User experience in ERP system development
An action research project to involve user experience in the everyday work

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Abstract
The aim of this project was to find and implement actions to increase ERP system developers’ ability to improve user experience. The focus has been methods and resources that are used in the everyday work, and the selected methodology was action research. The project took place at IFS, which develops the ERP system IFS Applications. The project started with a pre-study consisting of interviews, observations and a survey. Then, four workshops were organized where the methods Ad hoc personas, Heuristic evaluation and Speed sketching were introduced and practiced. The workshops also included information on user experience in ERP systems. The workshops were then evaluated with a new survey and focus groups. The results show that the participants thought the workshops had a positive effect on their ability to work with user experience. Heuristic evaluation and speed sketching were very well-received, and deemed easy to integrate with the everyday work. Ad hoc personas workshops should be conducted early in a project to have the best effect. Overall, the workshops increased the participants’ motivation for user experience work.
Acknowledgements

My supervisors Johan Åberg and Kristin Raukola have been fantastic at inspiring and challenging me this past year. I cannot thank them enough for their motivation, support and ability to always ask the right questions. Georg Abadir reviewed the thesis and caught many embarrassing mistakes, for which I am very thankful. I am also extremely grateful to everyone at the Service & Asset department at IFS for participating in interviews, surveys and workshops, and most of all for welcoming me to their group. This thesis would not exist without them. Special thanks to group manager Susanne Palmqvist for all her support. Finally, I want to thank my friends and family for their love and encouragement.
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1 Introduction

User Experience has become increasingly important in software development during the last decade and is now a significant differentiator for success (Uflacker & Busse, 2007). Developing good user experience often becomes more difficult where the product is very complex or has a very heterogeneous target market, as is the case with many of today’s Enterprise Resource Planning (ERP) systems. User experience is defined as “A person’s perceptions and responses that result from the use or anticipated use of a product, system or service” (ISO 9241-210, 2010) and differs from traditional usability in that it also includes hedonic qualities and aesthetics as well as ease of use and task efficiency (Bargas-Avila & Hornbaek, 2011). Within the Human-Computer Interaction community it is generally considered important to include users or user research in the design process to achieve good user experience.

Several studies on usability and organizational change have researched how to implement methods such as user-centered systems design within software development (Artman, 2002; Göransson et. al., 2004, Gulliksen et. al., 2003; Gulliksen et. al., 2009; Eriksson et. al., 2009; Cajander et. al. 2010). However, there has been little research on ERP systems (Uflacker & Busse, 2007). ERP systems are used to manage and organize the processes within a company or organization, for example to handle salaries and human resources, ordering and maintaining parts and products in a manufacturing company, keeping track of sales, issuing work orders, managing projects and much more. Some ERP systems are focused on just one area, such as finances, while others target virtually any industry. ERP systems that handle many different industries experience great complexity and an extremely large target market; it should work well for both a human resource manager and a maintenance worker. The diversity in the needs and behavior of the users creates a major challenge for user experience work.

This project is an attempt to develop better practices, tools and resources for working with user experience when developing complex ERP systems. This is investigated in a case study of the research and development department of IFS, a company developing an ERP system that is used by over 2000 companies worldwide in many different industries. The developers consist of Business Systems Analysts and Software Engineers, of which only a handful have user experience education. The company aims to be market leaders in user experience and strives to include this in the developers’ everyday work.

The goal of this project is both to acquire new knowledge within the user experience research community and to develop useful solutions for IFS. The selected methodology is action research, developed by Kurt Lewin during World War II (Adelman, 1993). Action research combines a research objective with creation and implementation of solutions to the problems studied; stating that the researcher should participate in the environment studied and the subjects should take part in creating and implementing the solution. Action research is iterative and encourages reflection and adjustments throughout the project, where planning, intervention and reflection occur simultaneously and at multiple intervals. It is described as a suitable method for organizational change as it is a democratic process where research is carried out with people, not on them, as people are more likely to be embrace solutions that they have taken part in creating.
1.1 IFS – Industrial and Financial Systems

IFS is a global enterprise software company that develops, supplies and implements the enterprise resource planning (ERP) system IFS Applications. It has around 2,000 customers and focus on industries with the core processes service and assets, manufacturing, supply chain and projects. IFS has approximately 2,800 employees and is present in 60 countries as of 2012. The company was founded by five engineers from Linköping University and its headquarters are located in Linköping, Sweden with 270 employees. A major challenge is the diversity of the customer base. With 2,000 customers all over the world, IFS supplies both the American defense and small service providers in rural Sweden.

The Research and development (R&D) department design and develop the ERP application. It is made up of six product groups: Service & Asset, Manufacturing, Projects, Supply Chain, Financials and Human Resources, as well as a separate group, Technology, developing the technical foundation on which the application is based. Teams at R&D consist of around six people, including Business Systems Analysts (BSAs) who design and test the application, Software Engineers (SEs) who program the application, and sometimes but not necessarily a Technical writer or Architect. Each department also has various management roles such as support manager and project managers. The teams at R&D are commonly distributed, where some team members are based in Linköping and others in Colombo and Kandy, Sri Lanka. Some are also based in London, United Kingdom. The teams communicate using email and the online instant messaging and call service Microsoft Lync.

The teams use an agile methodology called AQUA, where tasks are saved in a backlog. For each 30-day iteration the team selects the tasks that are to be completed during that iteration and assigns them to team members. They also estimate how long it should take to complete each task. The teams start each day with a fifteen minute Daily Standup meeting where each member describes what was done the day before and what he or she will work on that day including hindrances in their work.

IFS strives to develop a very user-friendly application, and a goal is to make user experience part of the everyday work and mindset for every employee. However, most BSAs and SEs (as a group referred to by the term ‘developers’) do not have a background in the user experience field. Thus, integrating user experience into the everyday work has been identified as a challenge.

This project will involve one department at IFS R&D: Service and Asset (S&A). S&A develops functionality related to management of services and assets, such as planning and performing construction and maintenance, optimizing field workforces, issuing repair orders, and much more. S&A has around 60 employees worldwide, mostly in Sweden and Sri Lanka, of which 24 people are based in Linköping.

1.2 Purpose

This project concerns facilitation of user experience work in ERP system development. The purpose is two-fold: First of all, there is a research interest in finding work practices that facilitate user experience work in the development of ERP systems. This requires consideration of the challenges that developers of these systems face and knowledge of the situation at hand, both objective facts and the developers’ subjective experiences. Each company is different, and solutions, such as new work practices, must be tailored to fit the context in each working environment and company.
culture. Thus, a single solution cannot be devised solely based on theory and implemented without consideration of the circumstances at hand. This leads to the second purpose: a problem solving interest where a solution is devised based on both theory and real-life conditions, implemented, and evaluated. Implementing and evaluating a solution in a real-life setting also contributes to the research interest as it allows for revision and improvement of the solution.

The project is thus divided into two parts. The first is a pre-study consisting of interviews, observations and a survey to investigate today’s work practices and experiences among the developers at IFS. The research questions for the pre-study are:

- What affects Business Systems Analysts’ and System Engineers’ ability to improve user experience in the IFS application during their everyday work?
- How do Business Systems Analysts and System Engineers experience their ability to improve user experience during their everyday work?

Based on the results from the pre-study and theories on user experience and organizational change, an intervention will be devised and implemented in the second part of the project. The research question for the entirety of the project is thus:

- Which actions can be taken to increase ERP system developers’ perceived ability to improve user experience in their everyday work?

As the project has a problem solving interest as well, the goal is also to implement these actions at IFS. The project is limited in time, and an evaluation of the effects must therefore take place relatively soon after the actions have taken place. As development of new functionality takes several years, it is impossible to evaluate whether the actions taken have had an effect on the application itself, i.e. improved its user experience. Therefore, this study will measure whether the developers themselves feel they are more able to handle these issues, i.e. their perceived ability.

1.3 Delimitations
This project will be focused on facilitation of user experience work, i.e. introducing work practices and information that will improve the developers’ ability to increase the IFS application’s user experience. The project will not focus on the usability or user experience of the application today; thus there will be no evaluation of the application or attempts to improve it directly, the attention will be on work practices to improve the application’s user experience long-term.

This study adopts the definition of user experience as limited to interaction through an interface suggested by Law, et. al. (2009), and includes usability as part of user experience. As usability has been the favored concept within HCI research for many years, and user experience is more recent, more studies focus on usability and the facilitation of usability work. As usability is considered a part of user experience, usability studies are featured in the theoretical background as well. Many studies on organizational change are focused on usability rather than user experience, but deemed relevant concerning user experience as well. The reader is asked to keep in mind that the concepts are different, even though both terms are frequently used. This study focuses on user experience, but features literature focused on usability.
1.4 Thesis structure

The thesis is divided into the following sections:

- Theoretical background: Describes theories found in relevant literature.
- Methodology: A description of action research and other methodological concerns.
- Pre-study: A description of the pre-study on which the subsequent actions are based.
- Actions: Based on the pre-study, workshops were devised and implemented. In this section, the theoretical background, procedure, results and reflections for each workshop is presented.
- Results: The results from focus groups and a concluding survey, and summary of the workshop results.
- Discussion: A discussion of the results and methods and recommendation for future actions at IFS and future research in this field.
2 Theoretical background
This section will describe the theoretical background relevant to this project, namely user experience, ERP systems, and organizational change.

2.1 User experience
The concept of user experience, commonly abbreviated as UX, has emerged as an important quality and research topic within the community of Human-Computer-Interaction (HCI) in recent years (Bargas-Avila & Hornbaek, 2011). However, there are many different definitions of the term (All About UX, 2013). Most state that user experience is the overall experience of using a product, including usability, but also qualities that are excluded from traditional usability research, such as hedonic and aesthetic qualities that are not related to fulfilling a particular goal or completing a task (Hassenzahl, 2007; Bargas-Avila & Hornbaek, 2011; All About UX, 2013). Hedonic qualities refer to the “be-goals”, such as being competent or unique, as opposed to the pragmatic “do-goals” such as making a telephone call.

Usability is more focused on ease of use when interacting with a system, and concerns for example learnability, efficiency, memorability, errors and satisfaction (Nielsen, 1995c). Molich and Nielsen (1990) proposed ten heuristics for usability, to be used for evaluation of an interface. These are:

1. **Visibility of system status:** The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
2. **Match between system and the real world:** The system should speak the users’ language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
3. **User control and freedom:** Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
4. **Consistency and standards:** Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
5. **Error prevention:** Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
6. **Recognition rather than recall:** Minimize the user’s memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
7. **Flexibility and efficiency of use:** Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
8. **Aesthetic and minimalist design:** Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
9. **Help users recognize, diagnose, and recover from errors:** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
10. **Help and documentation:** Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user’s task, list concrete steps to be carried out, and not be too large.

Law et. al. (2009) recommend that user experience should be limited to products, systems, services and objects that a user interacts with through an interface. According to this definition, user experience would concern the interaction between a user and a company’s products or services, but it would be distinguished from brand experience. Brand experience is broader than user experience and includes all the instances where a user interacts with the company as a whole, and also includes media reports and other people’s opinions. Brand experience affects user experience, as a user may forgive flaws in the product design if they already have a positive opinion of the brand. Another type of experience is service experience, which is more focused on face-to-face interaction between a user and an employee. This does not fall under user experience as humans are not “used”, but, for instance, an online trouble-shooting tool could be evaluated within the scope of user experience. (Law et. al. 2009)

It is generally agreed that users should be involved in the development of interactive systems within the HCI and Interaction Design literature in order to achieve good usability and user experience (Iivari, 2006; Cajander et. al., 2008; Göransson et. al., 2003; Artman, 2002; Cajander, 2006; Boivie et. al., 2003; ISO 13407: International standards organization, 1999; Beyer & Holtzblatt, 1997; Bodker et. al. 2009). There are several ways to involve users, such as creating personas, i.e. fictional users representing a set of behaviors and goals that aid designers and developers in understanding the users’ needs. This is used in methods like goal-directed design, invented by Alan Cooper. According to Cooper (1999), talking about “users” or that a product should be “user-friendly” is too vague and not practical for communication in the design process. If the concept of the user is unclear, almost anything can be designed for, which often results in a bad compromise. Cooper (1999, p. 126) describes this phenomenon as “the elastic user”.

Contextual design employs ethnographic methods as well as interviews and stresses the importance of getting to know the users’ environment (Beyer & Holtzblatt, 1997). Users can also be involved as co-designers and not merely informants, as prescribed by participatory design (Bodker et. al. 2009).

Another method that does not involve interacting with users is the Ad hoc persona method, developed by Pruitt and Adlin (2006). It is recommended as a starting point when creating personas, or as a way to gather and structure the existing assumptions about the users if there aren’t enough resources or time to do user research.

### 2.2 ERP systems

Enterprise resource planning (ERP) systems are frameworks for organizing business processes to plan and control an organization. ERP systems are used to handle such diverse areas as finance, projects, manufacturing, service, sales, human resources, etc. They commonly employ a database and can run on many different hardware or networks (Khosrow-Pour, 2006).

Several studies have identified the need for improving the usability in ERP systems. They identify complex user interfaces as the key factor that most often cause usability issues in ERP systems, and
call for more research in this field (Uflacker & Busse, 2007; Oja & Lucas, 2010). Today, users must usually undergo training before they can use these systems effectively (Oja & Lucas, 2010).

A pilot study by Oja and Lucas (2010) identified usability issues in ERP system by asking three ERP system users to report any critical incidents they experienced while working under normal conditions. Critical incidents were defined as events occurring during task performance that significantly indicated something negative about usability. The users’ screen movements were also captured and reviewed by the users’ afterwards. They reported a total of 53 incidents which were categorized into ten usability problems. The problems were then ranked based on impact, persistence and frequency:

1.) Severe: It is difficult for users to find the next step (i.e. the button to push, the field to fill, the transaction to open) in a multi-step task.
2.) Severe: Feedback and information provision is often unclear, unhelpful, not sensitive to context, and inappropriately positioned within the system.
3.) Medium: Procedures of data entry can be very tedious (with alternatives unknown to users).
4.) Medium: Basic rules of data entry (i.e. formats, restrictions, required fields) are not always obvious to users.
5.) Medium: It is difficult for users to discern the current location within the system and what is functionally possible at that location.
6.) Medium: The functioning of the Search feature within transactions is inconsistent and unclear.
7.) Medium: The visual design (i.e., labels, icons) and placement of buttons in the interface are often unclear to users.
8.) Mild: It is difficult for users to understand how some functions actually work, and the purpose of these functions is unclear.
9.) Mild: It is not easy for users to change certain settings or adapt the system according to their wishes.
10.) Mild: Basic navigation and selection within lists is not obvious or consistent.

