

**Considering the Usability of an ERP System in a Multicultural
Collaborative Organizational Context through Hertzum's Images of
Usability**

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Enterprise resource planning (ERP) systems, although common in organizations, are noted for their lack of usability considerations. They are often large and complex, and as such are difficult to learn and to use.

We set out to understand how a multicultural, geographically dispersed organizational setting affects the usability of ERP systems. Usability itself is difficult concept to define. Multiple definitions exist, most of which look at usability through a number of narrow, more approachable attributes.

To incorporate different contextual and usability factors, we applied Hertzum's method of usability analysis. The method considers six images of usability: universal, situational, perceived, hedonic, organizational, and cultural, each with a distinct perspective on usability. We explored which image would rise as dominant, and also considered the usefulness of applying Hertzum's method in the context of an actual organization.

The study was performed as a single-case study in an international organization, and focused on the ticket handling process of IT support personnel. We applied a mixed method approach, gathering data through a usability survey, semi-structured interviews, as well as live observation.

Organizational usability emerged as the dominant image, as it was seen to elicit the most comments in the survey. The usability of the system was seen to result from the combination of all individual factors, and therefore to be rooted in specific instances of use. While Hertzum's method was found to require a large scope of study to provide enough data to consider all images equally, the method nevertheless provided new insights into the usability of the ERP system. It is our hope that our results may assist future researchers appreciate the value gained from a change of perspective.

Keywords: usability analysis, organizational usability, collaboration over distance, enterprise resource planning system, context of use, situational usability

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1. Introduction

Enterprise Resource Planning (ERP) systems have become common in IT (Information Technology) organizations [Lambeck et al., 2014]. They are used to integrate and manage business processes, enable communication and coordination between different functions and distribute information [Singh and Wesson, 2009; Scholtz et al., 2010]. In an IT organization or an IT department, an ERP system can be used to provide customer service and to manage, distribute and prioritize daily work assignments [Usmanij et al., 2013]. As a result of daily work being carried out by the IT personnel and logged into the ERP system, the system can also function as an information repository.

Despite the importance of ERP systems to the IT support, their usability is often criticized. ERP systems have been accused of being overly complicated and difficult to use and learn [Singh and Wesson, 2009; Coopriider et al., 2010; Oja and Lucas, 2010; Babaian et al., 2014; Lambeck et al., 2014; Veneziano et al., 2014]. Usability issues have a negative effect on the productivity of the users, and make them less likely to adopt the system [Babaian et al., 2014]. At the level of the organization, this results in a loss of resources and diminished return on investment [Coopriider et al., 2010].

Usability has received several definitions over the years [Nielsen, 1993; Elliott and Kling, 1997; ISO 9241, 1998]. While most definitions consider usability to contain a specified user, task and context, many studies on usability leave out contextual factors, and rather concentrate on interface usability and users' task performance with the system.

The exclusion of many contextual elements enables more standardized methods of conducting research. Still, the results of the studies are applied and the systems are used in actual organizations. There have been scarce attempts to create a unified model that would include the user, the task and the context in usability studies. One such attempt was made by Hertzum [2010], who introduced a method that allows considering usability through different "images of usability". Hertzum bases his work on images combined from existing usability research papers, which have considered usability from different perspectives and with different foci. Hertzum's method may allow the inclusion of the actual setting into usability analysis without compromising research quality or standards.

Hertzum proposes the six images of universal, situational, perceived, hedonic, organizational, and cultural usability. Universal usability focuses on making the system work for everyone. Situational usability considers the usability in a specified situation, including users, tasks, and the context of use. Perceived usability sees usability through the experience of the user, while hedonic usability focuses on the enjoyment of the user. Organizational usability focuses on organizational collaboration, and cultural usability considers the cultural background of the users. These images are compiled from existing

usability research approaches. Each of the six images emphasizes different aspects, although the images interlink and overlap to some extent. By decomposing the situation of use, with all its variables, the context may become more manageable, which may help with usability analysis. [Hertzum, 2010]

In this study, we consider the usability of an ERP system for IT support personnel. Specifically, we discuss the effects that the multinational, non-collocated organizational setting has on the usability of the ERP system for IT support. The work of the geographically dispersed IT support personnel is mainly distributed and organized through the ERP system. The IT support personnel are also the first link between the members of the organization who contact IT support and the rest of the IT organization, making it important to consider the usability of their primary tool.

This study is conducted as a case study in a single organization with an internal IT department and a commercial ERP system that is being developed further in-house. The organization operates globally and has offices in over 30 countries, with IT support personnel working in most of the larger offices. The IT support uses the ERP system to handle service requests, known as tickets, sent by the organization's own employees. The tickets can include any requests, from ordering new equipment and software to reporting IT related problems.

