see if any rate changes at the New York exchange is influencing his positions. He is one of a small group of foreign exchange traders that extend the banks' trading hours throughout the evening and night equipped with the trading pager, a mobile phone and a PocketPC with web-based trading services. The small group of traders entrusted to do off-premises trading negotiated their positions before leaving the trading floor earlier in the afternoon to get an common understanding of their limits. When trades are made, the mobile phone is used to call into an answering machine at the bank to record the transactions for back-office for further processing in the morning. (Study 4 in Table 1)

Context Study 4: The portfolio of mobile IT allows for off-premises trading and has made it possible to transform the organisation from three-shift trading to off-premises trading supplementing the normal trading day. The traders were not very happy with the three-shift system and although being granted permission to engage in off-premises trading, this still places quite strong demands on traders family life with constantly being connected. This is one of the main reasons for maintaining a light-touch with no management control during of-premises trading and traders are generally left to themselves. This, however, can lead to problematic situations if they do not at times engage in minimal co-ordination with fellow off-premises traders to negotiate trading limits.

The discussion of organisational or managerial control versus individual discretion relates to

the more general concern of emerging changes to organisational arrangements in terms of centralisation versus decentralisation. Malone (2004) argue that organisational forms largely depend on the cost of communicating. He argues that hierarchical and centralised communication through vertical command-and-control management is a necessity when there is a high cost associated with interaction in large organisational forms. This, Malone argues, changes when the cost of communicating drops and as a result will allow for large-scale co-ordination of activities in networks emerging through horizontal cultivation of relationships. Much has been written about shifts from hierarchical to networked organisations, and this debate is quite often based on the wrong premises that networked interrelations can occur disassociated from established structural arrangements of traditions, power, influence etc (Kallinikos, 2006). Courpasson (2000) argues that some contemporary organisational forms show the characteristics of horizontal operational co-ordination of activities in networks along with centralised control over the tactical and strategic issues of resource allocation and agenda formation. For the off-premises foreign exchange traders in study 4 the trade-offs between organisational control to ensure proper documentation of trading versus the need for discretion featured prominently. The primary mechanism to ensure this balance was the careful vetting of which pit-traders would be granted the coveted status of membership of the exclusive group of off-premises traders.

5 Collaboration: Alone or Together?

Vignette Study 5: It is early Tuesday morning and Ray has just begun working. He is one of the 40,000 licensed London Black Cab drivers. Ray has decided to start early today as he need to pick up his teenage daughter from school in the afternoon and take her to an appointment with their doctor. As he drives down Oxford Street towards Marble Arch one of his three mobile phones starts ringing. This particular phone is exclusively used for a service automatically locating an available cab nearest to the location of the caller's mobile phone. The driver answers and within five minutes the passenger is picked up at Notting Hill Gate. As he drops the passenger off in front of The Houses of Parliament one of his colleagues calls and informs him that due to a problem with one of the local train lines there is a need for a number of cabs to replace the train for a few hours. As it is good money, Ray decides to accept and sets off to the station. (Study 5 in Table 1)

Context Study 5: London Black Cab drivers have been around for 420 years and since 1851 been certified according to a strict set of exams, "The Knowledge", ensuring the driver knows over 300 routes in inner London. Drivers tend to own their own cab and work has always been conducted in a highly independent manner with each driver deciding how and when they work. This is an archetypical example of choice of work context as a strategic concern and after studying for 3-4 years for The Knowledge, drivers typically spend several years learning how to position themselves to be profitable. The mobile phone serves as a natural tool for drivers to get in touch with the rest of the world whilst driving. Colleagues may inform them about particularly profitable work or essential traffic situations. One of the computer-cab systems automatically links the nearest cab to the calling customer's mobile phone location. Competitive pressure from minicab companies without license to pick up at ranks or in the street makes closer collaboration through centralised computer dispatch systems a viable option for the independent Black Cab drivers to pool their resources. They thereby will appear as an organised unit and not individuals, but this also is associated with major discussions about the relative merits of joining the different organisations in terms of fairness of job allocation and requirements to choose a certain number of jobs from the company each month.