As these problems were revealed by testing only three participants, it could be a useful way to discover usability problems when the resources are limited (Oja & Lucas, 2010).

Uflacker and Busse (2007) describe complexity in ERP systems and the challenges it poses to interaction designers. The main reasons for this complexity are the need for very large amounts of data and the heterogeneity of the customer landscape. The ERP system in their case study targets a global market with different constraints depending on country, type of customer and type of industry, and is divided into modules depending on business area such as Sales & Distribution, Financial Accounting, Human Resources, etc. According to Uflacker and Busse, complexity must be minimized in order to maximize user experience. The software has to be simple to understand and easy to use, and this is described as an important differentiator for success.

Complexity is described by Uflacker and Busse (2007) as two dimensions: functional vs. nonfunctional complexity and front-end vs. back-end complexity. Front-end is what the user can perceive via the interface, and the goal is to reduce front-end complexity in order to shield the user from back-end complexity. Functional complexity concerns the system’s functionality, which is strongly determined by the large problem domain and heterogeneous customer landscape. It is common to have special
cases for each customer group, and coupled with different laws and regulations of a global market and growing amount of available business data, it is very challenging to provide simple back-end software. Non-functional software concerns quality requirements such as robustness, security and maintainability. The system must be customizable to different usage scenarios. An additional challenge is that ERP systems are often developed over time and it is common to replace parts of the system with new architecture, which must be compatible with the rest, creating inter-component complexity with different platforms, languages and processes demanding software adapters and workarounds. Consequences of this can be inconsistencies in the appearance and behavior of the user interface. This requires careful consideration during the design process. (Uflacker & Busse, 2007)

Uflacker and Busse (2007) recommend user-centered design methods to decrease front-end complexity. They emphasize the importance of including end users and not basing design decisions solely on functional requirements identified through domain experts. They also highlight the fact that more and more information workers who are used to usable consumer software will use these systems, making user experience increasingly important for success.

2.3 Organizational change

Several key factors have been identified regarding the facilitation of usability work. First of all, the development team’s involvement in usability work is very important, and they need to perceive usability specialists as allies (Aucella, 1997; Bloomer & Croft, 1997; Tudor, 1998). Another important criterion is support from management, where they view usability as a success factor (Boivie et. al., 2003; Fellenz, 1997) and that usability specifications are included in the requirements, in which case the client should be involved as well (Artman, 2002). Experienced, professional usability specialists working in a centralized group is another important criterion as well as the creation of best practices (Fellenz, 1997; Aucella, 1997). It is also very important that the usability work is available for every employee, both the results and descriptions of the methods and techniques (Fellenz, 1997; Aucella, 1997). Finally, the formal development process should include usability work (Boivie et. al, 2003; Fellenz, 1997).

There have been several studies of how developers, designers and project managers think about user experience, and attempts have been made to integrate user experience methods in software development organizations. The results show that it is commonly regarded as “cake frosting” – positive but not important (Boivie et. al., 2003; Ilvari, 2006; Göranson et. al., 2004; Cajander, 2006; Artman, 2002).

In the three year research project conducted by Cajander (2010), she describes her attempts to use action research to integrate user-centered systems design methods in the in-house software development of six different public authorities. Previous studies by Cajander et. al. (2008) and Sandblad et. al. (2003) show that abstract models of work as flow diagrams guide the development of new systems, which lead to inflexible computer systems that, in turn, shape the end users’ work. The results also show that there is alienation and little understanding between the IT department and end users. There were little or no usability activities in IT system development, few usability goals the requirements specification, usability was often limited to software testing, and usability was perceived as a vague and unclear concept. When introducing user-centered design methods in software development, the results showed that the developers first regarded user involvement as unnecessary as they considered their own knowledge equal or superior. However, after conducting
field studies many developers expressed that it had a positive effect on their understanding of the users and their overall work. Most of them said that it provided them with new insights and knowledge and expressed that they would like to do it again in the future.

According to Iivari (2006), it is important to plan the usability measures in accordance with the organization’s culture. In a case study with five different companies, four different “cultures of usability work” were identified. These were:

1.) Innovative and adhocratic culture: People frequently criticize and challenge each other and the management. There is an extensive background in usability work and it is part of strategic decisions.
2.) Obedient engineering culture: Structured ways of working and trust in authority. The software developers design the interface based on guidelines, and while there may be usability specialists to represent the users, they cannot affect the design very much. In this culture, it’s important to integrate usability work in the process model and provide detailed work descriptions.
3.) Informal goodies culture: A smaller unit that has recently been incorporated into a bigger organization, with clear resistance to new requirements from the new management. The group is close and social, with very little background in usability work.
4.) Hectic and competitive culture: The priority is to maximize profit and the most effective people are the most appreciated. Usability work is considered time-consuming and unnecessary.

Iivari emphasizes the need to understand the cultural context and plan facilitation strategies accordingly. She also points out that an organization is unlikely to reflect only one culture type.

Brandt (2004) used action research to introduce user-centered work practices in software development projects. Workshops were organized to allow for interaction and discussion between users and developers, and new design representation were introduced. The workshops were the first time the developers had used collaborative design with end users of their product and were found rewarding by the participants.
3 Methodology

The selected methodology for this project is action research, as it focuses on both generation of new knowledge and finding and implementing solutions to problems. It has been used in previous projects attempting to implement user experience methods in software development, such as Cajander (2010) and Brandt (2004). Baskerville and Wood-Harper (1996) describes it as an ideal method for studying technology in its human context and states that it is very appropriate for the study of methodology within information systems development.

3.1 Action research

Action research was developed in the 1940s by Kurt Lewin (Adelman, 1993; Reason, 2006). The main differentiator between action research and other methodologies is its dual objectives to both gather knowledge about a subject and provide solutions to real-world problems in collaboration with the people affected by them. According to Rasmussen (2003), research is conducted with people, not on them. Traditional hypotheticodo-ductive research emphasizes representation of the world rather than action within it, but as Rorty argues in Reason (2006), the goal of research should be to both find truth and achieve something better by finding and implementing the solution to a problem.

A distinguishing feature is that the researcher should actively and deliberately be involved in the context of the investigation, as there is a mutual dependence between the researcher and the problem owner where each is reliant on the other’s skill, experiences and competences (McKay & Marshall, 2001). This feature also differs from traditional science where the researcher is seen as an impartial spectator. Reason (2006) identifies four characteristics of action research:

1. Worthwhile practical purposes
2. Many ways of knowing
3. Democracy and participation
4. Emergent developmental form

Worthwhile practical purposes refer to the fact that action research should be rooted in practical concerns and work towards a solution. It originated in the social sciences and was primarily used to investigate issues such as the empowerment of minority groups and develop better communities (Adelman, 1993; Reason, 2006). Many ways of knowing concerns the way theory and practice are integrated, there should never be practice without theory and vice versa, and different types of data should be collected. Democracy and participation refers to the ethical standpoint that those affected by the outcome of the research have the right to participate in its design. People should be able to contribute to the decision-making process and take part of knowledge that is about them. Action research necessarily has an Emergent developmental form, as it evolves over time. Action and reflection follows one another in iterative cycles.

Other characteristics of action research are presented in Rasmussen (2003). These also emphasize the participatory nature of action research, and also state that data collection is not restricted to formalized rules. The empirical material can include recorded dialogues, heuristic methods and actions taking place as part of the process. Another characteristic is that the researcher has many different roles, such as facilitator, process-planner, analyst and evaluator.
Rasmussen also highlights the fact that replication is not a scientific criterion of action research. As the research is based on a real-world problem and the people affected by its outcome take part in the decision making and design of solutions, each action research project will by definition be different. Action research should instead be measured by other criteria, such as transparency, consistency and validity. The primary rule according to Reason (2006) is to be aware of the choices made during the research process and their consequences, and make it clear to the audience why each choice was made. Rasmussen (2003) writes that to value the data, the following questions should be considered: (a) Who collected the data? (b) When were they collected? (c) Which kind of data was collected? (d) Why was that data collected? This transparency of choices and descriptions of interventions is also described as key factors for scientific rigor in action research by Whyte (1991). Baskerville and Wood-Harper (1996) state that generalizability in action research should be done with restraint as the results are very context-specific, but that generalization can nonetheless be done as long as the results are valid.

A challenge within action research is staying objective and focused on the research question while involving oneself in the environment to be studied (Baskerville & Wood-Harper, 1996). The researcher must remain impartial. A way to stay on track is to keep a diary, in which the researcher writes findings and reflections over the course of the project. This will also clarify the choices that were made, an important criterion according to Reason (2006).

McKay and Marshall (2001) write that critics of action research claim it is more like consultancy than research. They also argue that a main problem of action research today is that there is little guidance on how to conduct an action research study. McKay and Marshall suggest a conceptualization of action research as two cycles instead of one: the problem-solving cycle and the research-interest cycle, which run in parallel, see figure 1, adapted from McKay and Marshall (2001).

Figure 1: The two cycles of action research.

According to McKay and Marshall (2001), adoption of a dual-cycle model ensures that the research interests are not forgotten and dispels the criticism that action research is little more than
consultancy. The actions taken must answer the research questions, and may also give rise to new insights that may or may not have been anticipated in the research questions.

McKay and Marshall (2001) argue that action research is very useful in information systems research, calling it “a powerful tool for researchers who are interested in finding out about the interplay between humans, technology, information and socio-cultural contexts” (McKay & Marshall, 2001, p. 48). They describe how it is ideally suited for studying whether technology or methodology is useful and helpful, and how practice can be improved within the value system of the problem owner. Brandt (2004) and Baskerville and Wood-Harper (1996) come to the same conclusion, stating that action research is a suitable method for investigating and improving work practices in the development of complex information systems.
4 Pre-study
In order to devise actions to facilitate user experience work, it is necessary to first identify areas that could be improved. The purpose of the pre-study is to discover:

- What affects Business Systems Analysts’ and Software Engineers’ ability to improve user experience in the IFS application during their everyday work?
- How do Business Systems Analysts and Software Engineers experience their ability to improve user experience during their everyday work?

4.1 Method
To answer the research questions in the pre-study, observations, interviews and a survey was used, which are further described below.

4.1.1 Observations
As is recommended by action research literature, the researcher should be involved in the everyday work of the participants as much as possible. Therefore, I spent approximately three days of every week from August to January in the offices of the S&A department. This enabled me to speak with participants at any time, join in on meetings and take part in social activities.

One of the teams were followed more closely and I took part in the 15 minute daily standup meetings. I also took part in the iteration planning meetings which outlined the work of the upcoming month. In addition to this I took part in iteration demonstrations where the deliverables from the previous month were demonstrated for the rest of the department.

The User Interface (UI) Forum took place every week and I attended these meetings as well. UI Forum consists of representatives from the seven departments within R&D. Their goal is to coordinate usability work between different departments and make sure different projects don’t use different solutions to the same problem, as well as support the developers, and it gave me an overview of the usability work at Research and Development as a whole and common usability issues brought up by developers. The UI Forum also discussed possible projects to improve user experience.

Notes were taken during meetings and at the end of each day to keep a record of impressions and ideas.

4.1.2 Interviews
Qualitative, semi-structured interviews were performed with Software Engineers (SE), Business System Analysts (BSA) and other employees at IFS. Six SEs and six BSAs were interviewed, as well as one group manager, one architect, one consultant and two people from the Technology department with responsibility for guidelines and user experience in the technical foundation. Three of the participants were visiting from Sri Lanka.

Initially five interviews were carried out to learn more about IFS and the everyday work. The results from these interviews were then used to formulate relevant questions for the remaining interviews. The participants in the initial interviews consisted of two BSAs, one manager, and two others with user experience responsibility at another department, as they provided information on available
resources and user experience work. The subsequent interviews focused on how the SEs and BSAs used these resources and experienced their role in user experience work.

The interviews ranged from 20 minutes to an hour in length depending on the availability of the participant. Most interviews with SEs and BSAs lasted around 30 minutes. Each interview was based on a list of questions which were the same for all the BSAs and SEs, with slight variations in special cases. For example, in the interviews with the participants visiting from Sri Lanka more time was spent on discussing the pros and cons to working in distributed teams and user experience work in Sri Lanka. Due to the semi-structured nature of the interviews and time limitations, all participants were not asked the same number of questions, and some were asked new follow-up questions depending on previous answers. The interviews took place at the Service & Asset department. Two interviews were conducted over telephone.

All the interviews were recorded with the approval of each participant. The recordings were transcribed and analyzed to look for common themes. These were based on topics that were covered in many of the interviews; however, each participant did not speak about every topic as the number of questions varied. If only one or two participants mentioned an issue considered relevant for future actions, it is included in the results but it is specified that this was only brought up by one or few participants. The majority of the interviews were conducted in Swedish, and English translations are quoted in the result section.

4.1.3 Survey
A survey was sent to the Swedish part of the Service & Asset department, which totals 24 people, of which nine are Business Systems Analysts, three are Software Engineers and the rest have various management roles. Fifteen people responded to the survey, of which nine were Business Systems Analysts, Software Engineers or Architects and six had management roles. Five people had joined the company in the past five years, while six had worked there for more than fifteen years. The survey was created using the Questback EasyResearch tool and the participants completed the survey online. Most of the questions were in the form of a five degree Likert scale, with the following options:

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree. The questions also had an option for “I don’t know” or “I prefer not to answer”.