A case study is the recommended method for studies that include real-life contextual conditions [Yin, 1994]. All data are gathered from within the organization, but viewed through the images offered by Hertzum. It is beneficial in case studies to aid the data collection and analysis by using a theoretical framework [Yin, 1994], such as Hertzum's method. Hertzum's process of usability analysis is relatively new, and it provides a way to include the context of use into the study.

We aim to understand how the wider context in this organizational environment affects the usability of the ERP system. By conducting the usability study using Hertzum's method, we also explore its usefulness and applicability in practical usability research. We hope to find the factors that most affect the usability of the ERP system, or, as Hertzum [2010] says, the "*dominant image of usability*". To answer these questions, we apply a mixed method approach. By using both qualitative and quantitative measures, we hope to increase the validity of the results.

We have considered the usability of the system by conducting a survey for all IT personnel involved in ticket handling. To gain insight into the situation in which the ERP system is used, the IT support personnel were observed during their daily work tasks. A semi-structured interview was conducted for chosen IT department employees. Our personal experience working in the IT support of the organization provided both inside knowledge and a deeper understanding of and access to the organization and the ERP

system than would have been available for an outsider. The results are analyzed using Hertzum's images of usability. Finally, we assess the analysis process to understand the potential of Hertzum's method.

By gaining new insights into the usability of the ERP system in its actual use setting, we aim to help improve its usability and benefit both the organization and the users of the system. This study will supplement existing research into usability, while considering a relatively new method of usability analysis in the context of an actual organization.

Based on the results, organizational usability was chosen as the dominant image of usability. Because our focus was on usability as perceived by the IT support personnel, perceived usability was chosen to supplement the dominant image.

While the organizational environment was seen to affect the usability of the ERP system the most, cultural differences were also evident. Many of the attributes affecting the usability of ERP systems in a multicultural, non-located organizational setting can be analyzed through multiple images of usability. Switching between these different perspectives helps understand the underlying reasons behind usability issues, and also find possible solutions to them.

Hertzum's [2010] method of usability analysis and the images of usability proved to require a much larger scale of research than was possible with the available resources. However, we believe the results to be valid, and to form a good basis for future research. The analysis method itself was easy to use, and it brought forth dimensions and perspectives that would have easily gone unnoticed. Considering the different images of usability also highlighted some of their strengths and weaknesses. This information is useful when choosing a focus or perspective for any usability study.

The study is structured in six chapters. Chapter 2 introduces the key concepts of usability, Hertzum's images of usability and the related analysis method, as well as the common methods of usability analysis. It covers the relevant existing literature and gives the theoretical background for the study. Chapter 3 introduces the case study and the setting in which it was conducted, and explains the purpose of the study and the research methods used. In Chapter 4, the results of the usability analysis are presented, and the findings are evaluated against the theoretical framework. Chapter 5 analyzes and discusses the usefulness of the images and Hertzum's method. Conclusions are presented in Chapter 6.

2. Perspectives into Usability

Usability is not a simple concept. It has received several definitions and its meaning is still being debated, see e.g. [Lewis, 2014; Hertzum, 2018]. Usability is often researched with a focus in specific aspects in order to narrow the scale of the study. For example, contextual factors are often omitted to allow more focus on the match between the user and the system.

In Section 2.1 we consider the definition of usability. In Section 2.2 we introduce the six images of usability by Hertzum. These images represent some of the foci taken in usability literature. In Section 2.3 we consider the different methods of usability analysis and introduce the background for the methods used in the present study.

2.1. Usability

The ISO standard definition states usability to be the *“extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”*. Effectiveness is measured with the user’s ability to perform a task accurately, efficiency compares the effectiveness of completing a task to the expended resources, and satisfaction measures the user’s attitude toward the system. [ISO 9241, 1998]

With usability being such a wide concept, it is easier to analyze by decomposing it into smaller, more easily approachable components. Various attributes are used to define usability beyond those mentioned in the ISO definition [Alonso-Ríos et al., 2009], and some of the three attributes in the ISO definition may not have direct equivalents in other definitions. For example, Nielsen [1993] lists five components that define usability: learnability, efficiency, memorability, errors, and satisfaction. While efficiency and satisfaction are also found in the ISO definition, there is no direct equivalent for effectiveness. There are also differences in names and definitions of the attributes across different standards and models [Seffah et al., 2006].