Mobile information technology can, as for example the in-car equipment in police patrol vehicles be multi-user systems. However, this kind of technology is most often associated with individual use and appropriation. As one of the primary reasons for people working together is to negotiate their mutual interdependencies in their collaboration, an obvious concern regarding mobile information technology is to what extent it can support engaging in such negotiations. In this sense the technology can remove many boundaries to rapidly collaborating (Schmidt and Bannon, 1992). This, for example can imply that organisational actors who previously did not have opportunities to directly negotiate their mutual interdependencies with mobile information technology can be presented with multiple means of interacting directly.

The London Black Cab drivers (study 5) provided a clear-cut example of how mobile information technology can support an increased collectivisation of work. Individual taxi drivers owning their cab have traditionally decided entirely themselves where, when and for how long they work. Each cab was an independent business unit of driving people and things from A to B. They have traditionally engaged in the exchange of experiences and tips either when waiting at taxi ranks or when meeting for coffee or lunch, much in the same way as the engineers studied by Orr (1996) exchanging important knowledge about the profession and not in a highly detailed and operative manner (Elaluf-Calderwood and Sørensen, 2008). However, the mobile phone has made it possible for emerging and changing communities of Black Cab drivers to weave networks of mutual interdependencies, in a similar manner to the geographically situated ephemeral organisation described by Lanzara (1983). When, for example, a train operator needed many cabs to transport stranded passengers, drivers would call others to alert them of available jobs. Also, as many cab drivers will be spending some part of their working time chatting with colleagues, this would also offer opportunities of sharing a common awareness of not only emerging business opportunities but also of traffic conditions.

More fundamentally, London Black Cab drivers face competitive pressures from minicab companies who can only interact with their customers through the customer requesting their services in the minicab office, by telephone or through the Internet. As a result of this pressure, drivers increasingly join organisations facilitating the pooling of individual Black Cab resources by providing automatic, semiautomatic or manual dispatch services. This signify not only increased opportunities for individual drivers to interact with each other but is the creation of organisation where there previous was none or very little. This re-intermediation is largely dependent upon the combination of computer-cab systems and mobile phones linking the cab to the central infrastructure of the dispatch organisation.

In the case of mobile work in industrial waste management (study 9), the introduction of stronger automated links between the work done and the systems used to monitor work

implied a much smaller level of granularity in the discussions of work tasks and thereby made work more collaborative between those who worked locally, and those who managed the work remotely. This is similar to the example documented by Ciborra (1996) of the product development documented in Lotus Notes discussion groups, which in turn were read by top-executives situated remotely. As in the waste management case, this ability to remotely observe detailed work decisions led to conflict.

There was ample conflict in the health professional case (study 7), and it was mainly related to the organisational disagreement about what working together actually meant and the relative importance of one collaborative context as opposed to another. For the local hospital where the health professionals engaged in daily training, this was the main place of collaboration. However, for the learning centre in London where one-week sessions would be hosted, the ability to remotely observe and quality assure the learning was of high importance. This conflict between local and remote collaboration formed the main cause of conflict in the failure of the PDA system (Wiredu, 2005; Wiredu and Sørensen, 2006).

However, the use of mobile information technology can not only relate to increased collaboration. It can also be part of the opposite phenomenon of increased individualisation or segmentation of work. Many organisations seek to manage the complexity of their business by focusing on core issues and sub-contracting or outsourcing other aspects. This relates to a variety of organisational trade-offs between managing work through social control or through economic exchange with the acquisition of commodified knowledge embedded in a product being mainly social control and the internalisation of knowledge through ongoing employment of experts marks the social control approach (Scarbrough, 1995). Packaging of knowledge, outsourcing of activities, and sub-contracting all seek to cut or contractualise some of the mutual interdependencies within organisations and replacing them with temporary relationships or with negotiated specific contributions by individuals (Barley and Kunda, 2004; Willcocks and Lacity, 2006; Voutsina et al., 2007).

Modern project-workers, who do work on a contractual basis as opposed to continuing employment can, for example, spend a significant proportion of their time networking with others in order to ensure future involvement in projects (Nardi et al., 2002). We clearly found this in the study of Tokyo professionals (study 1), especially since Japanese culture frowns upon direct solicitation of own services. Barley & Kunda (2004) show how software developers use recruitment agencies as the organisational arrangement ensuring a steady stream of project engagements with clients. Although the Tokyo professionals in study 1 often would be engaged in collaboration with others, work would most often be project based and in some cases highly individual by consisting of clearly separated modules or services. Mobile information technology supported this individualisation of work as channels by which work could be negotiated and where the work results could be disseminated.