The questions were phrased to be a mix of positive and negative statements to ensure that respondents were not choosing the same option for every question out of habit. If a question included a term they might be unfamiliar with, such as user experience, a definition was provided. Aside from background information such as how many years they had worked at IFS, the questions were as follows:

- I am able to affect user experience in the application as much as I would like to.
- If you cannot affect the user experience in the IFS application as much as you would like to, what are the obstacles?
- My immediate managers (such as group manager, support manager and project manager) have clearly communicated how I should work with user experience.
• The senior management (such as directors and VPs) have clearly communicated what is being done by the company as a whole to improve user experience, such as projects, available resources, user studies, etc.
• I think it would be helpful to have an appraisal goal related to user experience.
• I did not receive any information about user experience when I started working at IFS.
• I received a lot of information about end users when I started working at IFS.
• The information available today is sufficient to learn what I need to know about end users.
• I am familiar with the guidelines regarding design and interaction in the IFS application.
• I think it is easy to find what I am looking for when I use the guidelines.
• Have you consulted the User Interface Forum (UI Forum), or one of its representatives, when you have been unsure about a decision related to user experience or usability? (5 times or more, 3-4 times, 1-2 times, Never)
  • If never, why not?
  • Have you consulted OpenIFS? (5 times or more, 3-4 times, 1-2 times, Never)
  • If never, why not?
  • Is there anything you would like to add regarding UI Forum, guidelines and OpenIFS? (Open answer)
  • I think the IFS application is generally easy to use.
  • Is there anything you would like to add regarding User Experience at IFS?
4.2 Pre-study: Results

This section will describe the results from the pre-study.

4.2.1 Observations

The observations show that the teams rarely discussed end users, and such discussions were more often focused on requirements from the customer, i.e. the buyer, not necessarily the user. The teams’ only contact with the customers was through a customer representative which they met about once every three months. When end users or usability was discussed, the arguments were based on speculation or personal experiences from previous employers, as a couple of the team members had worked in that industry. However, these experiences were from several years ago, and it was uncertain if the same conditions still applied. There were no references to user studies conducted or common usability principles during any of the observations.

4.2.2 Interviews

These themes emerged from the analysis:

- Communication: Concerns communication among the developers and between the developers and other instances.
- Affecting user experience: Concerns how the developers experience their own ability to affect the user experience.
- User experience in the application: Concerns how the developers feel about user experience in the application today; what works well and what could be improved.
- Knowledge of user and context: Concerns the developers’ knowledge of the end users and the context in which the application will be used.
- Introduction for new employees: Concerns the introduction for new employees, with particular focus on user experience.
- Resources: Concerns use of the resources available to the employees to support their user experience work.
- Support from management: Concerns the developers’ perceptions of managements’ views on user experience, and their ability to support everyday user experience work.

Communication

As most of the teams are distributed in different countries, most of the communication is handled via Lync. The members of one of these teams was interviewed separately while the team was gathered in Linköping for a month and they recounted some pros and cons to working in different countries. One advantage mentioned by many was the opportunity to learn about other cultures and get to know people from across the globe. They also mentioned some disadvantages, primarily related to communicating electronically and the four-hour time difference. They felt more effective working in the same room.

“It’s good to have cultural differences; we can question each other and bring something new.”
Communication also concerns how different departments communicate and how the developers are informed about changes, projects and other work related to user experience. The results suggest that this could be improved; several people wanted more information on what was going on in the company as a whole and what resources were available to support them in their everyday work.

“\textit{I’d like more information on what’s available and what you should keep in mind.}”

“(…) I think it’s quite bad that there’s a lot of information that you’re unaware of. I don’t have time to look for all that, it would be better if we just had a contact person who could tell us about new developments or changes.”

Passing on experience to others has been something informal which has depended a lot on the individual.

“If you work on a new project and someone has usability experience from an earlier project they tell the others.”

Several participants thought that it was a great advantage to be located near people with user experience education. When asked about User Interface forum the majority described how they usually just had an informal discussion with the UI forum representative rather than sending a question to the group and awaiting their response.

“I think that’s important, to have someone close to discuss issues with and not just have a bunch of guidelines on the intranet.”

Affecting User Experience

The responses were very varied in terms of how much the participants thought they could affect user experience. Some thought their ability was quite good while some thought it was very limited. The main obstacles mentioned were the technological framework, the issue of user experience versus consistency, time limitations, and insufficient knowledge of the end user and context.

The technological framework and consistency

This was mentioned as an obstacle by many participants. However, some considered it a problem while others did not. It is closely related to the issue of consistency: the technological framework ensures that the application is consistent; that it looks and behaves the same in every module. This was regularly cited as one of the strengths of the application. It was also seen as a hindrance, as the participants were unable to make improvements that would cause inconsistencies. The participants said:

“You could make a form really easy to use, but that would make it different from the other 6000 forms, so it’s better if it’s consistent.”

“It’s good that we have one foundation, it makes the application consistent. But it also constrains us: you have one toolkit and if what you want to do is not in there then it’s not available to you.”

“You can make minor adjustments but there are a lot of historical constraints.”
“You usually just look at how similar forms look in the application, but you don’t know if they follow the guideline. It’s more important that the form is consistent with the rest.”

It differed between individuals and projects how much they felt hindered by this. As one participant put it:

“[We can affect user experience] quite a lot as we’re developing new functionality right now. But we still have regulations to adhere to; however, we can consider how it will be handled from the user’s perspective.”

**Time**

Another obstacle was lack of time. Some participants talked about how user experience didn’t feel like a priority as the major focus was finishing the deliverables on time. They also felt they didn’t have enough time to use the resources provided by the company, such as design and interaction guidelines, as they could be difficult to navigate.

“Time is always a limitation for building the GUI, it’s usually the last thing you build and you might not have much time to think about usability at the end of a project or iteration. I’d like to see more of it in the specifications.”

“You don’t always think to check if there are guidelines for everything you’re working on, and they’re difficult to find. It takes time to look around.”

“I think it should take a bit more of our time than it does today. We work so much with product development so it feels like usability should be a pretty big part of it but it’s not.”

“In my current project I would have loved to visit customers and do interviews but there’s no time.”

**Knowledge of end user and context**

Many participants lacked, in their view, sufficient knowledge of the end users and the context in which they would use the application. The information they based their decisions on were requirements presented by a customer representative who they had contact with from time to time throughout a project. Several participants talked about how the information was always filtered, and that it depended on if the individual representative passed on a correct representation of the users.

“It depends a lot on the people involved if it works well or not: when it second or third hand information you know that half of it is left out because they’re stressed and then another third because they couldn’t be bothered to include it. You get the essentials, but a lot disappears, which can be both good and bad.”

“We have customer representative, but that’s still filtered information. Always one or two steps between us and the user; getting information on how the end user works is pretty difficult.”

“A lot of the information is the customer representative’s firsthand experience and it’s difficult to share with others.”
“You just hope that the customer representative knows what they’re doing and tells you the users’ opinions and not their own.”

As the participants cited above mention, this filtering of information is not always viewed as negative:

“I think everybody would like to meet the user, it would be a good experience, but if the customer representative can give us the info it should work equally well.”

“Our job is to develop something general that fits many customers. So there are both pros and cons to having contact with the end user.”

“I don’t really lack anything when it comes to information about the user, the important thing is to know how they want it to work and I’ll do a design based on that.”

However, most participants expressed a desire to have more contact with end users and many mentioned visits to customer sites as something they thought would be very helpful:

“I would like more opportunity to visit customer sites. It’s important for both System Engineers and Business System Analysts.”

“I think we should visit customer sites more often”

“I feel that I’m quite far away from customers and end users”

“We’d like to go out and meet the customers and see how they use the things we’re developing.”

Some of the participants had previous experience from the Service and Asset industry and had firsthand knowledge of that context. However, they felt it could be difficult to convey these experiences to others:

“I think I know enough about the end user as I’ve worked many years in the industry, but I don’t think we know enough as a group as we have different backgrounds.”

**Introduction to user experience at IFS**

None of the participants had gotten any introduction to user experience or what type of user they would be designing for. One had been told to respect customer’s needs and think from their point of view. Most said that the focus had been on how the application worked on a more technical level. Some also said that they were not told about resources like guidelines; however, some mentioned that they had been told about UI forum and the opportunity to discuss usability issues with them. Most of the participants had learned about user experience over time by speaking to colleagues.

“I don’t think they mentioned guidelines when I started, it was something I found after a while.”

“The part about what customers we have have been quite bad. But then again, there are so many customers.”
Resources

Resources concern the support available to the developers in user experience and usability work. The ones available today are more concerned with usability, such as the design and interaction guidelines and the User Interface Forum. The guidelines are documents detailing the basic design and interaction; for example, where to place the label to a text field or how the application should behave if the user zooms in and out. New guidelines may be written if there is an inconsistency and developers need to know which solution to implement. The UI Forum provides recommendations on specific usability issues submitted by developers. There is also an online forum where the IFS employees can interact with end users.

Many participants said that they knew about the guidelines but that they rarely used them and that they were hard to navigate. Some thought they were too focused on technical details while others wanted more technical information, such as how to group functions to reduce the number of tasks the user had to perform. They also expressed concern that the guidelines were updated from time to time without their knowledge:

“The biggest problem is that we have a lot of information but it’s difficult to find it.”

“They’re renewed once in a while, you might just check them maybe once a year and a lot can happen in that time.”

“There’s a way to search for guidelines in the documentation, but it doesn’t work that great. You get a lot of hits that aren’t relevant. We’re not sure if they’re used as much as they’re supposed to.”

Time constraints were a big obstacle, as previously described. Several participants talked about the difficulty of staying up to date and wished to be told explicitly when something changed. They also said it was too time consuming to look through the guidelines every time they designed something, the most common practice was to look at similar forms and use as guidance. But they also talked about how this was a vulnerable practice as the other forms may be based on outdated design.

The OpenIFS forum was not used very much; most said that they didn’t have time and that they weren’t very familiar with it:

“We tried a bit with OpenIFS, but it hasn’t been used much, especially not by developers to get in touch with users.”

“I haven’t really used the online forum, I don’t have time.”

“You might use the guidelines but you don’t have time to read anything in the online forums”

The UI Forum was mainly used informally, as many participants talked about having discussions with their UI Forum representative. Some also talked about how they had sent in questions electronically to be discussed by the UI Forum members at their meetings, but it was more common to just walk to the nearby office and ask in person. Most thought this worked well, but also emphasized that it was important to have someone nearby to avoid misunderstandings and save time:
“I have used UI forum maybe one time “officially” but don’t really use it like that today, I mostly just talk to [our representative].”

In 2012 a project called the Early Adopter Program (EAP) was carried out, where a few customers tried out the new release. During this project representatives from the departments of Research and Development visited the companies and carried out user studies, interviews, and surveys. The results from the Early Adopter Program were considered very valuable for future development and both the report and the participants of this study who were involved in EAP said the project was successful and very appreciated by both customers and developers:

“I’ve never experienced a project like this at another company and it’s great.”

Those who talked about the EAP project were very positive and thought it should be carried out again with other customers and a bigger budget. However, it was not clear how the results of the EAP would be conveyed to the developers as this had not been done at the time. The developers knew about the project and some about the results but not in detail. Getting the information to the developers was mentioned as an important challenge both by managers and UI Forum.

Management support

This category concerns both the immediate and upper management and how they can support and motivate user experience in the developers’ everyday work. As most of the participants were developers, i.e. Business System Analysts or System Engineers, the results mostly concern how they experience this. However, there is also information from a managerial point of view as one interview was carried out with a group manager, who manages a department of R&D of around 25 people.

Today, the upper management specifies goals for the department heads to fulfill. However, these are more abstract and the department heads break these down into more specific goals. The new goals are reviewed by upper management to ascertain that they correspond to the original goals. Based on this, the department managers specify a few appraisal goals for each employee to be fulfilled within a year. The department managers can also start projects that are focused solely on usability or user experience:

“It’s easier when you have a project that is supposed to focus on usability. It’s more difficult to give an individual concrete goals, or spread usability information. And also to relate and connect this to the everyday work without taking too much focus from the regular tasks you have to perform.”

Integrating user experience into the everyday work was seen as most difficult, both by managers and developers. All the interviewed developers said they knew that IFS thought user experience was very important, but few could name specific things the managers or the company as a whole did to improve this in practice:

“The upper management has told us to focus on usability, but it’s unclear what it means in practice.”

“We got a directive that said that every project should think about usability. But not really how. [Our UI Forum representative] talked to us a bit about usability and UI forum,
and then we were supposed to keep it in mind. But what I lack are some references and links.”

Although many felt it was unclear what was expected of them in terms or user experience work, several said they felt that the immediate management was open to new ideas and that they prioritized user experience:

“The immediate management always say that if we have some idea that would make the application more user friendly we should suggest it and they might set aside some resources to work on it.”

“My experience is that they’re focused on it, as they did for example the Early Adopter Program.”

Appraisal goals were mentioned by a manager as one way to motivate people to think more about user experience. However; when asked about them, few said they had appraisal goals related to user experience.

**User Experience in the application**

The participants talked about how they felt about the application today in terms of user experience and usability. In general they thought it looked good aesthetically, but mentioned some usability issues, generally related to the great amount of data required in the system:

“Challenges for our company is that the system is so huge, it takes so much work to change something. It’s easier to think usability when you build something new, but some should be rebuilt to optimize the work flow”

“I think it can be too messy, too many clicks, too much data. I know it has to be a lot, but it could be done better. It’s not easy to use.”

Some talked about how it’s easy to get used to the application after a while and that it could be difficult to take a beginner’s perspective:

“There’s a lot of things that feels very logical if you’ve worked with ERP systems for some time, but if you haven’t they may appear very illogical.”

“There are little issues that you’ve learned to deal with over time, but that I imagine would be quite difficult for a first time user. You can see that there have been different groups that have solved problems in different ways.”