In many usability studies contextual factors are not described in much detail [Bargas-Avila and Hornbæk, 2011]. Contextual elements are the users, tasks, equipment and the environment, both physical and social, in which the system is used [ISO 9241, 1998]. The environment can be divided into technical (equipment), physical (workplace conditions, design and safety), and organizational (organization’s structure, attitudes and culture, and job design) components [Bevan and Macleod, 1994; Maguire, 2001]. Changes in any contextual elements may affect the usability of a system [Bevan and Macleod, 1994].

Usability analyses can be used for different purposes. While diagnostic evaluation methods can be used to assess the current usability of the system and discover individual

usability issues, they do not offer many insights on how to enhance the usability of the system beyond fixing those issues. However, uncovering usability issues is not sufficient. Lund [2006] calls for *“a deep understanding of the nature of the users and how the context of use shapes their experience and activity”*.

Many usability researchers narrow their focus to only include certain aspects of the actual use of the system in their studies. The field has been divided between those considering specific situations of use, and those attempting to provide generalizable data [Bargas-Avila and Hornbæk, 2011]. Hertzum [2018] speaks for a usability construct that enables being sensitized to the nuances of the use situation rather than considering usability as a rigid, definitive concept. Hertzum’s images of usability are intended to help understand usability as an empirical occurrence rather than strictly define it [Hertzum, 2010].

2.2. Images of Usability

The images, introduced below in Subsections 2.2.1 through 2.2.6, are universal, situational, perceived, hedonic, organizational, and cultural usability. Hertzum’s method of usability analysis is explained in Subsection 2.2.7.

The images overlap to an extent. Organizational culture, for example, is an attribute of both organizational and cultural usability, viewed from different angles. In order to present each image separately, we have decided to introduce these attributes in more detail under one image only. Because the focus of the present study is on the organizational environment, the theory behind organizational usability (Subsection 2.2.5) is elaborated in more detail.

2.2.1 Universal Usability

Humans are as diverse as they are many. Universal usability, as its name suggests, focuses on making systems for everyone to use [Hertzum, 2010]. Vanderheiden [2000] defines it as a *“focus on designing products so that they are usable by the widest range of people operating in the widest range of situations as is commercially practical”*. This requires considering all the different variables in which humans differ from one another, such as the frequency with which they use the system, their age, gender, disabilities, values, and income [Hertzum, 2010].

Universal usability is important especially with public systems, such as ATMs, that are intended to be used by anyone with minimal instructions. Although impossible to reach in practice, we find universal usability to function as a reminder to strive for inclusive design.

2.2.2 *Situational Usability*

Usability is more than just a system attribute. Situational usability considers it to be the quality of the entire use situation, and suggests that usability cannot be assessed independent of the context, because it is always featured within a specific use situation. In this image, contextual factors are considered to outweigh even general usability principles. [Hertzum, 2010.] We find that the most efficient and pleasant system may become less so when used, for example, on a laptop in a noisy swaying commuter train.

Situational usability contains the interrelations between a user, a task, and a system within the use context (see Figure 1). For example, two users may perform the same task using two different tools or use the same tool to perform different tasks. Situational usability also requires considering the interactions between the system and other systems needed in the use situation. [Hertzum, 2010]

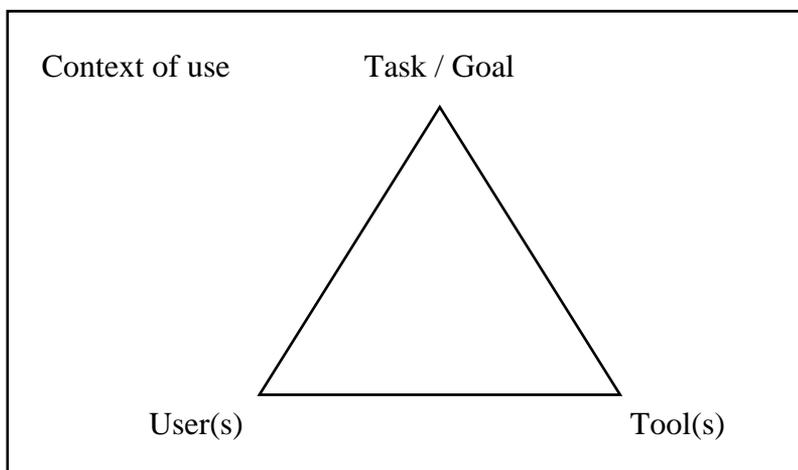


Figure 1. The use situation [Hertzum, 2010].