In the case of off-premises foreign exchange traders (study 4), their work had two distinct collaborative modalities. During the day they engaged in individual, but closely co-ordinated, trading in a stationary organisational setting. This had before been conducted as three-shift trading following the opening hours of the exchanges in Japan, Europe and USA, but trading outside normal working hours had been replaced by a selective group of trusted traders engaging in off-premises trading in their own time. As they in effect worked when off work, it was not feasible to impose the traditional requirements of collaborating and this resulted in off-premises trading largely being individual activities, which in certain situations selectively by the traders themselves could be subject to negotiation, for example of trading limits (Al-Taitoon, 2005; Al-Taitoon and Sørensen, Forthcoming). Mobile information technology directly made this modality possible through the Reuters SmartWatch with market access to data and the mobile phone for documenting trades to an answer-machine for back-office processing the following day. An intermediary mode of operation had seen traders engage in trading from their desk-based PC at home, but this was equally inconvenient as three-shift trading as they were bound to their desk for trading.

Round off discussing (Goldthorpe, 2000) and the ease of monitoring work etc. Perhaps save this for the book chapter? The issue of collaborative arrangements is of course related to the previous issue of organisational arrangements of decisions…

6 Technology: Ubiquitous or Opaque?

Vignette Study 7: Yin used to be a nurse, and she was very good at her job so she decided to do further specialist training for even more challenging work with patients as a specialist practitioner assisting surgeons. This involves on-the-job training for one year at the hospital she works. This morning she is following surgeons doing rounds. An essential part of her theoretical learning and practical training is done at one-week sessions every six weeks in London. Here, the main co-ordinator of the programme is keen to follow and record the progress of each of the 16 participants when they are back home. This is essential for both providing feedback on the learning and for documenting progress to ensure subsequent certification. The students are therefore provided with a personal digital assistant (PDA) with proprietary software to record conduct and outcome of each session back at their respective hospitals. Yin finds this very difficult to accomplish as the PDA constantly seems to get in the way of learning and working. The PDA, however, comes in very handy for her own personal information management and she also uses its built-in medical dictionaries frequently. (Study 7 in Table 1)

Context Study 7: The purpose of the PDA-based system, which reported to a centralised database in London was to ensure that situated learning by each of the medical professionals based around the country could be documented and subjected to assessment by the person responsible. The aim of documenting work-integrated learning at the place of work and centrally monitor and verify this did not succeed. This went far beyond the usability problems of having PDA interaction artificially interjected in situated hospital work. The conflicts between the localised control of the participants at their hospitals and the desire for centralised influence and control through the technology from the central London-based learning-centre presented a significant barrier for using the mobile technology effectively. The aims for strong local control over activities locally clashed in territorial dispute with the attempts to exercise equally strong remote control from the central learning centre. As as result, the only useful aspects of the PDA was the individual use of medical dictionaries and the personal information management functionality.

Mobile information technology is most often personal and it is always possible to physically take parts of it along as opposed to pervasive technology, which may or may not be mobile. Ubiquitous technology can be defined as the combination of technological mobility and pervasiveness, i.e, the ability of the technology to relate to its surroundings. Although most mobile technologies are exactly only that, and not particularly pervasive, the combined socio-technical relation can produce ubiquitous behaviour, for example the social use of the mobile phone as a location-based service. Although a mobile phone has quite precise information about where it is located through the cell it is registered in, this information is not normally used by its owner. However, the frequent short SMS messages or brief telephone conversations stating; "*I am on my way*"; "*I'm stuck in traffic on the motorway 10 miles away*"; or "*please wave so I can see you*", are all examples of how we can make the mobile phone ubiquitous simply because it for most people in the developed world is an individual device carried along with money and keys. As some mobile technologies, such as the mobile phone, elegantly has managed to find itself a place on or near our bodies, and others still are reserved a less close role, such as the laptop computer, it is interesting to explore the possibilities of mobile technologies becoming an ubiquitous part of work. However, just by being carried around close to our bodies does not necessarily always make a technology ubiquitously move into the background as a taken-for-granted resource. As some of the professionals in study 11 argued, mobile technologies in general, and the mobile phone in particular can become opaque and demanding attention, for example with the mobile phone when it has run out of battery or if someone is calling when the receiver of the call is busy concentrating on other important matters (Sørensen and Gibson, 2008).

