Interaction Design for Internal Corporate Tools

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Software tools to be used by employees of large organizations rarely satisfy the end-user. They might be complex, difficult to use, not feasible in the actual work context or even worse adding to the workload of the users. This is however not that surprising, since designing for such complex organizational contexts can be challenging. Typically, such projects involve a large number of stakeholders and a diverse group of users, all with their own roles, backgrounds, wishes, needs and preferences. For large enterprises is is a challenge to create internal tools that fulfill their supporting role for the employees and at the same time take away few as possible resources from the core business. This paper reports on a research under the umbrella of the larger areas of CSCW and HCI. The project aimed at getting more insights into using a user-centered approach to the design and development of internal-tools within a large multinational corporation. Field observations from within the department were combined with design explorations in which new tools were prototyped. A model for thinking about the work setting is presented and recommendations for interaction designers aiming at applying a user-centered approach to design of internal tools are given.

Interaction Design för interna företags software

Software som används av anställda i stora organisationer sällan tillfreds användarna. De kan vara komplexa, svåra att använda, omöjlig att använda i det faktiska arbetet eller sämre de lägga till i arbetsbördan för användarna. Detta är inte så överraskande men eftersom designa för att söka komplexa organisatoriska sammanhang kan vara en utmaning. Typiskt, sök projekt involverar ett stort antal aktörer och en blandad grupp av användare, alla med sina egna roller, bakgrunder, önskemål, behov och önskemål. För stora företag är det en utmaning att skapa intern programvara gjorde fullgöra sin stödjande roll för de anställda och samtidigt ta bort så lite som möjligt resurser från kärnverksamheten. Detta arbete rapporterar en forskning inom ramen för discipliner CSCW i HCI. Projektet syftar till att få mer insikt om hur du använder en användarcentrerad syn på design och utveckling av software inom ett stort multinationellt företag. Fältobservationer från inom avdelningen gjordes och kombinerades med designprojekt där ny software som prototyp. En modell för att tänka på arbete presenteras och rekommendationer för interaktionsdesigners som syftar till att tillämpa en användarcentrerad syn på design av mjukvara ges.
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ABSTRACT
Software tools to be used by employees of large organizations rarely satisfy the end-user. They might be complex, difficult to use, not feasible in the actual work context or even worse adding to the workload of the users. This is however not that surprising, since designing for such complex organizational contexts can be challenging. Typically, such projects involve a large number of stakeholders and a diverse group of users, all with their own roles, backgrounds, wishes, needs and preferences. For large enterprises is is a challenge to create internal tools that fulfill their supporting role for the employees and at the same time take away few as possible resources from the core business. This paper reports on a research under the umbrella of the larger areas of CSCW and HCI. The project aimed at getting more insights into using a user-centered approach to the design and development of internal-tools within a large multinational corporation. Field observations from within the department were combined with design explorations in which new tools were prototyped. A model for thinking about the work setting is presented and recommendations for interaction designers aiming at applying a user-centered approach to design of internal tools are given.

1. INTRODUCTION
Software tools to be used by employees of large organizations rarely satisfy the end-user (Finstad et al., 2009). They might be complex, difficult to use, not feasible in the actual work context or even worse adding to the workload of the users. Several academic areas of study deal with the question of how satisfying computer-based systems can be designed for people. Human-Computer Interaction (HCI) is a large interdisciplinary academic field of study concerned with the “design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” (Preece, Rogers & Sharp, 2002). A research area much related to HCI is that of Computer Supported Cooperative Work (CSCW), which focusses on the way groups and organizations use technology (Borghoff & Schlichter, 2000). A fundamental to these research areas is interaction design: the activity of “designing interactive products to support people in their everyday and working lives” (Preece, Rogers, & Sharp). Interaction designers are advocates for the end-users of products (Saffer, 2009). Often they work with user-centered design processes, characterized by the involvement of users in the design process. The goal is to design products that fulfill users’ needs, and that are comfortable to use (Bainbridge, 2004). In the last decade interaction design has become increasingly popular in businesses as well. Companies have become more user focused and pay more attention to what people want and need in their lives (Gothelf, 2013). Unfortunately, this philosophy is often only applied for the products that are brought into the market and employees are still expected to work with complex, difficult to learn, and dissatisfying tools (Finstad, 2009).

It has to be considered however, that designing software tools to be used in such complex organizational contexts can be challenging. Typically, such projects involve a large number of stakeholders and a diverse group of users, all with their own roles, backgrounds, wishes, needs and preferences (Rettig, 2007) (Marcus, 2015). Additionally, the way work is supposed to be done might not always equal the way work is actually carried out, making it hard to define a scenario of use for the tools (Blomberg & Karasti, 2013). These issues, and the role interaction designers can play in solving them, will be further explored in this paper reporting on insights gained from field observations and design explorations from within the large multinational telecommunication firm Ericsson.

From Ericsson’s headquarters in Stockholm, the Technical Sales Support department (TSS) of the Business Unit Radio (BURA) gives assistance to the sales people in the regions (which are the local Ericsson companies encompassing the business of different countries). One form of aid given by TSS consists of the development of internal software tools which could be used during various phases of the sales process. These internal tools have a much more limited use than typical commercial applications and often have a time-limited scope. The development of these internal tools have lower priority than the development of the core products, but is needed to support the core business. It is a challenge for Ericsson to create (or acquire) internal tools that fulfill their supporting role and at the same time take away few as possible resources from the core business.

This paper starts with a short overview of relevant theory, after which the insights of both the field observations and design explorations are presented. A model for thinking about the setting of internal tools developed by TSS for indoor small cells sales support is presented. The use and validity of this model is illustrated by its application in the design explorations. Finally, general sensitivities for
interaction designers aiming at applying a user-centered approach to design of internal tools are described.