2.2.3 *Perceived Usability*

The user is placed in a central position in perceived usability, which considers usability as the user's subjective experience. It can be seen as the perceived benefits (usefulness and quality) versus costs of using a system, although it shouldn't be mistaken for the utility of the system. [Hertzum, 2010]

Personal experience is affected by the context in which the system is used and therefore perceived usability cannot be studied independent of the contextual factors. As personal attitude, experience and performed tasks change over time, perceived usability is also subject to change. Therefore, it should be studied over a longer period of time. [Hertzum, 2010]

Established ways of working, habits, strongly affect the perceived usability of a system. People are more willing to follow their old, learned ways than to learn new

methods. [Hertzum, 2010.] The users' mental model of the system, meaning the way they understand how the system works, may affect its adoption and acceptance. If a cumbersome but working method has been found, or an incorrect mental model formed, it may discourage people from working with the system. This emphasizes the importance of adequate training. [Orlikowski, 1992]

2.2.4 Hedonic Usability

Hedonic usability considers the usability of a system with a focus on the user's personal pleasure in using the system. Unlike the other images, hedonic usability is not related to any specific task being performed in the system. Rather, it concentrates on the pleasurable emotions that the use of the system creates. Feelings of pleasure can be divided into four categories: physical (about body and senses), social (about relationships), psychological (about creativity, feeling good etc.), and ideological (about preferences, beliefs and values). [Hertzum, 2010]

Situational usability also includes user enjoyment, but is more interested in relieving (avoiding dissatisfaction) than hedonic (creating satisfaction) qualities. In situational usability, user dissatisfaction is avoided, but positive emotions are not specifically sought for, leaving the state of the system often neutral, i.e. being neither satisfying nor dissatisfying. Hedonic usability, on the other hand, is about creating positive emotions and satisfaction in a user. [Hertzum, 2010.] This makes hedonic usability an important concept in usability considerations.

The qualities creating positive emotions and relieving negative ones are not the same. This distinction makes hedonic usability relevant in systems that encourage sustained use, such as e-commerce platforms and consumer products. Pleasurable emotions also affect user's assessment and behavior, making this image of general interest as well. [Hertzum, 2010]

2.2.5 Organizational Usability

Organizational usability focuses on users working together within an organizational setting, where the use of the system is often mandated, unlike in the other images of usability where the use is discretionary [Hertzum, 2010]. Kling and Elliott [1994] consider organizational usability as "*the ways that computer systems can be effectively integrated into work practices of specific organizations*". We see its two major considerations to be user collaboration and the alignment of the system with the organizational structure. Hertzum [2010] states that this alignment may require both the system and the organizational structure and practices to be adapted.

	Technical	Sociotechnical
Accessibility	Ease of access	Effect of social role in organization to accessibility
Integrability	Access and fit into work practices	Social incentives and administrative control
Reliability	Error recovery	Reliability of information
Social-organizational expertise	Training and help	Influence of informal help from colleagues

Table 1. Dimensions of organizational usability [Elliott and Kling, 1997].

Organizational usability can be divided into four dimensions; accessibility, integrability, reliability, and social-organizational expertise [Elliott and Kling, 1997]. Each attribute can be considered from both technical and social perspective, as shown in Table 1.

Organizational alignment and customizability are important in commercial systems that are designed to suit the needs of multiple organizations. Usmanij et al. [2013] write, rather cynically, about the design of organizational systems as follows: “*Most software projects are largely undertaken with a focus on developing successful products rather than successful systems. For example, enterprise resource planning (ERP) products are generally developed in isolation from other system components like people, information or existing business processes.*” This calls for aligning the systems with the organizational structure and customizing them to suit their specific environment.

Any gaps between a system and the organizational practices may result in a situation where the users conduct their work outside the system or create their own workarounds. These gaps may be caused, for example, by some relevant functions that are not supported by the system or the organizational practices. Customization of the system may help overcome this issue. [Sumner, 2009]

The organizational structure includes the existing software environment within the organization. A lack of integration between different software systems is seen to impose additional burden on users, causing user performance to degrade. This could be avoided by achieving system interoperability, which would also save time and reduce costs for the organization. [Iqbal et al., 2012]

Hertzum [2010] acknowledges three collaborative elements, introduced in Table 2, that are important in achieving a match between the system and the organization. These elements are coordination, awareness, and common ground.

Element	Description
Coordination	Employees' ability to coordinate on tasks
Awareness	Employees' awareness of the collaborative work situation through observing their colleagues
Common ground	Employees' understanding and acceptance of the organizational goals, norms, and individual roles

Table 2. Collaborative elements in organizations [Hertzum, 2010].

Organizations are expected to collectively benefit from the use of a system. The benefits from the system and the work required to achieve them may not be divided equally. As several groups within the organization may use a system for different purposes, some may end up doing additional work in the system that others are able to benefit from. This *“uneven distribution of work and benefits enters into employees' perception of a system and its usability”*. [Hertzum, 2010]

In multicultural organizations the members of work teams and units may be located in different countries and offices. Face to face meetings in these organizations are uncommon due to their cost [Aragon and Poon, 2011]. Teamwork in geographically dispersed teams is known as distance collaboration. The largest challenges in distance collaboration are geographic, temporal, and cultural distance [Noll et al., 2010]. Temporal distance represents the time difference between multiple time zones.