Many participants mentioned inconsistency as a problem, while others felt it was more important to improve issues even though it would lead to less consistency. One participant said that the users don’t see the same parts of the application as the developers since they only use a small number of the functions and tabs available, so the application was much less complex in reality. However, another participant said that they had been surprised during a customer visit that the users had access to many functions as they had not learned how to hide those that were unnecessary. This challenged the assumption that the application was less complex for the users.
4.2.3 Survey
Figure 2 shows the average response for each statement, i.e. to what degree the respondent agrees, were one is minimum and five is maximum.

![Graph showing average response for each statement.](image)

**Figure 2:** Average response for each statement.

On the question “I am able to affect user experience in the application as much as I would like to”, the mean score was 3.1 out of 5, see figure 3.

![Graph showing response to the question](image)

**Figure 3:** I am able to affect user experience in the application as much as I would like to.
Of the possible obstacles, where the respondent could choose multiple answers, the technological framework was chosen by eight respondents. “Unclear definition of the concept user experience” and “Lack of resources to support working with user experience” were both chosen by six respondents. Next came “Unclear guidance on how to work with user experience”, chosen by five respondents. “Insufficient knowledge of the end user or context” was chosen by three, and “I am not motivated to work with user experience” and “My team is not motivated to work with user experience” was chosen by none.

Regarding the questions on support and guidance from management, the statement “My immediate managers (such as group manager, support manager and project manager) have clearly communicated how I should work with user experience” got an average score of 3.1, see figure 4.

![Figure 4: My immediate managers (such as group manager, support manager and project manager) have clearly communicated how I should work with user experience.](image)

The statement “The senior management (such as directors and VPs) have clearly communicated what is being done by the company as a whole to improve user experience, such as projects, available resources, user studies, etc.” got an average score of 3.4, see figure 5.
The senior management (such as directors and VPs) have clearly communicated what is being done by the company as a whole to improve user experience, such as projects, available resources, user studies, etc.

When asked if they thought it would be helpful to have an appraisal goal related to user experience, three respondents said they already had one, two said yes, four said they did not know, and six said no.

The statements concerning introduction to user experience were “I did not receive any information about user experience when I started working at IFS” and “I received a lot of information about end users when I started working at IFS”. The first got a rating of 3.25, while the second got 2.46, see figures 6 and 7. The statement “The information available today is sufficient to learn what I need to know about end users” got a score of 3.1, see figure 8.
Figure 7: I received a lot of information about end users when I started working at IFS.

Figure 8: The information available today is sufficient to learn what I need to know about end users.

The statements concerning the guidelines looked into whether the respondents were familiar with the guidelines and if they thought it was easy to find what they were looking for when they used the guidelines. On the first statement, the respondents’ average score in the Likert scale was 3.5 out of 5, and 3.2 on the second. However, the second statements also had three respondents saying “I don’t know”.

When asked if they had consulted the UI Forum, six answered five times or more, one said 3-4 times, seven respondents answered 1-2 times, and one said never, saying he or she had found another solution to the problem without involving the UI Forum. On the same question concerning OpenIFS, six respondents answered five times or more, one said 3-4 times, one said 1-2 times and seven said never. The most common reason for not using OpenIFS was that they had never felt the need to use it, and one person said it took too much time.
The open question “Is there anything you would like to add regarding UI Forum, guidelines and OpenIFS?” got seven responses. Three of these focused on the availability of the information concerning user experience, such as easy access to up-to-date guidelines and a more proactive UI Forum. Two focused on the importance of prioritizing user experience issues, and mentioned how they should be regarded the same way as performance problems. The other two comments stated that existing guidelines should be used rather than creating new ones, that the guidelines should be built into the development tools and that guidelines should be created were the application differs a lot today.

The statement “I think the IFS application is generally easy to use” got an average score of 3.5 out of 5, see figure 9.

![Figure 9: I think the IFS application is generally easy to use.](image)

The last open question asked if the participants would like to add anything regarding user experience at IFS. Four respondents replied, where two mentioned how IFS should work more from a process perspective rather than a product perspective and think more about work processes within product groups. Another commented that IFS is much better at user experience than competitors, and another respondent said that the amount of functionality could be an obstacle for the user.
4.3 Pre-study: Summary

In conclusion, the results show that:

- The participants want more information on what the company is doing to improve usability, such as resources and projects.
- The participants want to be informed when something changes, i.e. when guidelines are updated.
- Many participants think it is important to have someone nearby to be able to discuss usability issues informally to avoid misunderstandings and save time.
- The technological framework is considered an obstacle.
- It is considered difficult to have to choose between better usability and consistency.
- Some feel limited by time constraints.
- Nearly all participants want more contact with the end users and most see it as important and mentioned that they would like to visit at customer site.
- The contact with the customer representative is good but that it depends on the individual customer representative if it works well or not, as the information is always filtered.
- None of the participants got an introduction on how to work with user experience, although one said it was mentioned.
- Most of the participants only look at guidelines occasionally, some not at all. Many find them difficult and time-consuming to navigate.
- Most have only used the UI Forum one or two times, but regularly speak to their UI Forum representative. Many felt that it was better to have an informal discussion.
- The Early Adopter Program was much appreciated and many participants were pleased to learn more about how the application was used in real life.
- The participants agreed that the company as a whole prioritize user experience and that management considers it was very important, but many also said it was unclear what that means in practice.
- The participants think the application looks good but could be difficult to use, especially for beginners. The problems mentioned most often was too much data and too many choices for the user.
4.4 Conclusions and future actions

The purpose of the pre-study was to explore the following research questions:

- What affects Business Systems Analysts’ and System Engineers’ ability to improve user experience in the IFS application during their everyday work?
- How do Business Systems Analysts and System Engineers experience their ability to improve user experience during their everyday work?

The first question is on an objective level; what hinders or supports user experience work? The second is subjective; how do developers feel about this?

Answers to the first question have been gathered through interviews with developers, but also other roles, such as managers and others with responsibility for the resources available to support developers’ everyday work. The researcher observed a development team’s daily meetings and participated in the User Interface Forum each week. The results show that the developers are limited by the technological framework, insufficient knowledge of end users, guidelines that are time-consuming to navigate, lack of introduction to user experience, and lack of clear instructions from management on how user experience should be involved in the everyday work. Another hindrance was that very few developers had any formal education in this area, and many said they lacked tools and references. Factors that supported user experience work was access to the User Experience Forum and previous user studies such as the Early Adopter Program. However, few said they used the UI Forum formally, and said they preferred to talk directly to their representative. This creates a disadvantage for the employees who are seated in other locations, and the recommendation would be to have a person with user experience education in every location, who is given the task of assisting the developers. It is also important to make the results of the Early Adopter Program available for everyone.

Another important issue was lack of time. As the teams use an agile methodology, any available time in a given month is allocated to different tasks. The teams estimate how many hours each task should take to complete, and then choose which tasks to take on for the coming month. When there is no more time to allocate, the rest of the tasks are saved for the next month. This gives very little extra time, both to do extra tasks that were not planned, such as usability testing, and spending more time than estimated on a predefined task.

The developers generally agree that they want more flexibility in the framework, and more information about end users. However, some pointed out that less flexibility ensures the application’s consistency, and that contact with end users could make them biased towards those users which might make them forget the bigger picture. Another important issue is support from management. The developers thought that the company was focused on user experience in their marketing strategies, but were unsure how this was handled in practice. Practical examples of engagement from management would both provide better information on how to include user experience in the everyday work and increase motivation for these issues among the employees.

In summary, the results showed a number of challenges for successful usability work, the main ones being:
• Lack of information on user experience and methods to use
• Lack of information on end users
• Lack of time and resources
• Complicated technical framework
• Lack of instructions from management

The Research and Development department of IFS had many characteristics in common with the obedient engineering culture described by Livari (2006), who recommends that each usability facilitation measure is tailored to suit the company culture. Characteristics of the obedient engineering culture are structured ways of working and trust in authority. The interface is designed based on guidelines, and even though there may be user representatives, they cannot affect the design very much. IFS also has some characteristics of the hectic and competitive culture type, which is very focused on efficiency and productivity, as they use agile methodology where each task is assigned a fixed number of hours. If usability is not part of the task list, there is no time for it. This lack of time for usability work was also mentioned by several interviewees. For the obedient engineering culture, Livari suggests selecting methods and tools that emphasize rules, standard procedures, documentation and control. A way to accomplish that would be to integrate usability work into the current process model and provide detailed work descriptions. As the everyday work is also very focused on efficiency, it was important to find methods that provided as good results as possible without taking too much time from other tasks.

The complicated technical framework is a major problem for most ERP systems and lies outside the scope of this project. Thus, the measures taken are primarily focused on providing information on user experience and suggesting methods to use that will help developers improve user experience in their everyday work and find information on end users. To increase support from management on these issues, attempts will be made to include them as well in each action, even though the project was originally focused on developers.

As the project is based on action research methodology, action and reflection will alternate in cycles. The results from the previous action will influence the planning of the next. Therefore, each action is not specified beforehand, but will evolve as the researcher gains more experience on what could suit the company culture.

However, two methods that appear suitable for IFS were selected as possible actions: Ad Hoc Personas and Heuristic Evaluation. They are both efficient methods that are relatively easy to learn and will provide good results without taking too much time from the developer’s regular work. They are also easy to integrate into standard procedures and work well with agile methodology.

To integrate these methods into the everyday work, workshops were chosen as they provide an opportunity for both information sharing and learning-by-doing, i.e. using the methods in a practical example which is positive for both motivation and understanding of how the method can be applied. This is based on David A. Kolb’s (1984) theory on experiential learning, which emphasizes the central role that experience plays in the learning process. Workshops were also chosen because they provide an opportunity for discussion between participants.
5 Action 1 and 2: End users
Based on the pre-study in this project, one issue that was mentioned by many participants was lack of knowledge of end users. This is also highlighted as an important criterion for success within usability and HCI literature. However, given the resources and scope of this project, conducting a user study was not possible, especially given the extensive heterogeneity of the users. Instead, the Ad hoc persona method was used with two teams to discuss the end users or their respective projects, and inform them of this method as something that could be used in the future.

5.1 Ad hoc personas
Ad hoc personas are persona sketches that are created without collecting data. They are used as a way to articulate the existing assumptions about the user population, either as an alternative if user research cannot be performed, or as a starting point before creating data-driven personas. (Adlin & Pruitt, 2010)

Personas are descriptions of fictional users with the purpose of helping the designer understand the end users (Norman, 2004). They represent a user type, and are based on the wants and needs of different user groups. They are not based solely on roles; a group such as nurses is a very heterogeneous group, and therefore it can be necessary to, for example, create one persona for a newly employed nurse and one that has worked a long time. The persona method was popularized by Alan Cooper in 1998 and has been frequently used in the design community since then (Norman, 2004). Each persona has a name, picture, background story and personal goals, and are used both as a communication tool in the design team and as a way to build empathy for the users during the design process. Personas are commonly created based on user studies, such as qualitative or quantitative interviews, surveys, or ethnographic research.

Both Norman (2004) and Adlin and Pruitt (2010) writes that when working as usability consultants, they often have to make their points in just a few hours, and data-driven personas are often too time-consuming in those situations. Instead, Ad hoc personas can be used. Their primary goal is to make an organization articulate, analyze and categorize its underlying assumptions about users and business goals, and create persona sketches, which can later be verified with user studies. If user studies cannot be performed, the first task of discussing and defining assumptions have still been accomplished, but it is important that everyone involved is aware that the persona sketches are just assumptions, which should be verified if possible.

Ad hoc personas were deemed appropriate for IFS as there is considerable confusion among the developers on who the end users are. Some user studies have been carried out, but are also viewed as taking up a lot of resources without covering very much of the extremely large and diverse target market. As there is a great variance in the target market for all of IFS, this could be a good method for a team to use when developing new functionality to make sure the team members are on the same page. Adlin & Pruitt (2010) also state that Ad hoc personas are suitable for agile development as the method is fast and flexible.

The procedure for Ad hoc personas as described by Adlin and Pruitt (2010) and Adlin (2010) takes about eight hours. Before the process starts it is important to get the executive team involved as well as the development team, and defining the business goals. The next step is to get the participants to list all the words they currently use to describe users; it could be terms like customer, super user,
sales people, etc., it all depends on the company. Then, the participants do an exercise where they describe individual users – each person takes a pad of sticky notes and writes down one user per note. The user description should be in the form “Person + situation”, where situation can be goal, activity, action or problem, for example:

- “Senior Executive who needs a summary of performance reviews.”
- “New employee who needs to get everything set up.”
- “General Manager who needs to change her health plan.”

The next step is to sort the sticky notes under the user terms the participants listed in the previous step. After this, it’s time to reorganize the sticky notes based on statements starting with “I want” or “I need”, such as “I need custom reports” and “I need to know how to staff this internally”. The sticky note is placed under the statement that is deemed most important to that user. After that, look for patterns in the want/need-statements – some statements will likely fit in more than one group while others will be specific to a single group. This is the basis of the Ad hoc personas. Which patterns can be identified and which users are included in the different patterns?

The main point of the exercise is to get participants from speaking about users in general terms to get more specific and talk about which users they actually mean when they say “customer”. Then they go from thinking about the users to thinking like the users when they sort them under want/need-statements. Thereafter, they can identify patterns based not on roles but on preferences and requirements.

5.2 Participants

In the first workshop, one of the teams at Service & Asset that had taken part in the pre-study participated, as well as their project manager and group manager. The team consisted of six people and the workshop took place at the Linköping office. As most teams at IFS are distributed over several locations, the workshop was conducted a second time to see if it would be suitable for distributed teams as well. In the second workshop, a different team participated, which had team members distributed over several locations. They participated over an online call from Linköping, London, and Colombo.

5.3 Procedure

The aim was to discuss the end users of the functionality the teams were currently developing. The agenda was organized as follows:

- 10 min: Introduction
- 10-15 min: Write down all the users you can think of on sticky notes
  - Person + situation
  - Ex: A quality insurance rep who uses the system about two hours per day.
- 10-15 min: Sort the users based on “I want/I need”-statements.
  - “I need easy access to instructions”
  - “I want the system to be really flexible”
- 15 min: Look for patterns and discuss user groups and statements
- 2 min: Workshop feedback
The introduction explained the background and reasons for the workshop, the theoretical background for the selected methods, the purpose and goals for the day, the agenda, and the exercises to be performed, including examples.