2. THEORY AND RELATED WORK
Schmidt and Bannon (in Kensing, Simonsen and Bødker, 1997) point out that it is important to keep the specific groups of users in mind during the development of software systems that will be used within organizations. They name these groups ‘cooperating ensembles of users’. The study of such groups involves studying the specificities of the members of those groups and the collaboration between them. Kensing, Simonsen and Bødker used this concept to get better insight into the organization of a Danish Radio Station. They understood that the different groups of users, often composing different departments, have different work domains and ‘differences in perceived need for computer support’. Grouping users has since that time become popular in the software development area as well. There the groups are not so much seen as ‘cooperating ensembles of users’ but more as aggregations of users sharing similar characteristics and goals.

A common practice of interaction designers is to distill the specifics of such a group of users and present it in the form of personas. Personas are “fictitious, specific, concrete representations of target users” and consist of “detailed descriptions of imaginary people constructed out of well-understood, highly specified data about real people” (Pruitt & Grudin, 2003, pp. 3,29). Instead of trying to make a software useful for a broad audience, the personas make the designers focus their efforts to a very specific group of people. It prevents the mistake of seeing the target users as “everyone”, since this often results in systems that are useful for no one (Pruitt & Adlin, 2006). Personas can as well be useful as a medium for the communication a broader range of information towards for example developers, managers, marketers and other stakeholders of projects (Pruitt & Grudin, 2003). When little information is available to base the persona descriptions on, proto-personas can be created. Proto-personas are a “best guess” description of the targeted end-users of a product. Once more data is collected their description can evolve from a hypothesis to a certainty (Gothelf, 2013).

An important challenge of large and complex organizations is knowledge management. Although knowledge management is originally more of a business school discipline, extensive research into the area has been done under the umbrella of CSCW as well. CSCW takes a socio-technical approach to the topic, acknowledging that any technological tool for knowledge or expertise sharing needs to take into account the social context as well. Knowledge sharing refers to the externalization of knowledge into digital artifacts such as for example information repositories. Expertise sharing focusses more on the human components and refers to situations in which the capability to do something is transferred by one actor to another based on discussions between these actors (Ackerman et al., 2013)

Knowledge and expertise sharing are vital for large organizations. It is needed to learn continuously and to reinvent processes accordingly. Efficient expertise sharing is crucial in providing better technical assistance and presales marketing. (Ackerman, Pipek, & Wulf, 2003)

Expertise sharing does not come without challenges. Hinds & Pfeffer (2003) describe several cognitive and motivational limitations that interfere with people’s ability to share their expertise. The cognitive limitations arise from the fact that experts’ brains store and process information differently than novices. Experts use more conceptual, abstract representations of knowledge when performing a task, while novices’ representations of knowledge are more concrete. This gap needs to be bridged for successful knowledge transfer to occur. Experts can do this by providing background, by giving concrete information in context and by using language that is understandable for novices. Another limitation is the difficulty of people to articulate tacit knowledge (knowledge that is learned trough experience). It is not only hard to externalize this knowledge; the knowledge is also difficult to extract from a particular context or environment. For the knowledge to be useful for another actor the knowledge has to be extracted from the current context and adapted to a new context, which is not always easy.

Motivational limitations can be the presence of competition (knowledge is power and people are reluctant to share power in competitive environments) or the lack of incentives for sharing expertise given by the management. Often the the hierarchical structure of organizations governs how information flows. It is often constructed so that communication is done efficiently between specific actors, with instructions flowing downward and information flowing upward. This model is indeed efficient, but might make actors reluctant to share information in other ways that might disobey this model. Substantial differences in performance across sites can be the result when expertise and knowledge are not successfully shared in a multisite organization. Technology can be a part of the efforts of overcoming of this barriers, but should always be complemented with appropriate organizational structures and management practices (Hinds & Pfeffer, 2003).

Often ethnographically inspired research methods are used to inform the design of CSCW tools. An example is the research done by Harper (1997), who studied the work practice of the International Monetary Fund in Washington DC. By studying the Fund’s mission process, potential opportunities for the use of CSCW tools within the particular organizational circumstances of the Fund were identified. Another study of Harper, Hughes, & Shapiro (1990) studied the work practices at an air traffic control room. Their study informed the design of an interface to the flight database for controllers (Bentley et al., 1992).
The aim of observational studies is not to see how work can be done better, but to learn how work is done, in order to make systems that fit a particular organizational reality (Button, & Sharrock, 2009). Kensing, Simonsen and Bødker (1997) note that if you work within a specific environment, naturally your design has to be organizationally feasible within that context as well. This is why "organizational issues have to be an integrated part of the design and implementation” (p.342). It is important that knowledge is collected from which recommendations can be formulated that lead to feasible designs of software tools. Usually observational research leads to implications for the design, but Dourish (2006) emphasizes that it provides much more than just that. Namely “insight into the organization of social settings”, with as a goal “not simply to save the reader a trip; rather, to provide models for thinking about those settings and the work that goes on there” (p. 9). In both Kensing, Simonsen and Bødker (1997) and Cohen, Cash and Muller (2000), the insights gained from observation based analysis are combined with the design of a CSCW tool as a ‘design exercise’.

Building on this previous work, there is a strong suggestion that field observations combined with design explorations can give valuable insights and lead to design and development of better tools. The literature however also shows that these projects can be complex and challenging. This leads to the following research question:

What should interaction designers be sensitive to when applying a user-centered approach to the design of internal groupware tools in a multinational corporation?

3. RESEARCH CONTEXT AND METHOD
As front-runners in a high-technology environment, large multinational companies such as Ericsson face many challenges: they have to deal with market uncertainty, technological uncertainty and rapidly changing, unpredictable competition (Mohr, Sengupta & Slater, 2005). In addition to that, Ericsson functions in a business-to-business context, without direct contact with the end-consumers of its products. Many stakeholders are involved in bringing Ericsson products into the market and all of have influence on the work done within the company.