Distance can also be a subjective attribute: perceived distance has more impact on collaboration than geographical distance, although geographical distance influences the perceived distance by 50–70%. Interaction increases familiarity between collaborators, and prior experience reduces the perceived distance. [Cummings and Kiesler, 2008; vom Stein et al., 2016].

When collaborating over distance, the forms of communication are limited. For example, the use of gestures and facial expressions require seeing the person one communicates with, while nuances such as sarcasm are easily lost or misinterpreted in textual correspondence. Daily interactions may be limited to a text based chat or email messages. Even a video feed does not relay information about what is happening outside the camera view. The awareness of one's colleagues and their presence, activities and intentions is known as workspace awareness [Gutwin and Greenberg, 1996]. The lack of this kind of contextual reference is seen as one of the challenges of distance collaboration [Espinosa and Carmel, 2004].

ERP systems can be considered as electronic workspaces, where the users handle tasks collaboratively. Compared to a physical workspace, electronic workspaces have limited capabilities for providing workspace awareness. This makes the available methods all the more important. Increasing mutual awareness and sharing information extensively between collaborators can help overcome the issues caused by distance [Olson and Olson, 2014].

2.2.6 Cultural Usability

To consider cultural usability, we must start by defining the concept of culture. Culture can be considered as the attributes that distinguish the members of a group of people from others [Hofstede et al., 2010]. These attributes are the learned values and behaviors [MacGregor et al., 2005], as well as mental models and communication styles [Callahan, 2005] of the group members.

Cultural differences have a strong effect on distance collaboration [Olson and Olson, 2000]. They affect the way communications are understood and interpreted, and may result in misunderstandings and other communication failures [Noll et al., 2010].

Hofstede's model of cultural dimensions is commonly used to describe cultural differences [Myers and Tan, 2002; Hertzum, 2010; Aragon and Poon, 2011; Callahan, 2006]. The five dimensions are small/large power distance, individualism/collectivism, masculinity/femininity, weak/strong uncertainty avoidance, and long-term/short-term orientation [Hofstede et al., 2010]. The model has received critique for assuming cultures to be national and homogenous as well as for using only one company's employees as its source [Aragon and Poon, 2011].

Culture isn't homogenous and members of the same cultural group may not behave in identical ways. Cultures also mix and interact with each other dynamically, so people may have characteristics and habits deriving from multiple cultural backgrounds and preferences. [Callahan, 2005]

Cultural elements in the user interface are, for example, language, iconography, and the format of dates, times and numbers [Callahan, 2005]. Cultural variables in interfaces and their importance for system use and acceptance are seen in Table 3. Textual elements may be critical for system use, while graphical elements are more likely to affect system acceptance.

	Textual elements	Graphical elements
Critical for interaction (Interaction cannot occur without, or is severely affected)	Interface language known to user	
	Ability to enter proper fonts	
	Ability to specify appropriate formats (time, date, numbers, etc.)	
Important for interaction (Interaction cannot occur unless new information is learned)	Discourse style understandable to user	Culturally understandable graphical metaphors
	Transparent relation between translated word and system function	Transparent relation between culture specific icon and system function
	Understandable formats (date, time, etc.)	
Important for system acceptance (Interaction can occur, but system may be rejected)	Option to interact in native language	Culturally appealing / appropriate colors
	Use of discourse style of native language	Culturally acceptable graphical representation
		Information display characteristic of user's own country
		Culturally / morally accepted content

Table 3. Cultural variables for interfaces [Callahan, 2005].

Cultural usability is considered to be more than just a set of culture-specific characteristics in the user interface. It considers usability to take on different meanings depending on the user's cultural background. Hertzum defines cultural usability as *“the extent to which a computer system, especially in intercultural contexts of use, matches the cultural background of its users, such that it supports their activities effectively, efficiently, and pleasurably”*. Even the construct of usability may have different meanings across cultures. For example, some cultures may place more value on the ease of use of a system, while others emphasize the system's usefulness. [Hertzum, 2010]

Organizations can also be seen to form their own, hybrid culture over time; *“People from the same business culture will share some beliefs and attitudes, regardless of their nationality”* [Callahan, 2005]. Organizational culture may include simplified rules, customs, roles and expectations [Earley and Mosakowski, 2000], and emphasize the role of practices across organizations [Guo and D'Ambra, 2011]. In addition to a shared organizational culture, workplaces may also include subcultures among people with similar tasks within the organization, such as administrative or customer interface subcultures [Hofstede et al., 2010].