The exercises selected for these workshops were based on those described by Adlin and Pruitt (2010) for Ad hoc personas. The focus was on discussing the underlying assumptions about users, and identifying user groups to be prioritized based on business goals. As the workshop only spanned one hour, extended to one and a half for workshop two, instead of the recommended eight, the goal was not to create fully developed Ad hoc personas, but to inspire participants to think about users in new ways and discuss what they knew about them. Therefore, exercises that fit these objectives were selected from the method. These were:

1.) Writing down as many users as they could think of on sticky notes, is the format person+situation, with one user per sticky note. The situation could be an activity, a goal or a problem. The purpose was to get the team to think about the users.

2.) Sorting these users under different want/need statements, or writing new statements if they wished to do so. The purpose was to get the team to think like these users. If they felt that a note fit under several statements, they were encouraged to choose the one they thought would be most important to the user. The statements were:
   a. I need easy access to instructions
   b. I want the system to be really flexible
   c. I want as few choices as possible
   d. I need the system to be reliable
   e. I need to know where to find the right information
   f. I want to only see relevant information
   g. I want to visualize the information I’m working with
   h. I don’t want to read instructions

3.) Discussing the users and looking for patterns to identify and prioritize different user groups.

At the end of the workshop, the team members filled out the following survey to collect feedback on the workshop:

What did you think of the time frame?

<table>
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<tr>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Too short</td>
<td>Good</td>
<td></td>
<td>Too long</td>
<td></td>
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Was the workshop relevant for your project?

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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No, not at all</td>
<td></td>
<td>Good</td>
<td>Yes, very relevant</td>
<td></td>
</tr>
</tbody>
</table>

Did the workshop take place at an appropriate time in your project?

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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No, it would be</td>
<td></td>
<td>Good</td>
<td>No, it would be</td>
<td></td>
</tr>
</tbody>
</table>
Did you find the workshop useful?

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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No, not at all</td>
<td></td>
<td></td>
<td></td>
<td>Yes, very useful</td>
</tr>
</tbody>
</table>

The survey ended with an open question asking what could be improved.

5.4 Results: Action 1

During workshop one, all the participants were gathered in the same room, and used sticky notes which were then put on the wall underneath the appropriate statement, see figure 10.

During the first task, some participants found it quite easy to come up with users, while others found it very difficult. To simplify the task, some participants wrote “user”+situation, to avoid having to come up with a title.

For the next task, the participants gathered up their sticky notes and put them up on the wall. This task was completed quite quickly, and the rest of the time was spent on discussing the different statements and user groups. The participants did not add any new statements. There were a lot of different opinions, and also discussions about who to prioritize. Unfortunately, the discussion had to be cut short as the time ran out. After the workshop, the results were summarized in the following section, which were sent to all the participants. They were encouraged to discuss these results.
5.4.1 Summary
The fictional users were associated with a statement according to what would be most important to that user. The team then looked for patterns in the statements and sorted them into different user groups.

The statement “I want to visualize the information I’m working with” was considered important for all three user groups.

**Group one**
- I want the system to be really flexible

Most of the users put in the category were described as engineers. Their tasks were described as designing linear assets, comparing Compatible Unit configurations, registering Linear Asset and its configurations, report fault in a Linear Asset, and plan future maintenance.

**Group two**
- I need easy access to instructions and documentation
- I need the system to be reliable
- I need to know where to find the right information
The users in this group were mostly maintenance workers/managers. There was also a financial controller, and several had tasks related to keeping track of costs and finding possibilities to reduce costs.

**Group three**

- I want as few choices as possible
- I want to only see relevant information
- I don’t want to read instructions

Group three has mostly maintenance workers/technicians, a call center person, a project manager and a new employee. Their primary tasks were to find, fix and register faults and carrying out work from work orders.

### 5.4.2 Survey result

The survey was filled out at the end of the workshop by the development team who participated, and yielded the following mean scores, where \( n = 5 \):

<table>
<thead>
<tr>
<th>Question</th>
<th>Score  \ (1 = Too short, 5 = Too long)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did you think of the time frame?</td>
<td>1.4</td>
</tr>
<tr>
<td>Was the workshop relevant for your project?</td>
<td>3.8 (1 = No, not at all, 5 = Yes, very relevant)</td>
</tr>
<tr>
<td>Did it take place at an appropriate time?</td>
<td>2 (1 = Should be earlier, 5 = Should be later)</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>4 (1 = No, not at all, 5 = Yes, very useful)</td>
</tr>
</tbody>
</table>

The results show that most of the participants thought the workshop was too short, that it was quite relevant for the project but should have taken place earlier, and that they found the workshop very useful. One person answered the open question and wanted to “finalize and get the ‘aha’-feeling”.

### 5.5 Results: Action 2

Workshop 2 was carried out over an online meeting tool, Lync, where each participant was able to speak to each other. The participants all sat at different locations, namely Linköping, Sweden; London, UK; and Colombo, Sri Lanka. The PowerPoint presentation was shared with the group and the introduction was much the same as in workshop one. As the previous group thought that one hour was too short, the second workshop was extended to 1.5 hours.

As the participants were not in the same location, GroupZap, an online brainstorming tool, was used instead of sticky notes. A virtual whiteboard had been prepared in advance, with want/need statements, as well as tips for getting started when brainstorming users. The participants could add sticky notes to the whiteboard simultaneously, and see each other’s notes. The first exercise showed the same variations in difficulty as the first group; some found it relatively easy while others found it harder. After writing user notes, these were sorted under the different statements. This took longer than in the previous workshop as the participants discussed each note before deciding which statement it belonged to. When there were about ten minutes left of that exercise, each note was sorted by the individual who had written it in order to complete the task on time.

The last fifteen minutes were spent on discussing patterns and identifying user groups. The main groups identified were call center handlers and managers.
5.5.1 Summary
The whiteboard with all the notes was saved as a PDF file and sent to the participants, see figure 11. The A’s and B’s at the top represents to different user groups, where B was named the primary user group. Two statements were added by the team: “I want to do as few steps as possible using only one input channel” and “System needs to respond quickly”.

![Figure 11: The online whiteboard with the statements and notes from the second workshop.](image)

5.5.2 Survey result
To gather opinions about having a workshop over Lync, a question regarding that was added to the survey. The survey was filled out at the end of the workshop by the development team who participated, and yielded the following mean scores, where n = 5:

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean Score (1 - Too short, 5 - Too long)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did you think of the time frame?</td>
<td>3</td>
</tr>
<tr>
<td>Was the workshop relevant for your project?</td>
<td>4,2</td>
</tr>
<tr>
<td>Did it take place at an appropriate time?</td>
<td>2 (1 = Should be earlier, 5 = Should be later)</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>3,4</td>
</tr>
<tr>
<td>Did it work well over Lync?</td>
<td>3</td>
</tr>
</tbody>
</table>

The results show that the participants thought 1,5 hours was a good time frame, that the workshop was very relevant for their project but should have been conducted earlier, was useful, and worked okay, but not perfect, over Lync. Three participants responded to the open question about improvements, where they said they wanted clearer instructions with more examples, more time for the concluding discussion, and that it could be difficult to use GroupZap together if the connection is slow which it was at times. One person also wanted clearer instructions on how to translate the conclusions into action.
5.6 Reflections

The results show that both the workshops were appreciated and found useful and relevant by the participants. The first workshop was considered too short, and the second workshop was therefore 30 minutes longer, which the participants deemed was an appropriate time frame. During the first workshop, discussions were more animated, and more team members took an active role. This is could be due to the fact that the team was present in the same room instead of only hearing each other over Lync, as participants in the pre-study mentioned that discussions over Lync tended to be less active and more to the point. Another factor that could influence this was the presence of two people from management during workshop one, which could have influenced the participants’ motivation. During the second workshop, the discussion was mostly dominated by the participants from Linköping and London, although all participants were frequently asked their opinions. This variation within the team could be explained by cultural and personal differences between members.

While discussions flowed easier in the first workshop, the second workshop had the advantage of participants seeing each other’s sticky notes. In the first workshop, these were written in private and then put on the wall, making them difficult to read from a distance. Therefore, the following discussion mostly centered on the want/need statements. In the second workshop, more time was spent discussing users and which statement they would fit under. However, a risk when using an online whiteboard is technology trouble, and difficulty seeing each other’s actions due to a slow internet connection. One participant’s browser did not support GroupZap, but this was solved by two participants working together. This is another factor that could hinder active discussions.

Instead of organizing the workshop for the entire department, only two teams were included. This decision was made because it was deemed to be more fruitful for a single team to discuss the users they were currently developing for, as all teams work on different projects with different users in mind. Having a focused discussion with the purpose of discovering differences in the developers’ perceptions of users would therefore be more productive for teams rather than the whole department.

A way to improve the first workshop would be to quickly summarize the results for the participants and have a concluding discussion afterwards. This would allow for more discussion on which users were actually included in the different user groups, as the groups identified were based on the want/need statements.

The workshops did not completely follow the Ad hoc persona method as specified by Adlin & Pruitt (2010), but as most steps were carried out and the main objective was not to create Ad hoc personas but rather get the team to discuss users and think of them from a different perspective, it is not necessarily a weakness to this study. A critique against the Ad hoc persona method is the risk that everyone is wrong about the users, so collecting the knowledge already present in the department will not enlighten anyone. Instead, it may give a false sense of knowing the users, although no user research has been conducted. However, Adlin and Pruitt state that ad hoc personas are not necessarily an alternative to regular personas. The best way to use them is as a starting point, a hypothesis, and then adding data from user studies. What the ad hoc persona method accomplishes that regular personas do not is getting the developers to discuss their underlying assumptions and opinions about their users. However, if there are not enough resources to do user studies, spending a few hours talking about end users should give the participants new knowledge and inspiration, and
allow the team to pinpoint what they need to learn more about. Adlin and Pruitt also argue that the risk of being completely wrong is very small, and the positive side to discussing users far outweighs the negative.
6 Action 3: Heuristic evaluation

The previous actions attempted to help two teams structure their knowledge on end users, both to articulate knowledge that was already present in the team and help the team identify what they wanted to find out.

Other issues that the participants felt hindered their ability to work with user experience were time constraints and lack of information on user experience and appropriate methods to use. Action 3 attempted to address these issues by introducing a method to quickly evaluate the usability of an interface. The purpose was to introduce rules-of-thumb for usability in interfaces, independent of end user knowledge, in order to provide the participants with different methods that can be used in different situations depending on their current needs. In order to complement the End user workshop on Ad hoc personas, Action 3 consisted of a workshop on the method Heuristic evaluation. All employees at Service & Asset Linköping were invited, and twelve people participated.

6.1 Heuristic Evaluation

Heuristic evaluation is a form of usability inspection method for evaluating an interface. The evaluations are performed by one or a group of evaluators and the methods are fairly easy to use, and can be used by regular developers without usability education. (Nielsen, 1994)

Real users can be difficult to recruit and demands a lot of time and resources. According to Nielsen (1994), user testing usually finds some problems while usability inspection finds others, but one method does not cover everything, so the best way is to combine methods.

Heuristic evaluation is a well-recognized method that was developed by Jakob Nielsen around 1990 (Molich & Nielsen, 1990; Jeffries et. al., 1991; Jeffries & Desurvire, 1992). The method is efficient; the cost-benefit ratio in on case study by Nielsen (1995a) was 48: the cost was 10,500 and the expected benefits were about $500,000. According to Nielsen, 3-5 evaluators are enough to find most problems; on average, a single evaluator finds only 35% of problems, averaged over six projects.

As described by Nielsen (1995a), a heuristic evaluation is conducted individually; the evaluators should not speak to each other until the evaluation is finished. Each session normally lasts one to two hours. An observer can be used, but is not necessary; the benefit is less effort for evaluators as they do not have to record the usability problems, but can just report them to the observer verbally. It is also beneficial if the evaluators are novices on the domain or technology and need to ask questions to fully understand how to use the interface. If evaluators are novices to the domain, it is especially important to supply them with a usage scenario or a list of tasks to be accomplished. Conversely, if evaluators record the problems themselves it can save time and resources.

Nielsen recommends to go through the interface at least twice, first to get a feel for the flow of the interaction and general scope, and then to focus on specific interface elements. The evaluators can examine both a developed interface and a paper prototype, and they check the interface against ten usability heuristics developed by Molich and Nielsen (1990) and described in Nielsen (1995c):

11. Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
12. **Match between system and the real world:** The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

13. **User control and freedom:** Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

14. **Consistency and standards:** Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

15. **Error prevention:** Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

16. **Recognition rather than recall:** Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

17. **Flexibility and efficiency of use:** Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

18. **Aesthetic and minimalist design:** Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

19. **Help users recognize, diagnose, and recover from errors:** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

20. **Help and documentation:** Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

The result is a list of usability problems, with reference to with heuristic(s) it violates. An evaluator cannot simply say that they do not like a particular feature; it has to be tied to a usability rule. Each problem is listed separately, even if it concerns the same function or detail.

Nielsen (1995d) conducted a survey with participants from a usability inspection methods course eight months after the course was completed. 50% said they had used heuristic evaluation 9 times on average, and the method got an average rating for usefulness of 4.5 out of 5. 88% of the open comments about heuristic evaluation were positive. Nielsen (1995d) describes factors that are likely to affect which usability methods are adopted by a development team, namely:

- Make sure that the method provides useful information
- The method should be cheap and fast to use and easy to learn
- The method should be flexible and adaptable.
- The method should be taught at a time when it is needed in a project
- The method is more likely to succeed if there are people strongly advocating it
Nielsen concludes that heuristic evaluation fulfills many of these criteria, as it is useful and cheap, fast and easy to learn. It is also adaptable in that it will still yield useful results even if there are not 3-5 usability experts evaluating it; a single developer without usability experience will still find usability problems. Nielsen calls this graceful degradation, as minor deviations from the recommended practice will only bring slightly reduced benefits.