With offices and clients in over 180 countries, the company is organized in different business units and regional organizations. In this research, the focus was specifically on the Business Unit Radio (BURA), which is responsible for designing and producing radio equipment and related software. The work for this paper was performed within the the Technical Sales Support (TSS) department of BURA. One of the responsibilities of TSS is to assist the sales people that are operating in the regions with addressing new or unusual questions from the operators. This assistance is usually given in response to certain guidance requests from the sales people in the field. In such cases it is not only the task of the sales support department to aid them with their current issue, but additionally, to steer towards the creation of a protocol so that the sales force will be able to handle equivalent problems better in the future.

At Ericsson I worked in a team of four members. This design team consisted of me, two other master students (one working on a research of Lean UX (Gothelf, 2013) in a corporate context (Grama, 2016), and one working on a research in the area of simulations and interaction design (Laure, 2016)). The fourth member of our team was our supervisor at the company and a domain expert. He worked at the TSS department and was, among other things, responsible for the creation of internal support tools.

3.1 Method
Over a course five months, insights were gained from participant field observations, design explorations and interviews. Most of the work was related to the specific use case of the sales of indoor small cells, a relatively new product category in Ericsson’s portfolio.

The field observations were done at the TSS department within the headquarters of Ericsson in Stockholm. During the whole project, I was part of this department and was able to study the work practice from up close as a participant. During the time I spent at Ericsson I worked as a user researcher and front-end developer of software tools. Next to the meetings related to that work, I got the chance to attend other meetings where new strategies, quarterly results, educational instruction of new employees, technical support projects, and potential new tools were discussed. Noteworthy events have been regularly documented in a digital notebook in anecdotal form.

During the project three design explorations were carried out as a joint effort of the whole team. Two software tools were designed and prototyped and a third already existing tool was evaluated and partly redesigned. The design explorations allowed me to obtain a deeper understanding of the practicalities and challenges of designing and developing internal software tools within the TSS department and to see firsthand the impact of the tools and our user-centered design approach on the organization.

As a part of both the field observations and the design explorations interviews with Ericsson employees were conducted. Directly after arriving at Ericsson, the team interviewed three executives at the headquarters of Ericsson. The interviews were conducted in a meeting room at the TSS department and aimed at learning more about the different roles and work activities of the interviewees and their view on the current status of the market. The sessions were recorded and roughly transcribed for later reference. The interviewees gave permission for the recordings which are only used for research purposes and were only available to the members of the research team. Later, as part of the user research for one of the tools, a second set of ten interviews of around 40 minutes were conducted via video-conferencing with target users for the tool. The participants were located at different offices of Ericsson all over the
world. The goal of these interviews was to get insights into the status-quo of the sales activities, to learn about challenges of the sales teams in the regions, and to test tool concepts with target users. Also these interviews were recorded and roughly transcribed. The result section of this paper contains a few anonymized quotes from the interviews, which are only placed after the necessary ethical considerations and consultation of the Ericsson team member.

This work has been carried out as an inductive research. The results such as the model of work and the sensitivities have emerged from the insights gathered in the interviews, the field observations, and the design explorations combined. This paper is the result of several iterations of the text with the Ericsson team member (which is a domain expert and our supervisor at the company). This in order to ensure the paper is ethically justified and. The iterations also served as an evaluation method to strengthen the validity of the results.

4. RESULTS

In this section a depiction of the work practices, work context and social setting of generally BURA and more specifically the technical sales support department is given, focusing on the use case of indoor small cells. A model is proposed to frame the work activities. The model is then used to explore the motivations, needs and goals of the people involved in this work (section 4.2) and the way information travels throughout the organization (section 4.3). The use of the model is further illustrated in the context of the design explorations carried out during the project (section 4.4). The way work is described here deviates slightly from the traditional way of describing the work context in the ethnographical tradition. Were ethnographically inspired texts might put more emphasis on a detailed description of the context, I decided to present a more abstract visual model of the environment and the people in the form of a schema (figure 2). This in compliance with the vision of Dourish (2006) describe earlier. The model is created to provide a starting point for thinking and theorizing about the context, and not as a comprehensive description in order to ‘save the reader a trip’. Finally, in section 5 some overarching observations and challenges regarding the application of interaction design in a corporate context are discussed. All these results together form the basis for sensitivities formulated as an answer to the research question in the discussion section of this paper.

4.1 A descriptive model of work within BURA

One of the challenges of the internal software tools developed at the TSS department is the large number of stakeholders involved in a project. We experienced that it was hard to pinpoint the exact target users of specific tools within the company. It turned out that formal job titles are not representative of what people are actually working with. Therefore, it seemed more valuable to talk about different types of work people might be doing and to talk about a target user, as someone fulfilling a certain role, doing a particular types of work in a particular context. Based on this discussion I devised a classification system for the different types of work done within the business unit radio (BURA) in the area of indoor small cells. This model of work turned out to be a valuable tool and essential step towards the identification of target users.

Before presenting the model it is first important to show the official organizational structure of BURA (figure 1). Basically the business unit is subdivided into three levels, corresponding to different degrees of geographical scope. The first level of the organization is the headquarters in Sweden, the geographical scope of this division encompasses the whole world. The headquarters is responsible for new product development, general strategy and support. The second organizational level consists of ten subdivisions (the regions), all responsible for the business in a particular region of the world. Within Ericsson these subdivisions are referred to as “the regions”. The regions have a similar role as the headquarters but with a smaller scope. The regions in turn oversee the third level of the organization which consists of customer units, with one customer unit responsible for one client (usually an operator). In the customer unit the contact with the operators is managed: requests are being handled, new products are marketed and solution proposals are designed and then proposed to the customers. So, on different levels within the organization different work is been done.

