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When Users Move Faster Than IT: a study of mobile technology in a work related setting

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Introduction

Introducing expectations of ubiquitous computing at work

In 1991 Mark Weizer prophesied the notion of ubiquitous computing. The notion was a future where computers were seamlessly integrated into the world at large. By being integrated into our everyday life, by running indistinguishable in the background, for the only purpose of serving us; machines were supposed to fit humans and not the other way around. Weizer argued that this would enable humankind to do everyday chores and work related tasks faster and easier, with less cognitive strain than before (Weizer, 1991).

Not everything about Weizer prophecy has panned out exactly like he imagined. But he got one thing right; information technology has gotten more mobile with the introduction of smartphone technology, cloud computing tools and the gradual emergence of smart devices embedded within electronics, software, sensors, actuators. Today, smartphones has almost become a ubiquitous possession. Take a trip on some public transport or have a rest in some café, and almost everyone is entrenched in their mobile devices.

Making smartphones a part of our everyday lives creates expectations (Ling, 2013). There is now an all-round assumption that we should be able to perform tasks fairly easily while we are out and about. If you want to hail a cab, just request it via the Uber app; if you are lost, just turn on google maps; if you want to kill time, just turn on a podcast with some music and so forth. Obviously, this social behavior translates into all spheres of actions performed in a society, not at least when we're performing tasks connected to some kind of work. Most of us will expect that there really should be no need walk back to the desktop computer or drag a big laptop around to administer or finish our job tasks. But, despite innovations in mobile computing, to walk away from larger computer devices, isn't always as straightforward as we might think. There are still inherent problems with mobility and distributed collaboration, just like researchers in the pre-smartphone age uncovered long ago (Bellotti & Bly, 1996).

Not all information systems are developed to run on small devices. They are not responsive as computer scientist will put it. Due to this fact a schism occurs in many instances. Employees expect to use mobile technology even though employers aren't able or ready to provide good information platforms. We are going to study an instance where workers don't sit around and wait for things to happen. In our situation workers have taken the initiative to take an unresponsive information system out in the field on their mobile devices. In this situation the technology is the laggard. Users have moved faster than IT.

We want to study what happens *when users move faster than IT in a work related setting*. Our study is partly descriptive and partly normative. In the descriptive sense, we want to see how users handle an imperfect information system; what kinds of workarounds that has emerged due to system imperfection; how users handle goofy interfaces; how they tackle daily frustrations and so forth. In the normative sense, we want to come up with general guidelines for how these kinds of problems could be mitigated by employers.

The case: Eltel Networks

Eltel Networks is a sizeable corporation operating in 10 Northern European and several African countries. Eltel specializes in a field called "Infranet" and provide infrastructure

construction and maintenance services within the business areas: power, communication, transportation and security. The company employs around 10 000 people worldwide and have net sales of are around €1.25B annually.

Our case study takes place in Norway. In a Norwegian context, Eltel is a fairly large employer, employing around 1 250 people. The majority of the workforce jobs in the telecommunication infrastructure area. Their jobs are usually out in the field and consist of different kind of installation, maintenance or disconnection of various technologies, such as fiber, copper cable and mobile antennas. Accordingly, a large part of the workforce is on the go between different tasks in the field, working on demand from a company dispatcher. The work they do is socially critical, since it's about making sure that much of Norway's telecommunication infrastructure functions properly.

The Laptop PC has been the strategic platform of choice for Eltel since the start of the company 15 years ago, and is still the official IT strategy. The field technicians have specialized applications and equipment for working and reporting in the field. This system, and way of operating, has been developed over a long time, and builds on a web based interface. Accordingly, it's designed for PC and has limited support for mobile use. Due to this fact, the system isn't easy to use and interact with from mobile devices. Despite usability problems inherent in the system, it's the users who have taken the initiative to transport it directly into a mobile setting. In this case; we particularly want to find out:

- Why is there user-initiated adaption from laptop PCs to mobile devices even though the web based interface isn't responsive?
- Do the users use smartphones and laptops in combination, and do they use other media in addition?
- What is cumbersome or ineffective in this scenario?
- How could the work process be more efficient with better mobile system support?

This is an in depth qualitative case study into exactly one work setting. We look at the Eltel case as an *intrinsic and instrumental case* (Stake 2005). This is not a *critical case* suited for falsifying and verifying hypotheses (Flyvbjerg 2006). We want to understand how the expectation of doing ubiquitous computing is shaping practices in Eltel, and learning from that, provide insight into similar cases where non adaptable mobile systems has been implemented in the workplace. Our primary goal is to contribute to *rich insight* about the particular case. Specifically, we want "to capture insights from [the case] that are not easily categorized as concepts, theories, or specific implications" (Walsham 2002). Furthermore, based on the *rich insight* and by studying the system from the perception of the users themselves, we hope to uncover some findings that can be used to generate general theories about the particular subject and what happens when users move faster than IT.

Researching field technicians

Field technicians in this area has been expected to be communicating via a variety of technologies for a long time, and have been studied before with regards to work using mobile technologies. Furthermore, we want to find out whether the introduction of the smartphone at work has introduced new usability problems in line with research questions we previously have introduced. Our research is going to be contrasted with background theory about ubiquitous expectations (Ling, 2013), the "Janus-faces" of the mobile telephone, especially the dichotomies of fixed – mobile and connected – distant (Arnold, 2003) and paradigms about understanding mobile contexts (Tamminen, Oulasvirta & Toiskallio, 2004).