Nielsen also suggests combing heuristic evaluation with severity ratings of usability problems (Nielsen, 1995b; Nielsen, 1995e). A severity rating is based on three factors:

- The frequency with which the problem occurs: Is it common or rare?
- The impact of the problem if it occurs: Will it be easy or difficult for the users to overcome?
- The persistence of the problem: Is it a one-time problem that users can overcome once they know about it or will users repeatedly be bothered by the problem?

Each factor is given a rating between 0 and 4:

0 = I don't agree that this is a usability problem at all
1 = Cosmetic problem only: need not be fixed unless extra time is available on project
2 = Minor usability problem: fixing this should be given low priority
3 = Major usability problem: important to fix, so should be given high priority
4 = Usability catastrophe: imperative to fix this before product can be released

It is also important to assess the market impact of a usability problem. When this is used in combination with heuristic evaluation, it is not a good idea to let each evaluator rate each problem as they are discovered as the individual evaluators won’t find all the problems. A better method is to list the complete set of problems discovered, with specific explanations and possibly screen dumps, and let the evaluators rate the problems. At least three evaluators should provide severity ratings. (Nielsen, 1995e)

Nielsen also suggests alternating between heuristic evaluation and user testing, as some problems can be very difficult to find without users, especially when the system is highly domain-specific and the evaluators are novices in those areas. Jeffries & Desurvire (1992) also argue that usability inspection methods should not substitute usability testing as a balanced repertoire is necessary to correctly assess usability.

Heuristic evaluation was deemed suitable for the everyday development work at IFS as it is well-known and complies with several of livari’s (2006) recommendations for the obedient engineering culture, such as selecting methods that emphasize rules, standard procedures, documentation and control. With heuristic evaluation, the developers can evaluate the interface for each heuristic and clearly document why it complies or does not comply with usability guidelines. The recommendation is that the teams allocate time for this, but even if they don’t, it’s still useful to have a checklist close by compared to nothing at all.

Chisnell (2010) argues that while heuristic evaluation was very cost-efficient compared to usability testing in the early nineties, this gap has decreased in recent years. In 1990, it was difficult to get access to users, and most had to be trained before they could start using the interface. According to Chisnell, this is substantially easier today as it is less expensive to get access to users and they rarely
need special training. However, the ERP system in this case study is extremely complex, and users do need training and instructions to use it. The great diversity of the target audience also makes usability testing expensive and time-consuming, as many users must be tested in order to get a fair representation of the usability issues. Therefore, heuristic evaluation might be particularly well suited as an inspection method for complex ERP systems. However, it is important not to leave out usability testing completely, especially since the application can be very domain-specific, which makes it difficult to evaluate it without domain expertise.

6.2 Procedure
The workshop was scheduled for one hour and started with a fifteen minute introduction to the method heuristic evaluation and severity ratings. The participants were then given a step-by-step guide with a list of Nielsen’s heuristics, and spent approximately 20 minutes evaluating their time-reporting interface according to these rules-of-thumb. They were told to only find usability problems and not spend time on severity ratings, as Nielsen states that this should be done after all the results are aggregated (Nielsen, 1995a) The time-reporting interface was chosen as it was something they were all familiar with, as it was deemed too complicated to both introduce a new method and a new domain in a one-hour workshop, especially as it would be too time-consuming to act as observer and domain expert to all ten participants simultaneously. The participants were instructed to evaluate the interface individually, either by browsing freely or completing this list of common tasks:

- Add a new time code (a suggested time code, undisclosed here, was provided)
- Change something you have added previously from work to travel.
- Report half a day of illness.
- You worked late yesterday, add two hours to the overtime account.
- Confirm and remove confirmation.
- Check the help documents.

When approximately 20 minutes remained of the workshop the exercise was concluded. The participants then had time to discuss the results and their thoughts about the method. Some discussion topics were prepared, such as:

- What did you think of the method?
- What was easy/difficult?
- Can this be used in the BSAs’ and SEs’ everyday work? Why/why not?
- The list of heuristics can be adapted to suit the domain. Do you think something should be added to the list to better suit ERP systems?
- Are all heuristics equally important?
- Are the severity rating factors equally important?

When the workshop finished, the participants filled out the following survey:

**Usability Evaluation Workshop**

**Was is easy/difficult to understand the method?**

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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td></td>
<td>Very difficult</td>
<td></td>
<td></td>
<td></td>
<td>Very easy</td>
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</tbody>
</table>
Was it easy/difficult to use the method?

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<tbody>
<tr>
<td></td>
<td>Very difficult</td>
<td></td>
<td></td>
<td></td>
<td>Very easy</td>
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</tbody>
</table>

Do you think you will use heuristic evaluation in the future?

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<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No, not at all</td>
<td></td>
<td></td>
<td></td>
<td>Not applicable to my work</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maybe</td>
<td></td>
<td>Yes, often</td>
</tr>
</tbody>
</table>

Why/why not?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Did you find the workshop useful?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No, not at all</td>
<td></td>
<td></td>
<td></td>
<td>Yes, very useful</td>
</tr>
</tbody>
</table>

How could the workshop be improved?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

What is your title?  __________________________________________________________

Thank you for your participation!

6.3 Results
Seven of the twelve participants were BSA/SE/Architect, and five had managerial roles. All the participants used their own computer to individually evaluate the time-reporting interface. They performed most of the evaluation without speaking to one another, although they sometimes asked each other about certain functions, such as how to access the help documents. Overall, the atmosphere was very positive and participants sometimes laughed about how they didn’t know how to perform a certain task or couldn’t believe they hadn’t noticed a particular usability issue before.
In the discussion that followed, there was a general agreement that this method would be useful when evaluating an interface in their everyday work, and many said it helped them see issues they wouldn’t otherwise notice.

The survey yielded the following average scores.

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was it easy/difficult to understand the method?</td>
<td>4,5</td>
</tr>
<tr>
<td>Was it easy/difficult to use the method?</td>
<td>3,8</td>
</tr>
<tr>
<td>Do you think you will use HE in the future?</td>
<td>4,3</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>4,6</td>
</tr>
</tbody>
</table>

The first open question, “Why/why not?”, a follow-up to question number three, also yielded positive results. The only comments that voiced concerns were one that it was a good method, but could take some time to learn and get used to, and one that said he or she would use it if it became part of the official methodology. Other comments were very positive, and several called for this to become an official method to integrate into the everyday work for Research and Development as a whole. When asked how the workshop could be improved, the answers were also positive overall, with some suggesting more examples and focus on the heuristics to speed up the exercise and several also wanted more time for the exercise and discussion.

After the workshop, several participants suggested holding the same workshop for the employees in Sri Lanka, and expressed a wish to make heuristic evaluation a part of the official development methods. Therefore, the workshop was held a second time for the UI Forum, which will start a project to look into how this could be included in the official methodology.

### 6.4 Reflections

One concern about using the time-reporting interface was that the participants might be so familiar with it that they wouldn’t find many usability problems. However, these concerns proved unfulfilled; the participants had no trouble finding problems when they had a checklist to refer to. One participant stated in the concluding discussion that it was “embarrassingly easy” to find usability issues. The fact that they could find usability problems in an interface that they didn’t think about otherwise seemed to make people more positive towards using heuristic evaluation.

One of Nielsen’s instructions is that the evaluations should be made individually; the participants should not speak to each other during the process. However, as the participants were seated in the same room there were nonetheless a few comments from time to time, such as asking other participants how to access help documentation. The comments were not very frequent and as they also served to keep the group in a positive mood overall, it is not considered a weakness, especially since the participants received clear instructions that should be done individually if they use the method at another time.

Overall, the participants gave very positive feedback and many mentioned how this was exactly what the department needed. This is also reflected by the high survey score of 4,6 out of 5 for the workshop’s usefulness.
7 Action 4: Usability issues in ERP systems

The purpose of the fourth, and last, action was to put the previous actions in a larger perspective by introducing some of the latest research in this area, describing some methods used at similar companies, and discussing general and specific usability issues in ERP systems. Just like previous actions, this was organized as a workshop. As the practical exercises in previous workshops had been much appreciated, the workshop also introduced the method speed sketching in a short exercise in order to mix theoretical concerns with a concrete example of something they could apply in their regular work. Aside from the employees at the Service and Asset department, the members of the UI Forum also participated, some at the Linköping office and others over Lync.

7.1 User Experience strategies

The topic of the forth workshop was common usability issues in ERP systems, and also included user experience strategies at other ERP companies and a sketching exercise. As common usability problems have been described in the theoretical background, this section will describe user experience strategies at other ERP companies that were collected in preparation for the fourth workshop and a description of the sketching exercise. The information was gathered through an interview with a person involved with user experience at another ERP company, and an open discussion in the online forum ERP Community, a part of the social networking website LinkedIn.

7.1.1 Interview

An employee from another ERP company was interviewed for around 30 minutes about usability and user experience issues and strategies. Some differences were that their system was less complex and directed at fewer industries. Like IFS, they had a few developers with a background in interface design but most had no such background. User experience was mainly viewed as a question of resources, no extra time was allocated for user experience activities. The company has two personas which are used to some extent, but most developers talk about user roles, such as “super user” instead of the named personas.

The main difference was that they regularly create sketches before moving on to implementation. Sketches are also often used when defining requirements. A goal was to always verify the sketches before moving on to implementation. At IFS, sketching is not widely used by developers, so an exercise called speed sketching was included in the fourth workshop. This exercise has been used in interaction design courses at Linköping University to get people more comfortable with sketching and inspire creativity.

7.1.2 Online discussion

To collect data on how user experience issues are handled by other companies, a discussion was started in the group ERP Community, a part of the professional networking website LinkedIn. The group has around 45,000 members who work in or are connected to the ERP industry. The group allows members to connect with each other, post job offers and discuss various subjects. The topic of the discussion started was “What are your most important user experience and/or usability issues in your ERP system and how do you handle it?”. After a few responses had been gathered, a follow up question was asked in order to clarify the topic: “Do you have any suggestions on what could be changed in the systems engineers’ and business systems analysts’ every day work in order to achieve a system with better usability?”
The discussion got 25 responses from twelve respondents. The respondents all worked with ERP systems and had everything from a few years to over 30 years of experience. Four worked in North America, one in Australia, three in Asia and three in Europe. Their titles were also diverse, including variations of systems analysts, software developers, consultants and CEOs. One respondent had also written a book about manufacturing ERP systems. All respondents were aware that the information was gathered for a thesis and gave their permission to have their insights included.

One issue described by many respondents was the difficulty and importance of having more contact between developers and end users. These are comments by three different respondents:

“It’s important for developers to ensure that they have end user experience testing as part of their development programme and that they don’t gloss over when it is not clear how a user should achieve a task.”

“The challenge then is to get users and designers talking to each other regularly.”

“Getting the Dev team involved with the users face to face is ideal if you can do it.”

Another important issue was the ability to simplify forms and create personal user roles that only includes relevant information. This was considered important both for learnability and efficiency as it would decrease the perceived, or front-end, complexity of the system.

“Flexibility is what is important. Interfaces should be adaptable as well as the system functions.”

“The ability to easily personalize an entry form either by the user themselves or by an IT person.”

Several respondents also mentioned the importance of background knowledge of context and business processes among the developers – namely, why something was being developed instead of just what to develop.

“I used to preface each [functional specification] with a page or two, describing WHY the modification or enhancement was wanted. (...) After a while, the developers started to come back to me, saying that they could deliver more than I had asked for. The difference was that they had moved from knowing what was wanted to understanding what was wanted.”

“If BA’s don’t fully comprehend the full nature of the process they are automating, they have little chance of getting it right, regardless of the functionality of the system.”

In summary, the main issues described were decreasing complexity and increasing efficiency by personalizing the application, getting developers more involved with end users, and increasing knowledge among developers of the context and business objectives of their projects. These issues were discussed in workshop four, which will be further described below.

7.2 Procedure

The workshop was organized with the following agenda:

1. 10 min: Research findings on common usability issues in ERP systems
2. 10 min: User experience strategies at similar companies
3. 10 min: Exercise – Speed sketching
4. 10 min: Moving forward – Future challenges
5. 10 min: General discussion

Each topic was introduced for about five minutes, and then discussed for a few minutes before moving on to the next topic.

The research findings discussed were first the general issues of complexity, inconsistency, and having a large and diverse customer base. After that some specific issues were introduced, namely those found by Oja and Lucas (2010), described in the theoretical background on page seven. Then the results from the LinkedIn discussion were presented, followed by discussion, and then the results from the interview were presented. This was followed by a speed sketching exercise, and then a concluding discussion on future challenges.

Speed sketching is done in two minute iterations. The exact time frame can be adjusted; the main point is that it’s short. For two minutes, the participants sketch a design solution, and after two minutes, they must start over and do a new design. The short time frame ensures that the designer does not spend time perfecting details instead of focusing on the main layout, and its primary purpose is to generate a few different ideas instead of just implementing the first one that comes to mind. This method would suit the everyday development work at IFS as it doesn’t demand any artistic skills, as that might make developers without a design background wary, and doesn’t take much time.

At the end of the workshop, the participants were asked to fill out a feedback survey with the following questions:

- Did you find the topics relevant? (1: Not at all, 5: Very relevant)
  - Any topic you felt should have had more focus? (open)
  - Any topic you felt should have had less focus? (open)
- What did you think of the sketching exercise? (1: Not at all relevant, 5: Very relevant)
- Do you think you will use speed sketching in the future? (1: No, not at all, 3: Maybe, 5: Yes, often)
  - Why/why not? (open)
- Did you find the workshop useful? (1: No, not at all, 5: Yes, very useful)
- What is your title? (open)

7.3 Results
Fourteen people participated and the survey showed the following mean scores:

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you find the topics relevant?</td>
<td>4,6</td>
</tr>
<tr>
<td>What did you think of the sketching exercise?</td>
<td>4,7</td>
</tr>
<tr>
<td>Do you think you will use speed sketching in the future?</td>
<td>4,4</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>4,5</td>
</tr>
</tbody>
</table>

For the open questions, three mentioned topics they thought should have had more focus, which were: “Different demands depending on clients”, “Improvement in future development, like speed
sketching support” and “User studies in ERP systems”. None wanted any topic to have less focus. Some wanted more exercises and many wanted more time for discussion. This was also mentioned by many in the question asking for how to improve the workshop; more time overall, more exercises and more time for discussion was mentioned by several people.