![Figure 1: Organizational structure of the Business Unit Radio (BURA)](image-url)

These levels are part of the official structure of the organization. Although they do give a good general idea of where actors are located, and what they are responsible for, they are not yet descriptive enough as a model of thinking about the work done within the organization. After 2 months of participatory observations, the first three interviews, and many reflective discussions within the design team, I realized that there is another attribute on which the work could be classified, namely whether the work done is more proactive or reactive. So whether the work activities are creating and controlling opportunities, or if they are more responsive in nature. Within the context of Ericsson, these activities can be referred to as the proactive...
“engagement” activities for products and solutions, and the reactive activities dealing with “delivery” of those same products and solutions. Engagement work generally involves among other things the marketing towards the customers, the development of new products, and the active search of new business opportunities. And delivery work encompasses the activities done after a request is done by a customer. I was able to test this view in the 10 interviews with sales people in the regions. The interviewees were asked to describe their general work activities, from the different way people in different roles described their work, I was able to confirm that this second engagement vs. delivery subdivision of work is accurate and meaningful in the context for a model of thinking about the work context.

In summary, the different work activities for indoor small cells in BURA can be grouped on two properties 1) the geographic scope of the work and 2) the proactive or reactive nature of the work (whether the work deals with engagement or delivery activities).

![Figure 2: Classification of work with Indoor Small Cells within BURA](image)

Figure 2 shows a schematic representation of the work done with indoor small cells in BURA. Vertically the three levels of geographical subdivision are shown, and horizontally a division between engagement work and delivery activities is made. In this way, the work is ordered into six distinctive categories.

The next section describes how the schema functions as a basis for the formation of proto-personas depicting target users of tools, and how it can be used more generally as a probe for communication in design projects with different stakeholders. Then in section 4.3 the schema is used to visualize and describe the way information travels throughout the organization. This is relevant in the lights of the endeavors of TSS to spread knowledge and expertise throughout the different areas of BURA’s business.

### 4.2 People working with indoor small cells

The classification schema of the work done within BURA for indoor small cells turned out to be powerful tool for our team in the design process of support tools in the TSS department. Because the area of telecommunications was completely new for me and the other two students in our team, we were extra dependent on information from our target users for design. For the same reason however, we were not able to pinpoint our exact target users for our design explorations since we were unsure of the roles or job titles of the people we wanted to get feedback from. This is where the schema turned out to be useful. When we asked some colleagues and higher management to aid us in the process in recruiting participants for interviews for the design exploration of the “5-step tool” (described later in section 4.4), we showed them the schema and asked for people working with work activities in category 2 and 4 of the schema. Immediately they started naming different people, job titles and roles. They would for example say things like “Alan might be good to interview; his official role is more in category 3 but in practice his work is very much in the area of category 4”. Moreover, we found ourselves discussing among each other in which category the people we interviewed fit the best. This is an indication that the model serves its intended purpose as a starting point for “thinking about the work setting and the work that goes on there” as stated by Dourish (2006).

The work of individual people working with indoor small cells might not fit into only one of the categories of the schema. Stereotyping some of the work practices and imagining people only focusing on one type of activities is however useful for the purpose of design. Using the schema, we were able to start creating some proto-personas for our tools. For the purpose of illustration, three proto-personas (Elisabeth, George and Dimitris) are described here, their position in the classification scheme is depicted in figure 3.

![Figure 3: Three proto-personas placed in the classification schema](image)

**Elisabeth: engagement practitioner for a region**

Elisabeth works as an engagement practitioner at a regional level. Most of her activities are related to marketing strategies and work practices that can be applied in all of the regions. Her work is driven by creating sales scenarios in which Ericsson’s products come forward in the best possible way. She describes this herself as “generating opportunities” and “opportunity hunting”. As part of this work she is actively engaged with the customer. For instance, she might be working on replacing old design criteria that lead to over-dimensioned and expensive
solutions, with new design criteria which provide the desired performance at a lower investment cost.

**George: solution architect at a customer unit**

As a solution architect at a customer unit, George designs among other things, indoor network solutions. His work is reactive in the sense that normally a solution is designed in response to a customer request. Often projects have to be carried out under time pressure. “By the time they send us a building it has already gone to the CTO and CEO level, so for them they expect a solution within a week”. George usually deals with a specific building in a specific city with a specific problem. For him it is important that the aid he receives from the TSS department matches his exact situation. His work leaves little room for abstractions and generalizations.

**Dimitris: engagement practitioner at a customer unit**

Dimitris is an engagement practitioner, just as Elisabeth, but works locally in a customer unit. A lot of his time goes to translating the strategies coming from the headquarters and the regions into concrete steps to take with his customer. This is not always easy, since some of the difficulties he faces are context specific and might not have been foreseen by the headquarters. Since the customer unit is small, additionally he is responsible for the contacts with the operator. He would like to be more proactive, and is working on that, but this does not always have the highest priority.

These proto-persona descriptions are of course quite limited, but they give an idea on how the classification schema can be used as a basis for persona creation. When it comes to designing internal tools, the work activities have a large impact on the needs and goals of the different actors. The way work is intended to be done might not always equal the way work that is actually carried out, for example in Dimitris case who’s limited resources sometimes prevent him to work as proactive as he should and wants to. This is a challenge and also an opportunity for internal tools. The tools need to reflect the strategy that is envisioned by the headquarters. Moreover, they need to be functional in the real work environments of the people in the customer units. Striking a balance between abstract future-oriented vision and concrete present-day applicability is a big challenge.