2.2.7 Usability Analysis through Images of Usability

The images introduced above offer partial views into usability. Hertzum [2010] has created a method of usability analysis that encompasses all these images in order to gain a true understanding of usability. The method is primarily intended for practical use in organizations, in research and development work.

The method involves a three-step process, as seen in Figure 2. The first phase attempts to discover which of the six images of usability are present and relevant in the system and context being studied. This is achieved by looking at the usability of the system through each image. [Hertzum, 2010]

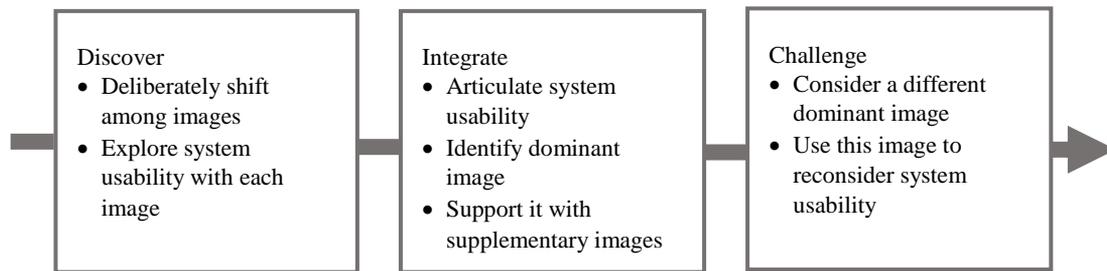


Figure 2. The process of usability analysis with images of usability [Hertzum, 2010].

In the second phase, integration, the image with the most effect on the usability of the system is identified. It is named dominant and the usability of the system is articulated through it. The other images can be considered where they support the dominant image. [Hertzum, 2010]

The third phase challenges the dominant image and considers the usability of the system through the other images. Each image is chosen as the dominant and the usability is considered through it to offer new insights. [Hertzum, 2010]

Hertzum suggests using the following five dimensions central to usability:

- Objective vs. perceived
- Process vs. outcome
- Performance vs. pleasure
- Individual vs. collaborative
- Short-term vs. long-term use

These dimensions can help compare and contrast the images of usability. [Hertzum, 2010]

2.3. Methods of Usability Analysis

While usability as a concept and the attributes it contains vary across different definitions, the methods used to evaluate usability are also varied. Iterative formative usability

analysis, which focuses on discovering and fixing usability errors in the system, can be studied using various methods. These methods can be either formal or informal, such as expert and heuristic evaluations or usability testing either with or without the think aloud method. Summative usability analysis, on the other hand, follows the ISO definition of usability by considering user satisfaction as well as the effectiveness and efficiency of the task performance. Traditional summative methods tend to have little interaction between participants and observers and be more formal than formative evaluations. [Lewis, 2014]

Surveys, interviews, expert evaluations, and live observation are among the most used methods in usability and user experience research [Oja and Lucas, 2010; Bargas-Avila and Hornbæk, 2011; Pettersson et al., 2018]. A set of heuristics, or guidelines, can also be used to evaluate system usability [Nielsen, 1993; Singh and Wesson, 2009].

Considering the images of usability, Hertzum sees questionnaires as a viable method for studying perceived usability. Interviews can be used to understand the underlying reasons for emotions that systems evoke (hedonic usability). In-situ interviews as well as ethnographic observation are used in organizational usability studies. Universal usability relies on the use of guidelines and heuristics, while situational usability can be measured with, for example, task analysis or usability evaluations using the think aloud method. Cultural usability, according to Hertzum, calls for more “*exploratory methods*” that better appreciate cultural distinctions. [Hertzum, 2010]

As one example of questionnaires used in the industry for conducting usability surveys, we consider the USE questionnaire. USE stands for usefulness, satisfaction, and ease of use (and ease of learning). [Lund, 2001] These four attributes of usability are also found in other models of usability. For example, satisfaction can be found both from the ISO definition and Nielsen’s [1993] usability components.

The USE questionnaire, shown in Table 4, has 30 simple and categorized ratings [Lund, 2001]. The ratings that Lund suggests having a smaller impact on the overall category are shown in italics.