On the question of why they would or wouldn’t use speed sketching, most wrote positive answers such that they had tried it sometime before but it was good to be reminded, that it was another way of thinking than normal (as a reason why they would use it), a fast way to find alternative solutions, put forward new ideas, and was effective. One person said that it might not make that much of a difference as they still had the framework guidelines to adhere to, but that s/he would still like to give it a try.

### 7.4 Reflections

The workshop aimed to put usability issues in a wider perspective by having participants discuss general and specific usability issues and strategies used by others. It also had the purpose of introducing a method they could use in their everyday work.

It is of course not possible to know whether the twelve respondents in the group discussion constitute a fair representation of its 45,000 members. Some are more active than others, and those not interested in usability issues would not be likely to contribute to the discussion. However, the aim was not to find out the most popular strategies of the group members, only to investigate some different ways to handle these issues. There are most likely many more ways to work with usability that was not revealed in the LinkedIn discussion but that does not damage the credibility of the contributions. As the discussion was conducted in English and took place in a primarily English-speaking social network it may have excluded those who don’t have English proficiency. However, as the participants came from a variety of continents, they are less likely to only display the user experience strategies of a single culture.

The interview was conducted with a person involved with user experience at a similar company. The person was aware of the purpose of the interview and had been told he could stop at any time. Notes were taken but the interview was not recorded. The interviewee was a personal connection who was familiar with the project and expressed an interest in these issues, and the interview ended with a discussion where both parties contributed information. The interviewee worked for a competing company, but the risk of a conflict, such as the interviewee spreading false information or tried to hurt the project in any way is judged to be minimal, as the discussion was based on a genuine interest in these issues and desire to improve user experience in ERP systems.

The purpose of the workshop was to put user experience on the agenda by increasing knowledge of common issues and ways to handle it, and make sure these problems were discussed by the participants. It was a way to put the methods they had learned in a larger perspective and hopefully increase motivation to continue to seek information on this.

The sketching exercise got very high scores on the survey and many people were very positive about it, both during the workshop discussions and afterwards. It was described as a fast method to get a few different ideas. One person described how she had started out drawing the time-reporting interface as it usually looks, then thought about how she usually looks at outlook as well when she did her time reporting so she included that in her second sketch, and then for the third sketch she
designed an interface that was based on the outlook calendar with time reporting functionality. She said it felt like a good way to identify the “golden nugget” and be able to do further designs based on what was important.

Ways to improve the workshop would be to allocate more time for it and make more time for discussions. Some participants said it felt a bit hasty to just discuss a topic for a few minutes before moving on to the next, and that it might be better to have fewer topics if the workshop is only an hour long.
8 Results of all actions
In order to measure whether the workshops led to any changes in the work practices and attitudes of the participants, the participants were asked to take part in a survey and focus groups. The purpose was to measure both quantitative changes between surveys and the participants’ self-reported experiences.

8.1 Focus groups
Everyone who had attended at least one workshop was invited to take part in a group discussion. Two groups were created, the first with five participants who had all taken part in one of the End user workshops and at least one of the other two. The second group consisted of five participants who had taken part in the Heuristic evaluation workshop and/or the Usability in ERP systems workshop. The focus group sessions were 30-40 minutes long and the main questions discussed were:

- Have the workshops affected the way you work with usability issues or think about usability issues?
  - Have the workshops been equally effective (or ineffective)?
- Do you think there is more motivation to work with user experience now than before workshops?
  - If yes, do you think it will last?
  - If no, what would be required to achieve it?
- Do you think people are more able to work with user experience now?
  - If yes, do you think it will last?
  - If no, what would be required to achieve it?
- Does it matter whether the methods introduced becomes a part of the official methodology?

The participants were also presented with a list of the success factors for usability work identified in literature, described on page eight, and were asked to discuss how they applied to IFS:

1. It’s important that the development team is involved
2. The development team needs to perceive user experience specialists as allies
3. Support from management – view of usability as a success factor
4. Usability specifications included in requirements
5. Experienced usability specialists working in a centralized group
6. Creating best practices
7. Usability methods and results from user studies must be available to every employee
8. The formal development process should include usability work

The participants agreed that the workshops had had an effect on their motivation and way they thought about user experience. They all thought the methods had been good and seemed very useful in future work. Some described it as an eye-opener, and even a “kick in the head”. However, they also agreed that the biggest challenge would be to make it a lasting routine and integrate it with the everyday work. They said it would take reminders every now and then to use the methods. Both focus groups compared it to things they knew were important, but that was rarely prioritized over general development work if there was a lack of time, such as writing documentation or doing risk analysis.
Lack of time was seen as a major problem and was discussed at length by the second group; they described how people had very little influence and little time to try something new. One developer talked about the importance of spending as little time as possible on a task as taking too long might mean not having time for other tasks at all. In some cases, not finishing all the tasks could mean that the entire functionality being developed could not be used at all, which meant that several people’s time had been wasted.

The first group stated that in order to make the effects last, it would be important to have the guides and information easily accessible. They also said that it might make a difference if the methods introduced were included in the official methodology, but that it would not be a certainty for long-term effects. Other factors that were seen as important to integrate this into the everyday work were to have frequent discussions about this in teams. To make it a little easier to remember, they suggested narrowing down the heuristics to the five most important ones.

The first group consisted of participants who had all taken part in the End user workshops. However, they said that they had not really discussed or used those results after the workshop, even though they thought it was a positive experience. They said it had not really affected the way they talked about end users in their everyday work, but that it might have had a greater effect if the workshop had been conducted earlier in their projects; as they were almost finished there was not much they could change. A better way might be to include it as a way to kick off a project.

When asked to think about how the success factors for usability work applied to IFS, “The development team needs to perceive user experience specialists as allies” was mentioned as one that needed work. One developer stated that “Today, usability specialists are seen as aliens, not allies”, and the group agreed that it had to be improved, especially since new generations of users have greater demands on usability. “Experienced usability specialists working in a centralized group” was also mentioned as it was similar to UI Forum, but some also commented that the UI Forum does not necessarily have a background in usability and can only spend 20% of their time on UI Forum work. They also discussed the last factor, “The formal development process should include usability work“, and talked about the importance of including Heuristic evaluation in the official methodology. Another factor discussed was “Usability methods and results from user studies should be available to every employee”, as several wondered if there was anything like that going on, and said they did not know where to find results from previous studies, such as the user study Early Adopter Program conducted last spring.

Another important factor discussed was that user experience needed to be a priority to a greater extent. The second group said that people with usability experience should work on this full time, and to have more authority in design decisions compared to the UI Forum today.

8.2 Survey

The survey consisted of the same questions as the survey in the pre-study, listed on page fourteen, with six extra questions added at the end:

- Which (if any) workshops have you attended? (Multiple select)
- Are you more motivated or less motivated to work with user experience than you were 4 months ago (before the workshops)?
The survey was created using the research tool Easyresearch by Questback, and a link was, as in the pre-study, sent to the employees at Service & Asset Linköping office. At the time of the previous survey, 24 people worked at the department in Linköping, but that number had since been reduced to 20 as a four people were no longer employed or on parental leave. However, both surveys got fifteen responses, making the response rate 62% for the first survey and 75% for the second.

The difference between the two surveys was measured with independent samples t-tests in SPSS Statistics with a significance level of $\alpha = .05$. The results show no significant differences between the two surveys. For the newly added questions, figure 12 shows the number of participants in each workshop who responded to the survey. As workshop 1 and 2 had been held for two selected teams, they have fewer participants; especially workshop 2 which was held for a team with only two members based in Linköping.

Figure 13 shows the difference between the average answers to the two surveys. There is a slight decrease on every statement except the first, “I can affect user experience as much as I would like to” and “I received no introduction to user experience when I started working at IFS”. No changes are statistically significant.
Figure 12: The number of participants from each workshop who responded to the survey.

Figure 13: Average results from the two surveys.

The results also show that when the participants stated if any of these obstacles prevented them from working with user experience, “Unclear definition of the concept user experience” and “Lack of resources to support working with user experience” had decreased, as figure 14 shows.
Figure 14: How often something was selected as an obstacle.

Figure 15 describes the answers to the statement “Are you more motivated or less motivated to work with user experience than you were 4 months ago (before the workshops)?”. Most participants felt more motivated and none felt less motivated.

The participants were also asked if they thought others at the department seemed more motivated to work with these issues, the responses are presented in figure 16 and follow the same pattern as the previous question.
Figure 16: The respondents' perception of others' motivation.

On the question “Do you think these workshops have had any effect on your ability to improve user experience in your everyday work?”, all participants thought they had a positive or very positive effect, see figure 17.

Figure 17: The respondents' perceived ability to improve user experience.

As the survey was distributed just one week after the last workshop, the participants were also asked if they thought the workshops would have an effect over time, see figure 18. Most thought they would have a positive effect.
Another result that emerged from the data analysis but was not expected was the difference between developers and managers on the following statements, see figure 19:

The statements in figure 18 are abbreviations of the full statements, which are phrased as follows:

- I am able to affect the user experience of the IFS application as much as I would like to.
- My immediate managers (such as group manager, support manager and project manager) have clearly communicated how I should work with user experience.
• The senior management (such as directors and VPs) have clearly communicated what is being done by the company as a whole to improve user experience, such as projects, available resources, user studies, etc.
• The information available today is sufficient to learn what I need to know about end users.
• I think the IFS application is generally easy to use.

There is a tendency for developers to agree with each statement to a lesser extent than managers. The following statements in the second survey showed a significant difference between managers and developers where \( p < .05 \): “I am able to affect the user experience of the IFS application as much as I would like to.”, “My immediate managers have clearly communicated how I should work with user experience” and “The senior management have clearly communicated what is being done by the company as a whole to improve user experience, such as projects, available resources, user studies, etc.” The data from the surveys was analyzed with independent samples T-tests with role (manager/developer) as the grouping variable. The first survey revealed no significant differences between developers and managers.

8.3 Feedback from the workshops

The surveys answered by the participants after each workshop showed that when rated for usefulness, workshop 3 (Usability evaluation workshop) was considered most useful with a rating of 4,6 out of 5. Workshop 4 (Usability in ERP systems) came second with 4,5. Workshop 1 and 2 were the same topic, End users and Ad hoc personas, although there were some differences; Workshop 1 took place with all participants gathered in Linköping, and were an hour long; Workshop 2 was conducted over Lync with participants in several countries and was extended to an hour and a half. Workshop 1 was rated 4 on usefulness and Workshop 2 got a rating of 3,4.

The one-hour workshops were all deemed too short by the participants; the length of workshop 2 was considered appropriate by those who attended. Many also wanted more time for discussion. The practical exercises were very appreciated by many participants.

An overview of the feedback surveys from each workshop:

**Workshop 1**

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did you think of the time frame?</td>
<td>1,4 (1 = Too short, 5 = Too long)</td>
</tr>
<tr>
<td>Was the workshop relevant for your project?</td>
<td>3,8 (1 = No, not at all, 5 = Yes, very relevant)</td>
</tr>
<tr>
<td>Did it take place at an appropriate time?</td>
<td>2 (1 = Should be earlier, 5 = Should be later)</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>4 (1 = No, not at all, 5 = Yes, very useful)</td>
</tr>
</tbody>
</table>

**Workshop 2**

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did you think of the time frame?</td>
<td>3 (1 = Too short, 5 = Too long)</td>
</tr>
<tr>
<td>Was the workshop relevant for your project?</td>
<td>4,2</td>
</tr>
<tr>
<td>Did it take place at an appropriate time?</td>
<td>2 (1 = Should be earlier, 5 = Should be later)</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>3,4</td>
</tr>
<tr>
<td>Did it work well over Lync?</td>
<td>3</td>
</tr>
</tbody>
</table>

**Workshop 3**

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was it easy/difficult to understand the method?</td>
<td>4,5 (1 = Very difficult, 5 = Very easy)</td>
</tr>
<tr>
<td>Question</td>
<td>Rating</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Was it easy/difficult to use the method?</td>
<td>3,8</td>
</tr>
<tr>
<td>Do you think you will use HE in the future?</td>
<td>4,3 (1 = No, not at all, 5 = Yes, often)</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>4,6</td>
</tr>
<tr>
<td><strong>Workshop 4</strong></td>
<td></td>
</tr>
<tr>
<td>Did you find the topics relevant?</td>
<td>4,6</td>
</tr>
<tr>
<td>What did you think of the sketching exercise?</td>
<td>4,7</td>
</tr>
<tr>
<td>Do you think you will use speed sketching in the future?</td>
<td>4,4</td>
</tr>
<tr>
<td>Did you find the workshop useful?</td>
<td>4,5</td>
</tr>
</tbody>
</table>
9 Discussion

The purpose of this project was two-fold; both contribute to the research on user experience in the context of organizational change, and implement solutions at IFS. The research question was:

*Which actions can be taken to increase ERP system developers’ perceived ability to improve user experience in their everyday work?*

The selected methodology was action research, and the project started with a pre-study to determine which solutions would be most appropriate for IFS. The main issues identified were:

- Lack of information on user experience and methods to use
- Lack of information on end users
- Lack of time and resources
- Complicated technical framework
- Lack of instructions from management

The complexity and structure of the technical framework lies outside the scope of this project, but attempts were made to deal with the other issues. The first two issues received particular focus, primarily because the educational background of the researcher is user experience and user studies. “Lack of time and resources” and “Lack of instructions from management” are more related to areas like time management and human resource management, which is not the focus of the thesis. However, these issues are obviously very important as well, and taken into account in the selection of methods. For example, time-efficient methods were selected, and managers were invited to take part in all workshops to make sure the whole department could discuss user experience topics.