4.3 Knowledge Management

Next to the use as probe for communication and basis for the formation of personas, the classification schema can be used to analyze the way knowledge and expertise is shared within the organization and how different groups within the company communicate. As described earlier, Ericsson employees working with Indoor Small Cells are located all over the world. The scope of their work can be either worldwide, regional, or one operator only. This geographical division between different subunits of the organization has an influence on how information travels throughout the company. Just as described by Hinds & Pfeffer (2003) the organization is constructed in a way that communication is done efficiently, with instructions flowing downward and information flowing upward. This flow of communications is visualized in the classification schema in figure 4.

![Figure 4: Information flows within BURA](image)

4.3.1 Downward flow of instructions

The research & development department is not part of the schema, but people doing proactive engagement work at the headquarters (category 1 of the schema) are the most likely to get input from them. They will use new knowledge and imagined futures to create new products, solutions and marketing strategies for the market. Then these materials are transmitted to the regional level (category 2) where more engagement work is done in order to translate this knowledge into more specific material that is tailored to the reality of their particular region. Another round of new contextualization of knowledge will be done one a local level (category 3): the materials and messages will be adapted as to fit a particular operator’s brand and requirements. The information travels mostly through PowerPoint presentations, video seminars and video conference meetings. This chain of contextualization and adaption of knowledge transferred from the headquarters to the customer units constitutes a downward flow of instructions. This downward flow of instructions goes mostly trough people doing work on the engagement side of the classification schema.

4.3.2 Upward flow of information

As well as a downward flow of instructions, there is an upward flow of information within Ericsson. It consists mostly of the feedback from the people working ‘in the field’ flowing back to the headquarters via the people doing work on the reactive side of the schema. An important quantitative source of information on the sales success is of course the report on the quarterly sales results. But another more qualitative source of information comes from the requests for support to the TSS department. These cases are in some way challenging for the customer units or regions and need extra resources to be adequately handled. The specifics of these cases tells the headquarters what knowledge and expertise is still missing in the regions and where more support needs to be provided. This might lead them to organize a web seminar or, for example, to create a software tool.

Of course the marketing strategy and sales processes advocated by the headquarters are designed with the practical situations of those people in the regions in mind. It
is however so that customer units vary so much from
country to country and operator to operator, that it is hard to
have a ‘one size fits all’ solution. Sometimes the customer
units find it challenging to adapt the strategies to fit their
own situations and translate the headquarters’ vision into
appropriate actions in the customer units.

4.4 Design Explorations
During the five months at Ericsson, the team undertook
three small design projects, all with different scope and
purpose. More generally the aim of the explorations was
three-folded. Firstly, to design and prototype new sales
support tools for the department. Secondly, to observe how
the department reacted to a more user-centered way of
working involving iterative designs, prototypes, user
interviews, etc. And thirdly to validate and evaluate the
classification schema of work and its use in practice. For
these projects my role in the team was that of user
researcher and front-end developer.

4.4.1 Carrier Aggregation Tool
Scope and Purpose - In our first design exploration, we
created a web-based tool for the sales people that can be
used to show the benefits of carrier aggregation (a specific
technique used to make more efficient use of the existing
telecom network). The tool facilitates the creation of graphs
that could be used for presentations to customers.

The purpose of the design exploration was two-folded: one
was to aid and leverage on the research of team member D.
Laure, who developed the backend of the tool (Laure,
2016). But secondly, the small scope of the project gave the
team the opportunity to promote at TSS the principles of
user-centered design and to learn from the reactions of the
people at TSS on the tool and the user-centered design
approach.

Design Approach - The tool basically let the sales people
reproduce two standard graphs that are often used in
presentations to the customers. One of such PowerPoint
presentations was used as a basis for the design. Multiple
stakeholders where interviewed after which a paper
prototype was created and presented. The feedback on this
prototype were processed into a new design, and a
wireframe was created. With this as a guide, the tool was
developed in a web-environment on top of a backend
connecting it to simulation software.

Generally, our focus was very much on usability, not
directly involving the end-user into the design process of
the tool, but definitely making sure the tool would be user-
friendly and fit to the target user’s work practice.

Use of Schema and Personas - The classification schema
helped the design team to identify the target users of the
tool and the type of work it would be used for (see figure
3). Looking at the functionality and goal of the tool (the
creation of graphs for promotional presentations), the tool
would be clearly part of the engagement type of work (left-
hand side of the schema). The graphs would be used for
presentations directly to customers. This type of work
generally happens at the local or regional level (categories 2
and 3 of the schema), depending on whether the needed
expertise is locally present at the customer unit. We decided
to design for a target user working with engagement at a
regional level (category 2 of the schema). The persona
“Elisabeth” described in the previous section matches this
profile. Selecting a target user for a new tool became easy
in this way. This is an example of the usefulness of an
abstract visual model of the context such as the
classification schema of work.

Knowledge Management - This tool gives the sales people
the opportunity to create their own graphs using simulation
software created by the R&D department. Before they had
to ask an expert to produce the new graph, and now they
can do it themselves, taking the burden of the expert. This
tool is an example of how it is possible to make advanced
(expert) knowledge accessible for novice users.

Furthermore, it is an example of how software tools can
make expert abstract knowledge easier to contextualize for
novices by giving them the possibility to get concrete
information (the graph) for their own specific project
context.

Results - For feedback purposes a paper prototype was
created. The final design was later presented in a more
high-fidelity mock-up. Finally, the design was used to
create a fully-functional beta-version in a web-environment.

The developed tool enables the sales force to order
simulations of the application of the carrier aggregation
technique to the specific case of their customer. They can
explore their case through interactive version of the graphs
and relevant graphs can be taken and used in a PowerPoint
presentation.

Presentation and Feedback - The fully developed tool was
presented to the stakeholders of the project, the TSS tool
development team, and a group of representatives from
another department that often aids TSS in the development
of internal tools. Additionally, the different deliverables
of the project from prototypes to final tool were put up on the
wall of the department as an illustration of our team’s work
progress (see figure 5).