Usefulness

-
- 1 It helps me be more effective
 - 2 It helps me be more productive
 - 3 It is useful
 - 4 It gives me more control over the activities in my life
 - 5 It makes the things I want to accomplish easier to get done
 - 6 *It saves me time when I use it*
 - 7 *It meets my needs*
 - 8 *It does everything I would expect it to do*

Satisfaction

-
- 9 I am satisfied with it
 - 10 I would recommend it to a friend
 - 11 It is fun to use
 - 12 It works the way I want it to work
 - 13 It is wonderful
 - 14 *I feel I need to have it*
 - 15 *It is pleasant to use*

Ease of Use

-
- 16 It is easy to use
 - 17 It is simple to use
 - 18 It is user friendly
 - 19 It requires the fewest steps possible to accomplish what I want to do with it
 - 20 *It is flexible*
 - 21 *Using it is effortless*
 - 22 *I can use it without written instructions*
 - 23 *I don't notice any inconsistencies as I use it*
 - 24 *Both occasional and regular users would like it*
 - 25 *I can recover from mistakes quickly and easily*
 - 26 *I can use it successfully every time*

Ease of Learning

-
- 27 I learned to use it quickly
 - 28 I easily remember how to use it
 - 29 It is easy to learn to use it
 - 30 *I quickly became skillful with it*
-

Table 4. The USE questionnaire [Lund, 2001].

3. Case Study Introduction

In this study, we explore several aspects of the use situation and their effects on the usability of the ERP system. Therefore, we consider it essential to cover the ERP system, the organization, and the use situation in as much detail as necessary to help understand the context in which the system is used.

The scope of the study has been restricted to include only those functionalities introduced in Sections 3.1 and 3.2. This is to allow more focus on the core tasks of the IT support personnel within the ERP system.

We explain the setting in which the study is conducted in Section 3.1, and the way the ERP is used in Section 3.2. Much of the background information provided in these sections is based on personal organizational knowledge and internal documentation. We have personal experience working in the organization's IT support in several locations within one country both before and after the ERP system was introduced. This inside experience and access has helped us gather more data than would have been easily available to an outsider.

In Section 3.3, we will introduce the research questions and used methods. We will also explain the phases of our research process.

3.1. ERP and the Organization

The case study is conducted in a multinational organization with well over 10 000 employees worldwide and with its own internal and globally operating IT department, hereafter known as ITD. Some four years ago, an ERP system, hereafter known as ITD-ERP, from an external provider was introduced to the IT department. It has since been developed and customized within the department to suit the department's needs. It is a cloud-based software used mainly with the browser recommended by the organizational IT policy.

This study focuses on the incident management system within the ITD-ERP, which is used by IT support personnel. They use the system for prioritizing, distributing and handling IT support requests, called tickets. They are often the first contact to the organization's other employees, from now on referred to as customers, and they solve a majority of the tickets. Therefore, they are the group most affected by issues in the usability of the system. Figure 3 illustrates the position of ITD-ERP within the organization and ITD.

ITD has employees from and in various countries. The IT support personnel make up for approximately 30% of the entire ITD, and they are located in approximately thirty offices in eleven countries.