This section will discuss the results from all the actions combined, measured by a survey and focus groups. For reflections on the individual actions, see reflections from the relevant chapter. This section also includes recommendations for future actions at IFS and research on this subject.
9.1 Results

The results from all the actions were assessed with two focus groups and a concluding survey to find out if the actions had had any effect, and if the participants thought they would have an effect over time.

The survey was compared to the survey sent out before the actions took place. However, there were no significant differences between them. As figure 13 on page 54 shows, there was a slight increase in the respondents’ perceived ability to affect user experience, as well as a tendency to agree more with the statement “I did not receive any information on user experience when I started working at IFS”, which could be attributed to having more knowledge of the concept. Uncertainty of what user experience actually means in practice would have made it difficult to determine whether the introductory information was sufficient.

The survey shows that the respondents feel that they are more aware of what constitutes user experience. Only two named it as an obstacle, compared to six before the workshops. The respondents also feel they have more resources to work with user experience, as that was named as an obstacle half as many times in the second survey, three times compared to six. This is likely a result of the workshops as they both presented information on user experience, and introduced resources such as methods to be used in the everyday work.

The frequency of the other obstacles showed no significant differences between the two surveys. This was not unexpected as the project has not attempted to change the technological framework. Guidance from management on these issues remained unchanged as well, which is also unsurprising as a shift in attitudes and practical guidance is a long process and it is too early to determine whether the workshops have had any effect on that. Four people said that insufficient knowledge of the end user or context was an obstacle, compared to three people in the first survey. The change is small and could be incidental, or a result of having the Ad hoc persona discussions and pinpointing areas where more information is needed.

There is an interesting discrepancy between the statement “I can affect user experience as much as I would like to”, to which the responses had not significantly changed from the first to the second survey, and the question “Do you think these workshops have had any effect on your ability to improve user experience in your everyday work?”, to which all respondents stated they had a positive or very positive effect. This could be explained by the fact that the statement ends with “as much as I would like to”; a base level that could have changed with more motivation. Twelve out of fifteen participants stated that they felt more motivated to work with user experience now than before the workshops. More motivation on these issues could also make people more aware of limitations.

To complement to results from the survey, focus groups were held with workshop participants to discuss short-term and long-term effects of the actions. The participants said the workshops had been very useful, and had increased their motivation and awareness of user experience issues. However, to make these effects last the methods must be integrated with the everyday work and made a routine, which several pointed out as a challenge. They suggested recurring workshops on similar topics to keep the information salient and up-to-date.
The question of whether the actions have had any effect on the developers’ ability to improve user experience in their everyday work is difficult to answer as only a few weeks have passed since the workshops. Creating a change in work processes and attitudes takes a long time, and just because there were no significant changes between the surveys it does not mean that future surveys would not show changes if the actions were followed up and continued.

However, checking for differences between two surveys may not show if differences actually exist; the surveys were answered by a different group of people the second time compared to the first time, and although there is obviously overlap as it was sent to a single department, there are still differences. An important part of action research is democracy and participation; participants should be included in the design of the study and evaluation of the results. The participants have stated that they think the workshops have had a positive effect on their motivation, awareness and ability to work with user experience. The perception of the workshops have been very positive, and the workshops on heuristic evaluation and usability issues in ERP systems (action three and four) will be organized for other departments as well, per their request. It is clear that both developers and managers are more motivated to work on user experience issues, an important factor for long-lasting change. Including heuristic evaluation guidelines in the official methodology was a suggestion put forward by the workshop participants, not the upper management, which will increase the likelihood of employees embracing it. They have stated that it would be a suitable method to integrate with their everyday work and spread the word to other departments. These results show that the developers’ perceived ability to affect user experience has improved. With time, and continued use of the method, it is very likely that the developers’ objective ability to affect user experience in their everyday work will improve as well.
9.2 Method

The selected methodology for this project was action research. Characteristics of this methodology is a problem-solving interest as well as a research interest, where the research is planned, carried out and evaluated in collaboration with the people who will be affected by the results. The research question should be based on a real-world problem and the goal should be to find and implement a solution to that problem. The research question for this project is based on the need to integrate user experience in the everyday work of developers, a need expressed by IFS. This is also a relevant research topic, as user experience in ERP systems is an important challenge. There are studies on organizational change in relation to usability work, but very few concerning the development of ERP systems. As ERP systems pose particular usability challenges, such as a very complex technical framework and heterogeneous target market, there is a need for more research in this area. Alas, there is both an actual problem to be solved and a relevant research question to be answered.

Validity in action research is based on transparency and consistency. Transparency concerns the trustworthiness of the researcher; choices made in the course of the study must be clear, and reasons for the actions taken must be described. The results are consistent if data collected from different sources, or analyzed in different ways, point to the same results.

Each action taken in this project is described and reflected upon, and a diary was kept to ensure that the researcher remained impartial and focused on the research objectives. A risk within action research is that it turns into consultancy if the researcher forgets the scientific objectives; trustworthiness in the choices made and analysis of the results is therefore important. This is especially vital in this project as there is only one researcher who has no previous experience within the action research field. The guidelines for action research have been monitored continuously throughout the project to ensure the validity of the results. Reasons for each action and its connection to relevant theories have been described as clearly as possible, as well as alternative actions that were not taken.

Consistency is achieved by using several methods for data collection, such as observations, interviews, surveys and focus groups. In the pre-study, many different roles were interviewed, both managers and developers, and people from different departments to ensure that the results included different perspectives. In addition, a survey was distributed to check against the interviews, and meetings and everyday work was observed. In the action cycles, the results from each workshop were measured by a survey, and notes were taken directly afterwards to describe discussions and comments made by participants. At last, the survey and focus groups were used to measure the results after all the cycles had been completed. Collecting data in several different ways showed the consistency of the results, which, coupled with transparency, contributes to the validity of the results.

Within action research, and qualitative research in general, the aim is not to disprove a hypothesis in a way that can be replicated but to reach a deeper understanding of a particular case, asking “why” and “how” in addition to “what, where and when”. The focus is on exploring a real-world setting, and in the case of action research, cause actual changes to it. Therefore, exact replication is impossible as the environment in question will be different after the research than before, and a similar study in a different environment will be affected by the new context. However, generalization of the results is possible as long as the research is valid, but should be done with more caution as the results are
context-bound. As the measures taken in this project were based on the fact that the culture at IFS is similar to the obedient engineering culture described by Iivari (2006), the results could be generalized to ERP system development companies of the same culture type.
9.3 Recommendations for future actions

This section will describe future actions recommended for IFS in order to improve the user experience of the IFS application. This concerns both a continuation of the actions taken and other factors that were identified in the pre-study but not addressed.

A future challenge stated by the focus groups is making the methods a routine. The workshops have introduced the methods, but only the employees can integrate them into their work. For this to be successful it’s very important to have both managers’ and team members’ support; it must not be seen as a waste of time to do a heuristic evaluation or speed sketching. This relates to the success factors for facilitation of usability work, and particularly “The development team needs to perceive user experience specialists as allies” and “Support from management – view of usability as a success factor”. These factors were described as areas that needed more work by the focus groups, where one participant stated that user experience specialists today were more like aliens than allies to the other developers. The survey also shows that some developers experience a lack of support from management concerning these issues. IFS shows several characteristics from the obedient engineering culture described by livari (2006), which states that usability methods should be integrated with the official methodology for successful integration of these methods, and it is thus highly recommended that IFS makes usability methods part of their official methodology. At the time of writing, the process of integrating heuristic evaluation in the official methodology is ongoing, a direct result of the workshops.

The teams who participated in the Ad hoc persona workshop said it would be good to do that kind of workshop in the beginning of a project. As the purpose of that workshop is to discuss assumptions about users, attempt to describe typical users and prioritize different user types, it would be very useful to do this at the start of projects to avoid misunderstandings in the future work.

Another important success factor for usability work is inclusion of usability specifications in the requirements (Artman, 2002). This is especially important at IFS where user experience is given low priority if there is a lack of time. A recommendation would be to make usability evaluation a user story for each iteration, to make sure time gets assigned to it.

Easy access to the heuristic evaluation guidelines and other resources is also very important, stated both by the focus groups and in literature. For this purpose, a guide was put together that included the guidelines, the severity ratings, and a step-by-step guide on how to apply them. It also included addresses to websites with more information.

The pre-study revealed that many participants wanted to know more about end users and felt they were quite far away from the context in which the application would be used. This is described as an important criterion in the Human-Computer-Interaction and usability literature to increase understanding and empathy for end users among the developers. However, the application has over 500 000 users in many different countries working in many different industries. The teams learn about requirements from a customer representative, which are connected to representatives from the companies using the ERP system. A recommendation is to have more direct contact between the developers and the end users, for example through visits to customer sites or end user representations such as personas. During the spring of 2012, the Early Adopter Program was conducted, in which the new release was tested on a few customers and a user study was carried
out. This contributed to many new insights according to the conductors of the study, and the developers were positive and curious to see the results. However, although the results from the Early Adopter Program had been shared with the employees, they were not well-known and rarely used in the everyday work.

This relates to another issue brought up by many participants; insufficient knowledge of what usability measures are being taken and what resources are available today. This is a key factor regarding the facilitation of usability work according to Fellenz (1997) and Aucella (1997), who state that usability work should be available for every employee, both the results and descriptions of the methods and techniques. Many participants stated that although they knew that user experience was important to management, they were unsure of how this was handled in practice. Some said that it seemed to be used as a buzzword to sell the application, because they had not seen any evidence that the company organized any practical user experience measures. This is both an issue of knowledge and motivation; if the employees know for certain that user experience is important to management and not just a word used by the marketing department, it is more likely to be prioritized in the everyday work. This could also be improved by adding user experience to the introduction for new employees, both information on how to include user experience in their everyday work and what measures are being taken by the company as a whole.

According to Fellenz (1997) and Aucella (1997), experienced, professional usability specialists are another key factor in usability facilitation. The developers can consult a representative from the User Interface Forum, but those representatives do not necessarily have a background in user experience or usability engineering, and only work with the UI Forum 20% of their time. Most said they rarely, if ever, used the UI Forum formally; instead, they preferred speaking directly to their representative and solving usability issues together. This creates a problem for the part of the department located in other countries. As there is only one representative per department, and each department can be distributed over three or four locations, only one location have the opportunity for quick feedback. This could be solved by making sure every department has a usability specialist on every location.

Another obstacle mentioned by nearly every participant was the technological framework. The application is very complex and many said its main strength was consistency – it looks and behaves the same no matter if you work with project management or supply chain management. This is a substantial usability advantage; however, it also prevents improvements as one part of the system cannot be improved without changing all the other parts. Hence, a small change demands extensive resources. Today, there are inconsistencies in the system where the guidelines have not covered an issue or different product groups have solved it in different ways. If the team is developing something new, there are rarely guidelines to cover every detail and they must design new forms that are as user friendly as possible. One strategy mentioned by participants was to make new forms similar to other forms, but they also pointed out that these older forms might not follow guidelines, either because the developer had not read them or because the guidelines had changed since then. This tradeoff between better usability and consistency is a common problem among complex ERP systems. Uflacker and Busse (2007) suggest user-centered design methods to avoid as much complexity as possible. This issue is very difficult to solve and depends on strategic decisions from top management rather than everyday work of developers.
Conclusions

The results show that the participants had become more motivated to work with user experience and thought their ability to improve user experience had increased. They also thought their own and others’ motivation had increased, and stated they were more aware of these issues now than before the workshops. The participants were very positive and said they would like more activities of this kind, and they also recommended that the workshops were organized for other departments at IFS. The participants also requested that the heuristic evaluation guidelines be included in the official methodology, a process that is now ongoing and will be continued by the UI Forum.

IFS is recommended to take the following actions to maintain the participants’ motivation and improve their user experience work:

- Make sure there is a UI Forum representative in every location, or at the very least have someone with a user experience background in every location. Make sure that person has time assigned to help out with user experience issues.
- Make sure all resources are easily accessible, such as previous user studies, usability guidelines and descriptions of methods to use.
- Include information on user experience and end users in the introduction for new employees.
- Get more contact between developers and users – organize user testing and visits to customer sites.
- Include user experience in requirements and user stories.
- Give those with a background in interaction design time to conduct these workshops for other departments, and to organize new ones.
- Start each project with an Ad hoc persona workshop.
- Include heuristic evaluation in the official methodology.
- Look into how managers can provide more guidance and support to developers when working on these issues.
- The UI Forum has recently started sending out newsletters to the departments. This is a very important step and should be continued.
- A recommendation is to make the guidelines easier to navigate, for example by developing a search function, to make it less time-consuming to find information.
- Many developers feel limited by the technological framework. When making future changes to the framework, the developers’ ability to affect user experience should be taken into account.

Finally, it’s important to make user experience work a routine. This project has introduced methods, but if they are to make a difference in the development work, they must be habit. People must feel comfortable using them, and feel they have the support of their team and managers when focusing on these issues.

In future research within the fields of user experience, organizational change and ERP system development, it would be interesting to see studies on how managers can better support everyday user experience work. It would also be interesting to study new developments in ERP systems in the coming years, for example how these very complex systems can translate to tablets and
smartphones, and what that means for user experience. As this study focused on only one of the usability cultures described by livari (2006), it would be interesting to see similar studies on the other culture types. Another important research area is if the perceived ability to work with user experience translates into actual ability and improves the user experience of the IFS application. It would also be interesting to further develop the workshops, and discover how they can be adapted to fit different groups of people. Two workshops were held with single teams, and two with the whole department. Other possibilities would be to include other roles or departments, such as customer representatives and marketing departments.

User experience is described as a significant differentiator for success, and very important in ERP systems development which faces particular challenges due to its complexity. This project attempted to integrate user experience in the development work at IFS, and the results show that the participants are more motivated, more aware of user experience issues, and have more methods readily available to use in their everyday work. They state that the workshops had a positive or very positive effect on their ability to improve user experience, and have also asked that the methods are included in their official methodology. This indicates that the actions taken have increased the ERP system developers’ perceived ability to improve user experience in their everyday work.
11 References


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