The final version of the tool was generally received
positive. The people were impressed by the design, the
speed of the simulations, and the flexibility of the
interactive graphs.

It was however also clear that web-applications are not
standard within Ericsson. The ’slick design compared to the
more common Excel and Matlab based tools, initially raised
some suspicion on the seriousness and usefulness of the
tool. Only when we would go through a use case and look
in more details at the graphs and their implications the
people were convinced of the advantage of the tool.
Furthermore, because this was the first web-based tool made in the TSS department it took us some time to get the right infrastructure in place. We had some practical issues getting the final version up and running. Because of this it was unfortunately not possible to do an evaluation with a larger set of users.

The insights gained from these activities, and many conversations within the team led to the conclusion to only do a redesign of the tool’s interface, keeping the current functionality the same. Simultaneously, the team took a step back, looking at the pre-sales activities in general and designed a tool for these purposes. This design exploration is described in the next section.

In order to inform set goal of re-designing the user interface, the pre-sales tool was evaluated in two ways: 1) in an expert evaluation and 2) in an observation of a teaching session in which new users learned to work with the tool.

Use of Schema and Personas - The insights gathered during the contextual research of the tool were partly the basis for the classification schema presented above. Interestingly enough however, the schema helped achieve the initial goal of figuring out the cause for the tool’s lack of success. Firstly, the user interface had obvious flaws, and this limited the usability of the tool. But on top of that, the insights gained from observations, embodied in the classification schema of work, made it possible to explain the exact problems with the tool.

The tool was designed to be used for proactive pre-sales situations (engagement side of the schema). People working in a more reactive way (delivery side of the schema) then started to use the tool for a different purpose that it was not designed for. They did this because there was a lack of any other tools addressing their needs. The pre-sales tool came closest to what they needed, but it was not really suitable for that kind of use.

Originally, the tool was designed to give the user a generic view of the possibilities of different indoor solutions, their differences and their costs. It was meant to be used in order to get an abstract understanding of possible design solutions for example by the engagement managers on a regional level (the Elisabeth persona described earlier). Although the features and general idea of the tool did fit the needs of the people working with delivery activities (for example the George Persona described earlier), their needs for customization to very specific situations were not addressed by the tool.

So the use cases of people like George, on the delivery side of the schema were addressed in a way that resonated with people like Elisabeth, working with more engagement activities. This made the tool uncomfortable to use and inadequate for users of both groups.

Knowledge Management – During the observation of the teaching session, the challenge of knowledge transfers between experts and novices and its influence on tool design became apparent. The novice users of the tool did not only have difficulties due to the usability issues of the tool, but also generally with giving the right input. Sometimes they weren’t completely sure of some expert concepts and terms needed for a correct use of the tool.
These issues need to be taken into consideration when sales support tools are designed.

Results - Since a new tool was designed to address the needs of the sales people in the pre-sales process (see next section), we decided to put minimum effort in the improvement of the old tool, but to incorporate its functionality within this new tool with a wider scope.

We came up with some small improvements as a temporary fix for the most urgent usability issues, to make the current tool more easy to use until the new tool is fully developed and ready for use.

Presentation and Feedback - the improvements have been presented to the tool owner (the Ericsson member of the team) in such a way as to not only visually show the suggestions for improvement, but moreover, to explain the rationale behind these suggestions. This as part of our efforts to get the owner and TSS more comfortable with user-centered design practices.

The suggestions were well received and there are plans to update the interface of the current tool accordingly. However, the implementation was not started until the end of the project due to a lack of resources.

![Figure 6: Detail of re-design pre-sales tool](image)

4.4.3 5-Step Tool

Scope and Purpose - The challenges of the sales people in the field often encompass much more than technical issues only. Many of the challenges they face reach into the areas of business and marketing as well. About the same time as the start of our project, a team at TSS has devised a five step process for the sales of indoor small cells to address this challenges.

The team decided to explore the possibility of a software tool enforcing this five step process, while at the same time giving more practical technical aid to the sales people in the customer units.

The purpose of the design exploration was to understand if and how strategic instructions from the headquarters could be conveyed through web-based software tools to the sales people in the regions and customer units. A secondary purpose was to apply the Lean UX method of Gothelf (2013) in the design process, to show the benefits of user experience design practices to the team.

Design Approach - The team followed the Lean UX process for the design of the tool. This design exploration was mainly driven by the team member C. Grama, since applying Lean UX was the focus of his research (Grama, 2016). Working with Lean UX entailed that we as a design team first formulated some assumptions with matching hypothesis on wanted features and a prototype of these features was created (see figure 7). After this the hypothesis were tested by means of presenting the prototypes to target users and conducting semi-structured interviews with them. Based on this feedback the initial assumptions were either confirmed or rejected. With these new insights new assumptions were made and the process was repeated. In total three iterations were completed.

Use of Schema and Personas - This design exploration incorporating assumptions and experiments to test those assumptions was a perfect opportunity to test the validity of the classification schema of work and the proto-personas presented earlier in this paper. The proto-personas Elisabeth (doing work in category 2 of the schema) and George (doing work in category 4 of the schema) were selected as target users for the tool. Therefore, the interviews were conducted with people matching these profiles. Listening to their general attitude towards sales and the clients, their descriptions of work and the challenges they faced in their work, was vital information to validate the schema and personas and adjust them where necessary. The interviews deepened our understanding of the people and the work they do and were a valuable source of information for the final description of work presented in previously in this paper.

![Figure 7: First iteration paper prototype](image)
general market in their region. By systematically collecting this data, the headquarters can get a better insights into the realities and challenges of the sales people in the regions.