We are still far from realising the much promoted techno-optimistic vision of all matters of ubiquitous technologies like utilities of the 21st Century disappearing from our direct attention and unnoticeable becoming unconstrained resources for our immediate consumption (Weiser, 1991; Dourish, 2001; Mccullough, 2004; Sørensen and Gibson, 2008). The question is indeed if we ever will realise this vision, and if we do, whether or not it will be desirable. The extent to which mobile phones, for example, are constant subjects of conversation, adjustments, attention etc is a sign of the importance the users lend to this technology. It represents a means to be contacted by others and through which to reach them. The underlying 2 or 3G wireless infrastructure may only enter the user's awareness when there is no signal, much similar to other utilities such as water and electricity.

The traditional view of how information technology relates to organisational actions is one of large systems delivering a set of fairly standardised services which together forms sufficient and homogeneous support for the IT aspects of decisions (Mathiassen and Sørensen, 2008). The ways in which heterogeneous information services are combined and the variety of approaches adopted by individuals indicate the need for reconsidering the role of information

services in organisations. With advanced options of exporting data from one application and importing them into another is just one aspect of the ease by which users can seek their own individualised means of managing information through their selected portfolio of services and applications. Mobile services are no different and will play an increasingly important role in supporting the management of information and decision making. Modern professionals will have email at home, on their mobile phone, at the office, or indeed often anywhere with an Internet connection. The mobile phone will probably be able to download, display and maybe even support editing of attachments. So, for just the simple task of reading email, replying to them and editing sent attachments, the modern professional will have a range of options available and will often be able to combine these according to personal preferences or the situation they may find themselves in. For example, the instant availability of mobile email my lead to much more frequent checking of email (Mazmanian et al., 2005).

In our studies we generally found that closeness of the technology to the body of the user promoted an interactive process of individual adaptation allowing the user and technology to mutually adapt. In the case of study 4, the off-premises trading worked well because being an off-premises trader signalled status within the organisation, and because the organisation did not impose itself on the trader through the technology but instead allowed a natural flow of using the technology to support the primary tasks at hand. The London Black Cab drivers in study 5 were experts in selecting and appropriating technology that would directly support their main task of locating customers, but also support drivers in maintaining essential social links to friends and family while driving around the streets of London. Aspects of the systems, such as the fairness of the principles they implemented for allocating jobs to drivers were of significant importance and therefore discussed intensely. For the health professionals in study 7, using the PDA system was throughout at odds with the specific requirements of the work context and although they managed to make individual use of some features, the technology seemed to remain opaque and problematic throughout (Wiredu, 2007). For the security guards in study 8, the RFID-enabeled mobile phone quickly became a natural part of their work as it easily replaced the existing electronic reader. The operational police officers in study 6 displayed, due to the extreme nature of their work, very interesting mobile technology use patterns, where there were significant variation or rhythms of interaction with the technology depending on the circumstances and of how intensively they were required to engage with the physical world of citizens embroiled in incidents (Sørensen and Pica, 2005; Pica, 2006).

Perhaps instead of emphasising too much on how to make mobile technologies ubiquitously disappear in the background, it is more constructive to see the future of information work with such technologies much similar to the extreme case of the police. This would make the ability of rapidly shifting the attention from the technology to the situation or from one

technology to another according to the rhythms of work much more essential. The successes of the mobile phone is perhaps also based on this criterion that is mostly used for voice calls or SMS messages and here very easily engaged and disengaged. This perspective of engagement and disengagement also emphasises the importance of not only using the technology but also to make it disappear in order to engage with the world around. This relates back to the initial issue of mediated or situated interaction, and the crucial role of engaging with others when it really matters. For all organisations the lessons learnt from studying the police can be valuable in terms of augmenting situations with mobile services as opposed to replacing them. The bank executives in study 2 illustrated this very well with the entire emphasis being on intense negotiations with the client, but with relevant information for these negotiations being available when needed.