In regards to our normative perspective, we're going to build on theories about how we best go about doing design on an installed base. This is theories developed by a group of

researcher who we by shorthand call for the information infrastructure community (Hanseth et al. 1996; Benkler 2006; Hanseth & Lyytinen 2010; Tilson et al. 2010).

Methods

This study is conducted with qualitative research methods. Basically, we have six sources to gather information from, when conducting a case study: documents, archival records, interviews, direct observation, participant observation, and physical artefacts. We will use three strategies to gather data: interviews, observation and document analysis.

In the first round, we intend to study the field technicians at work through passive observation. In the second round, we expect to interact more with the users, ask them why they choose to do things in certain ways, i.e. using participatory observation. After having done sufficient observation, we expect to have garnered enough insight into what kind of issues users encounters when using legacy systems on mobile devices out in the field. Through interviewing, we want to acquire a rich description of the user context, potential user problems and user behavior. In the last round, we want to come up with simple suggestions for how the system can be improved to better suit the user's need. In order to do this exercise we have to take a look into technical aspects of how the system works today. Doing an analysis of system documentation will be important at the final stages.

Special Considerations

One of the researchers currently work in Eltel and has firsthand knowledge of what goes on there. Since we are dealing with qualitative data it is of utmost importance to be aware of any biases that this proximity to the research object can lead to. We have solved this by doing analysis of the data material independently before we compared our findings.

Data collection

In this case study we consider the Eltel line management and the internal IT organisation to be experts in the sense that they have first and second hand domain knowledge on the operational practice of the field workforce. We conducted a series of open interviews with various members of the Eltel organisation in order to better understand the complexity of the processes and the diversity in the workforce.

The Telecom business is split into 2 Area Business Units (ABUs) Mobile and Fixed, which in turn are divided into regions and teams. On team level there are in general two types of specialization; Care & Connect teams with many small work-orders, and Build teams handling larger projects. All use the same systems, which are communicating with the customer Telenor via B2B integrations. It would seem that the C&C teams in Fixed Telecom are the most mobile users expected to be in contact with their team manager, Telenor and service users throughout the day.

We decided to look further into the C&C field force user group as they appear to be required to work, test and report through a number of technologies at various places. Having

interviewed one of their managers at length and talked with other Eitel personnel it also seems like the field technicians approach this in a number of ways.

During the initial analysis it also became clear that the system developers have worked to make the most relevant features of the Workforce System mobile friendly. Although not officially a strategic choice there is a common understanding of the usefulness of ubiquitous computing, and the competency and service-mindedness within IT to provide this support for mobile devices.

Apparently users have reported functionality not compatible with the smart mobile internet browser as bugs directly to the system developers, or through the helpdesk, as if it is expected to work everywhere because it is web-based. Corporate standardization on browser support for the MSIE family above version 6 does not appear to have any bearing outside of the IT organization as users expect the system to work with whatever browser they prefer.

Sources within IT speculate that the younger employees are more prone to working from their phones than the older ones. We have no data to verify such speculations, nor what model of work is the most efficient. We note that both categories of adapters seem very engaged in their primary work and finding ways to improve their personal productivity. This seems to be in some contrast to the ideas of business management who seem to believe that the ones working with paper are reactionary and inefficient.

When analyzing the processes, it would seem that the secondary work of line management control and reporting is what suffers as a consequence of the paper based approach. They have little insight into what is being done throughout the day, and no possibility to re-assign work-orders, making the team managers possibly less effective in their job. The expectation of ubiquitous computing and constant flow of data between systems and different users seems to have a somewhat negative impact on the trust between workers and management.

GPS positioning devices has been installed in service vehicles in order to help the team leader assign incoming work-orders to a suitable worker nearby. The workers-union have demanded that this information is anonymized so that the vehicle can be identified and traced, but not who is in the car.

User Interviews

We interviewed several field technicians and realize that they have the possibility to work with or around the system in many different ways. All users have laptop computers with integrated WIFI and mobile 3G networking capacity. Most of the employees also have some sort of ruggedized Android 4+ based smartphone with 4G capacity and 4-5" touchscreen.

The official procedure guideline is to bring the Laptop in the service vehicle and report online through the Mobile Workforce application before starting each job, and after completing each work-order. In some cases, documentation is required before and/or after work.

Some users have adapted their working style to their preferences within what is allowed in the customer agreement, and possible within the limits of the technology available to them. Some print all the work-orders for the day to paper and set the status to Under Work before leaving home in the morning. They work on paper throughout the day unless they receive notice of an urgent work-order, that need to be addressed and completed using the PC in the normal way.

The users that triggered our interest to do this case study was the ones that had stretched the boundaries of the mobile technology and the workforce system by working as much as possible from their smartphones. Initial inquiries indicate that this is a matter of personal preference and initiative, and not so much a matter of what kind of primary work is done.

Ethnography

We hope to be able to join one or more field technicians on the job in order to observe how they work and gain firsthand experience that can corroborate the information we have received, and perhaps give us a deeper understanding of the context.

Conclusion

It would seem a bit premature to conclude at this point in the study. Tentatively we suggest that users adopt ways to work around technology that they feel is not well suited for the purpose. In this case it would seem that the WIMP laptop is less portable and flexible than newer technology like tablets and smartphones, or slower and less durable in the field than older technology like paper and pencil.

The convergence of technology in the smartphone, and the support for web based applications and information, has made it a very useful tool for mobile working. There appears to be little patience on the user side for systems that are not usable on smartphones. Management and customers have high expectations of constant status and progress reports due to the ubiquity of mobile technology.

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