Results - For the first two iterations paper prototypes were created and incorporated into a PowerPoint explaining the 5-step process itself and the concept for the tool. This PowerPoint was used as a probe for conversations during the interviews. Not only did the interviews led to new input for the next iteration of the design of the tool, some other deliverables were created with the gained insights. In the first iteration we tested the 5-step process itself since it was the basis for the tool. Secondly after two sets of interviews with people working in different regions, we got a good insight in the main challenges they faced in their work. Nine main sales challenges could be distilled from the interviews.

For the third iteration a high-fidelity mock-up was created. Due to time and practical constraints it was impossible to test the new set of assumptions with target users, but an evaluation with the Ericsson member of the team was done.

Presentation and Feedback - The prototypes made as probes were of course presented to the users during the interviews. Their feedback was valuable for next iterations in the design process. A complete description of the application of the Lean UX process on the design of the tool can be found in the research report of team member C. Grama (Grama, 2016).

The feedback from the technical sales people around the world on the 5-step sales process was summarized and presented to one of the two initiators of the 5-step process. We have not received much feedback on this. This might be due to the fact that only part of the feedback was related to the process and TSS tools. Unexpectedly, we actually collected a lot of feedback on sales challenges experiences by the interviewees. The nine main challenges were written down and explained in a Word document and shared with the Ericsson member of the team and presented to higher-management and product marketing of indoor small cells. Additionally, a final presentation of the whole project will also be given to the entire TSS and business management department (more than 50 people).

One of the outcomes of our work is that more resources have been planned for the development of the tool after our interviews confirmed that the 5-step process was appreciated by the people in the regions.

5. INTERACTION DESIGN IN A CORPORATE CONTEXT
As newcomers within the TSS department of Ericsson, coming in as students with an academic mindset, and as the first designers in the department, we sometimes encountered some challenges due to our general way of working. In this section some of those challenges are discussed and some general insights gained from dealing with those challenges are presented.

The first challenge we met was that the people in our department never heard of interaction design or user-centered design before. We of course had to explain our presence and goals. If we presented ourselves too much as designers, we often got reactions as “These guys do the interface right?”. If we presented ourselves more as tool developers, they expected us to be coding and did not understand our user research activities. After one of the interviews with an executive he asked “So are you also going to do some work actually, do you have time for that?”. We tried to explain that studying the users and context of work would be essential in making better tools, and that the interface is just the tip of the iceberg of what makes up interaction design. He expressed to be worried: “I don’t know what you will manage to do before you leave. We would like to see a demo before you leave”.

After developing the beta-version of the carrier aggregation tool we actually gave a presentation to some of the people in the department. We presented the tool, but additionally the concepts of interaction-design and user-centered design in general. The people seemed interested during the presentation, but not much follow up questions were asked. Generally, little questions were asked by co-workers on the content of our work during the time we stayed at Ericsson.

Once we were asked to join a conversation someone working with research who had ideas for internal tools related to the energy management of radio networks. Trying to figure out how we could be of use we asked questions like “who is it for” and “what are they going to use it for”. She had not really thought about the users of the tool, and was more interested in finding a way to spread the knowledge gained in her research, and to demonstrate the outcomes. Our questions were overwhelming her and got her in a defensive mode. We proposed to do a paper-prototype first. But she felt she could not just show up in a meeting with only a piece of paper with a drawing of a tool. Although we kept an opening for collaboration, a second meeting was never planned.

Likewise working in a team together with our supervisor at the company was challenging. He was quite unaware of the field of interaction design, but eager to learn more about it. When he realized what the whole field encompassed and what our skills were, he had some confusion on what he should “use us for”. His new understanding of our field made him ask us to take a step back and look at the large picture, since he felt we could give valuable new input to the department. He expressed that using our team for redesigning and interface would underuse our potential and make our work irrelevant from an academic point of view. Next to the fact that our supervisor had difficulties understanding our field of work, it was challenging for us to understand the work done in our department which meant we had to learn at least the basics of radio networks to do useful designs.
Testing our prototypes in the interviews with target users was not always straightforward. When we conducted the interviews aimed at getting feedback on our designs, we had to put extra emphasis on the fact that this was just the start of an idea, that what we presented was a prototype. That we were not telling them that this was the way it was going to be, but that we would like to work together with them on improving the design. Therefore, we discovered it was useful to purposefully stick to a low-fidelity prototype to make sure people understood it was meant to still be improved and were comfortable to share their insights and opinions. The feedback sessions were valuable to us, and generally we got the impression that it was good for the relations between TSS and the regions.

6. DISCUSSION
This research was conducted with the purpose of improving the design and development of relevant and useful internal software tools for the technical sales support in Ericsson. Participant observations were combined with design explorations in order to study the social context in which the tools would be used, the potential users of the tool and their day to day work activities. Additionally, user-centered design practices were showcased and advocated for within the technical sales support department through several design explorations. With the knowledge gained throughout this project an answer can be formulated to the underlying research question:

What should interaction designers be sensitive to when applying a user-centered approach to the design of internal groupware tools in a multinational corporation?

6.1 Fundamentals
The two sensitivities described in this section are the fundamentals or prerequisites for any user-centered design project in non academic (industry) context to be successful. Although they might seem common-sense, they can be easily underestimated or even forgotten. These sensitivities naturally follow from the challenges described in section 5 of this paper.

6.1.1 Explain who you are and what you do
Sensitivity - In large organizations people of a variety of backgrounds, having all kinds of competences are employed. It is hard to guess what their level of awareness on user-centered design approaches and interaction design is. In this project we faced the challenge that the people in the department were unaware of our field and related practices. It was sometimes hard for us to work in an environment in which a lot of misunderstandings about who we are and what we do as interaction designers existed. We were either seen as graphical designers who “make things pretty” or as developers. These conceptions of who were are had an influence on what people expected us to do and all activities we performed outside the scope of these expectations had the risk not to be see as real work. Therefore, it is important to actively frame who you are and what you do yourself and set the expectations.