7 Organisation: Cultivate or Transform?

Vignette Study 8: Late at night in an industrial estate in the outskirts of Manchester, the security guard Sandeep is doing his nightly round at an electronics warehouse. At each check-point he waves his mobile phone, which contains a built-in RFID (Radio Frequency Identification) reader over a tag mounted on the wall and a message is automatically sent to a central server to update his whereabouts. This is not a lot different from the previous systems where a torch-like tag reader would record each check-point. However, this would only allow data to be uploaded to the system once Sandeep was back in the office after a whole shift. Instead, the database is now immediately updated. Sandeep does not mind too much that he is a bit tighter observed as he already was so before, even if it was not in real time. (Study 8 in Table 1)

Context Study 8: The system above was part of a set of four extensive real-life experiments with RFID-reader mobile phones used to render work more effective through real-time updates within central systems of mobile work activities. The RFID reader mobile phone here enforced existing working arrangements and cultivated real-time updating of guard positioning allowing for a range of management practices operating at a finer level of granularity. As work already was characterised by a low degree of individual discretion, the technology was not seen as radically changing the conditions for work. The experiments also highlighted the added complexity of formulating systems requirements for technologies that are not only close to the human body but also directly links the physical and virtual world. Whereas end-users in other cases may be easier to circumvent, the complexity of RFID-enabling individual work processes implies the need to involve end-users and thereby also drawing them in as a significant stake-holder.

Mobile information technology can both offer incremental supplements to existing portfolios of information services and thereby support the cultivation of existing organisational practices. They may, however, also be intended to support more comprehensive transformation of these existing practices and lead to significant organisational changes. From both an organisational and a technology vendor point of view, the aim will often be to seek to transform the organisation of work to make it more effective, innovative, profitable or whatever criterion is sought after.

In our studies we mostly saw mobile technologies supporting the step-wise cultivation of

existing working practices, which is probably typical for many technologies as radical changes may only look appealing in business case texts and on spreadsheets with estimated gains or savings, but not at the coal-face of work. Furthermore, the closeness of the user and technology is in itself an experimental setting that in most cases will be needed in order to fully understand how the technology may provide transformative effects. The intensity of the human-technology relationship when the technology is constantly carried along and cared for is one that sets new issues on the innovation agenda. The user becomes an integral element in shaping the innovation and real life experimentation can be the only means by which the consequences of the innovation can be understood as the relationship between body, technology and work process becomes more and more intense (Haddon et al., 2006; Kietzmann, 2007).

In terms of the transformative capabilities of mobile information technology, then these must be seen in the greater perspective of the overall business objectives and the role of information technology herein. Whereas the traditional role of the organisational information system was to automate back-office processes, current information technologies seek to support the organisation in for example relating to customers and business partners. The multi-faceted challenges to contemporary organisations include the ability to listen comprehensively to what products and services customers and other stake-holders desire, and to go beyond listening to also engaging various constituencies in collaborative efforts. These types of efforts are only commercially feasible through intensive use of information technology as both support for and replacement of human activities (Sørensen and Gear, 2007). Mobile technologies will by definition follow organisational actors where they may go and as such represent the new information management boundary of the organisation. The ability of the bank in both study 2 and 4 to extend its information services boundary beyond the walls of the organisation provided potentially transformative boundaries. Similarly, the ability of the police offers to gain information before and during incidents can both help protect citizens and the officers as it greatly helps transform operational uncertainties into assessed risks.

If organisations aim at softening the boundaries to customers and associates in order to better understand and involve these stake-holders, then one of the primary means may just be mobile technologies. If Internet users are keen on helping companies supporting customers with deep technical questions about its products through posting their knowledge on discussion forums, some of this energy may in different forms be harnessed and adopted to the context of mobile technology use. Already now it is possible to study the phenomenon of micro-blogging, which often is done in a combined stationary and mobile manner - Twitter.com and Jaiku.com are two good examples of this. The technological convergence of various services from stationary to mobile technologies will provide interesting platforms to

innovate from, for example the recent development of an affordable 3G mobile phone with Skype functionality, or the integration of GPS receivers, contact-less payment cards or general RFID readers in mobile phones.

More and more organisations understand that reaching customers on their mobile phone, if done the right way, is a much stronger relationship than the one cultivated through a personal computer as it will allow much more direct access. Delivery drivers (study 10), police officers (study 6) and modern professionals (studies 1, 2, and 11) alike have all experienced the importance of getting access to each other and to vital organisational resources when interacting with people at the edges of the organisation. When an airline company allow its customers to check-in from a mobile phone (for example SAS mobile check-in), it gains effectiveness in the traditional manner information technology often does, by the customer doing some, if not all, of the work (Strassman, 1985). However, for the customer this is not necessarily a bad idea assuming it is sufficiently simple to do. For regular customers with an account set up, it is even possible to buy ticket and check-in in one simple operation. The potential for transformation if the right conditions are present is significant as the example of the M-PESA project in Kenya where the lack of general access to banking combined with the widespread diffusion of mobile phones provided fertile soil for a mobile phone based electronic money system (Hughes and Lonie, 2007).