Recommendation - It is much recommended to address these issues in an early stage of the project. Hence it is important to start by assessing their level of understanding. The current level of understanding will have informed the employers’ brief towards the team, which might not always make the best use of the full set of competences interaction designers have. Therefore, it is best to take a brief period of time at the beginning of the project in which interaction design, user-centered approaches, and common methods and tools within the field are explained. Then, with this new more complete understanding of the possibilities, the brief towards the design team can be reformulated if needed. This is however not sufficient. Be prepared to explain who you are and what you do to every new person you meet and every presentation you give. Often people need some time to build an understanding, but moreover, in large corporations, teams are flexible and often people come to visit, so usually you will have someone new joining for every meeting you have.

6.1.2 Get to know the industry
Sensitivity - It is likely that is not only the case that the company knows little about interaction design, but likewise, that the designers have little understanding of the industry in which the company operates. In this study we worked at the business unit radio of Ericsson, which solves complicated telecom network engineering problems. We needed to get a basic understanding of the industry, its technologies, people, work practices and vocabulary.

Recommendation – A simple crash course at the beginning of the project already makes a big difference. Next to that keep a list of common words and abbreviations used that are industry specific. Lastly, be honest about your level of understanding of the industry. In the end you are a designer and cannot and will not be expected to become an expert in the field.

6.2 Sensitivities for the corporate context
The next three sensitivities are more specific for corporate contexts and projects concerning internal tools.

6.2.1 Identify groups of users
Sensitivity - In order to do proper user-centered design, you need to understand who will be using the tool you create. This is not easy within a large corporation. When it comes to internal tools the initial conception of the target user might be “anyone within the company for whom it is useful”. We found out that it is not easy to be more specific. Job titles are often not informative at all when it comes to understanding the work people do on a daily basis. And even people with the same job titles might have acquired completely divergent roles within the company throughout the years.

Recommendation – Analyze the organizational structure and the different types of work performed within this structure and create an abstract model of work such as the classification schema of work within BURA described in
this paper. The schema of work can be a model for thinking about target users for specific internal tools. The different types of work in the schema are performed by different groups of users with different needs for computer support, matching the concept of “ensembles of users” as described by Schmidt and Bannon (in Kensing, Simonsen and Bodker, 1997). The schema can be used as a basis for the creation of personas, a probe for communications with stakeholders and a map of groups of users, the work they do, and how they work together. This uses of the schema have been shown in a practical context in section 4.4 of this paper, where the design explorations are described. I would like to emphasize the usefulness of visualizing the work context in an abstract schema such as the one presented in this paper. As illustrated in section 4.2 and 4.3 the schema is a canvas to project personas and information flows on. This wouldn’t be possible if the work context was merely textually described, but not put into an abstract visual model, which often happens in ethnographically inspired research reports.

6.2.2 Knowledge management and Internal Tools

Sensitivity - Being aware of the challenges in knowledge and expertise sharing, especially between experts and novices is useful for impactful designs of internal tools with an instructional component. The people at the TSS department expressed the difficulty of finding a balance between presenting information in an abstract way and so decontextualizing it, making it applicable in a wider context, and making the information concrete enough for novices to be able to grasp the often complex materials. These findings match the theory on the difficulties for knowledge and expertise sharing in large organizations by Hinds & Pfeffer (2003). When it comes to the motivational limitations that interfere with people’s abilities Hinds & Pfeffer describe, it can be said that they are not obviously present within a support department, since it is their main job to share knowledge and expertise and therefore the employees of the department have the proper incentives to do so.

Recommendation – Since the instructions are often made by experts but intended for novices. It is important to always check whether or not the way the instructions are presented in the tool resonate with different groups of end-users.

6.2.3 Introduce and explain prototypes

Sensitivity - Asking for feedback in early stages of a project might not be a common practice in the organization. It is important to understand the feedback culture of the organization: what kind of feedback is typically given, how it is given, etc.

Recommendation – When the people in the organization are not familiar with using prototypes in order to get feedback, it is always important to explain why a prototype is created, and what purpose it serves. This understanding is not only important in user interviews in order to make the interviewees comfortable with giving feedback. It is also important for internal discussions. If the project management is unaware of the purpose of prototyping they might see it as a waste of time that could better have been spend on for example development.

6.3 Future Work

Two aspects of this project can be especially interesting for future research. Firstly, the abstract visual model of the work context as presented in this paper has proven to be useful for interaction designers when developing internal tools in a corporate context. This analytic, visual, and abstract depiction of the context diverges from the traditionally more textual reports of ethnographically inspired research. More research can be done to prove the value of such visual schemas in other contexts. Secondly, by doing this project we introduced a new role (those of interaction designers) into the TSS department. The challenges we faced are described in section 5 and are also reflected in the sensitivities. It could be interesting to look more specifically into the influence introducing interaction designers into a traditional corporate context can have on that context.

7. CONCLUSION

In this paper the insights gained are over the course of the project are used to provide recommendations for interaction designers aiming at applying user-centered design in a corporate context. The paper provides a descriptive model of the context in which tools for sales support are used. This model in the form of a classification schema of work can be used as a basis for personas, a mental model to think about the context, a probe for communication among stakeholders, and to visualize information flows and collaboration activities between different groups of actors within the organization. Of course the schema of work presented in this paper is specifically to the the work practices around indoor small cells at Ericsson, but it is my belief that in general similar classifications schemas can be devised for other organizations as well, and could in many other situations be used as a contextual framework for the design and development of CSCW tools. Additionally, insights gained in the project were shared on the challenges of applying user-centered design in a corporate context. Being aware of these insights is important for interaction designers aiming at introducing user-centered design into similar large multinational organizations.
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