8 Services: Encounters or Relationships?

When considering exactly what information services mobile technologies offer, it is essential to distinguish between those supporting encounters as opposed to those mediating ongoing relationships. This relates to the previous subject of how mobile information services can be used to establish different customer relationships. Zuboff & Maxmin (2002) argue that the 21st Century is to be one characterised by individuated consumption of experiences and support more than merely the consumption of mass-produced goods. They see as one of the essential prerequisites the ability for organisations to engage in a relationship economy as opposed to the traditional transaction economy. A key element to engaging with customers and organisational partners will therefore be the ability to mediate customer relationships through information services (Mathiassen and Sørensen, 2008).

When a mobile phone is used for short voice calls, to send an SMS message, or for mobile email, then the phone mostly mediates encounters as any ongoing relationship is entirely managed by the people engaged in the interaction. If a series of phone conversations for participants amounts to an interesting relationship, then this is entirely constructed amongst the actors. The phone will only mediate a relationship to the extent it contains the memory of names and number sin the log or address book. Recent services, for example on the iPhone of representing ongoing SMS messages between people as though they were instant messaging

discussions will more significantly mediate the relationship (Mathiassen and Sørensen, 2008).

Comprehensive support for mobile collaboration requires additional services supporting mutual adjustment and recording of distributed decisions beyond merely allowing people to do so themselves through instant connections. Mobile collaboration support will require support for ongoing discussions, easy sharing of workspaces, coordination of mobile activities, and establshing mutual aareness through the technology (Wegner, 1997; Mathiassen and Sørensen, 2008).

As an example, the reason police officers from study 6 never disengaging their shoulder-mounted radio during incidents was that they through this kept an ongoing conversation with the control room, who could offer information and support (Sørensen and Pica, 2005). Taxi drivers in study 5 using a computer-cab system need some form of information service allowing them to update their recorded whereabouts in a central database at the dispatch office in order to be given jobs near where they are. The off-premises foreign exchange traders in study 4 used a fairly simple set of information services, but the essential Reuters SmartWatch allowed an ongoing updating of the latest market information and the ways the traders set up this relationship was essential for their performance. In the mobile support centre in study 3, the way in which the support staff managed their interaction with globally roaming bankers was through a support ticketing system - a type of CRM system - mediating the discussions of the status of submitted requests. The health professionals in study 7 attempted to engage in a complex relationship between remote learners and a central responsible through an advanced database system being updated by each learner from their PDAs. This did, however not work and it demonstrates the complexity of establishing mobile mediated relationships. Such relationships must be constantly nurtured according to changing needs and preferences. On the other hand if too much time and effort must go into this nurturing then this may be deemed unfeasible.

9 Conclusion

We have in this paper attempted to provide some initial categorisations to the question of: *What are the organisational implications specifically related to the application of mobile information technology?* This was accomplished by analysing the results from a collection of 11 fieldstudies of mobile information technology use. As a result, six different decision points of specific organisational challenges of seeking to gain organisational efficiency through mobile information technology was explored. We asked the questions: (1) should mobile IT through mediating remote interaction replace situated interaction or be used to make the context of situated interaction an organisational resource?; (2) Should mobile IT support increased organisational control of decisions or should it promote decentralised

application of individual discretion in decision making?; (3) Should the technology strengthen mutual interdpendencies between people within the organisation and with associated partners or should it make more individualised working easier to implement?; (4) How is the technology percieved in the context of everyday activities - as ubiquitous support residing in the background and out of focus, or as an opaque reminder of itself?; (5) Should the mobile IT help the organisation engage in a transformation of existing working practices or will it support the cultivation of these practices?; and (6) Should the mobile technology be aimed at providing information services mediating encounters between users and between users and informational resources or is it directly mediating ongling relationships?

Clearly, there are no straightforward answers to these six questions, but rather in each specific situation of intended organsational innovation with mobile IT, each aspect must either be considered carefully and subjected to ongoing experiementation. One of the characteristics of enterprise mobility is the increased reliance on localised innovation, individual ways of appropriating the technology and the need for organisational experimentation to investigate how to yield most benefit from the technology (Kietzmann, 2007).

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