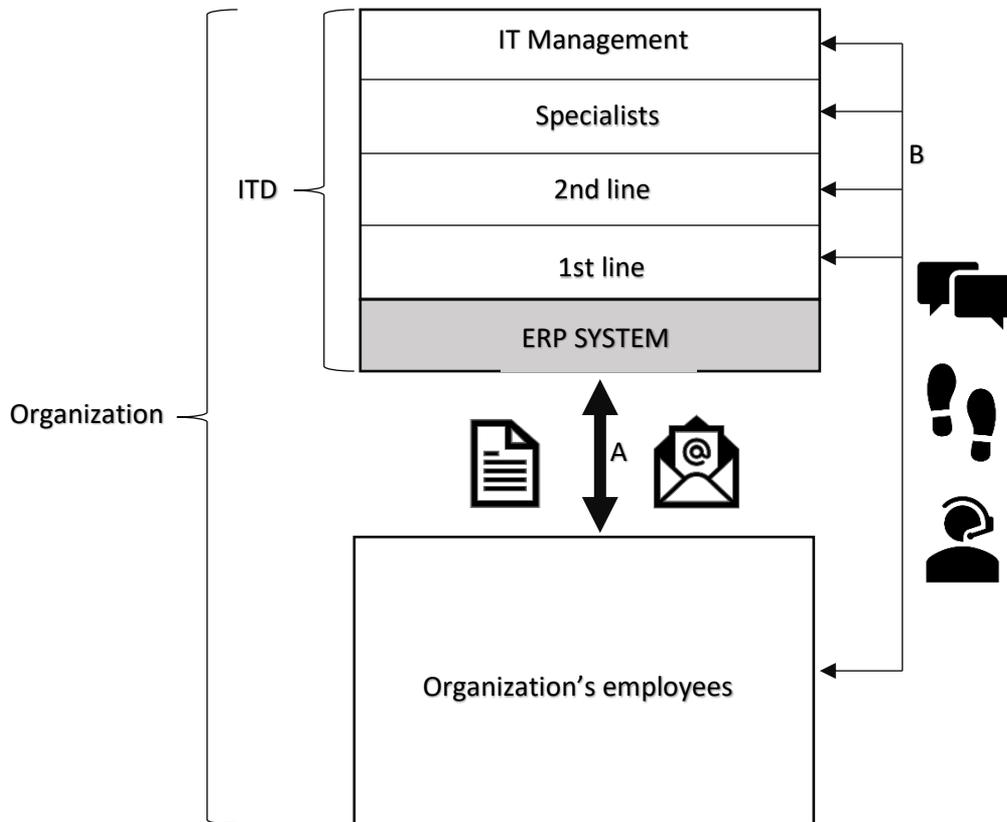


Figure 3. Position of ITD-ERP within the organization.

Tickets are sent by the customers to support personnel who handle and solve most of the tickets. IT support personnel work in rotating shifts. The first line of contact for the customers, known hereafter as the 1st line, handle quickly solvable tickets, while the 2nd line handle tickets that require on-site assistance or more time and effort to solve. ITD also includes other specialist groups that handle specialized tickets, such as server or mobile related issues. Global business application (GBA) specialists (referred to as specialist 2 in Appendix A) handle tickets related to basic business applications such as word processing software. ITD-ERP is the direct link from customers to IT support and from thereon to the entire IT department.

The recommended, official way to create a ticket (illustrated in Figure 3 as arrow A) is for the customer to create it from the customer portal or by sending email to a dedicated IT support address. This ensures that IT support personnel receive the tickets first, and ERP is used as an interface between ITD and the customers. If the ticket can be easily handled remotely, all communication with the customer can be handled through ITD-ERP and no external communication tools are needed.

Customers are also able to reach ITD personnel through other channels (arrow B in Figure 3). These include calling the IT support (recommended only for critical cases), walking to the ITD personnel's office, or sending an instant message request to an ITD

employee. These methods may enable the customers to reach the 2nd line workers or even specialists and management directly, bypassing both ITD-ERP and the 1st line support from the ticket handling process.

ITD operates globally, across national borders and different continents and time zones. All members of ITD work mainly in similar conditions, serve the same customers, and operate using similar equipment and software. However, they represent multiple different nationalities and cultures, and share a need to collaborate over geographical and temporal distances. They offer support for the organization for 24 hours a day for 6 days of the week, with plans to gain full 24/7 coverage in the future.

3.2. Ticket Handling

In order to manage the ticket queues, the ITD has calculated that each member of the IT support should solve approximately six tickets per hour, or in other words, spend no more than 10 minutes on one ticket on average. This has resulted in a practice where quickly solvable tickets are handled directly from the 1st line queue (during a phone call or upon picking the ticket from the ITD-ERP), whereas tickets requiring more time are logged in for later handling and forwarded to a global queue. Tickets requiring local knowledge or a visit on-site are moved to local queues. From January 2nd through February 28th in 2018, ITD handled approximately 5600 tickets (see Table 5 for details). One third of these tickets were solved directly in the 1st line, a third forwarded to the 2nd line, and finally a third forwarded to specialists.

Tickets can include any requests from ordering new equipment and software to reporting any IT related problems. Ticket handling is considered to include creating a new ticket and assigning, modifying, forwarding or resolving an existing ticket. Some parts of ITD-ERP are customizable, but the ticket window itself is not modifiable in ways that would affect its usability.

	Quantity	Percentage
Tickets solved in 1 st line	1922	34,21
Tickets moved to local 2 nd line	1002	17,84
Tickets moved to global 2 nd line	895	15,93
Tickets moved to specialists	1799	32,02
All tickets	5618	100,00

Table 5. Tickets handled by the ITD during a two-month period (Jan 2 – Feb 28, 2018).

Tickets are handled in order of arrival and priority. The five levels of priority are defined in the service level agreement (SLA) between ITD and the organization. Employees are urged to solve tickets before the SLA deadlines are breached.

A basic view of the global ticket queue, where all tickets from customers first arrive before being solved or moved to different queues, is shown in Figure 4. The name of the customer is normally shown in the Caller field and Location shows the customer's home office. Information in the Priority field defines the target resolution time for the ticket. State field shows the status of the ticket, which can be New (unopened), Active (opened), Work in Progress (being actively solved), Resolved (closed), or Pending (User, Internal, Vendor, or Change).

	Number	Created	Caller	Short description	Category	Subcategory	Priority	State	Location
<input type="checkbox"/>	INC0735586	2018-07-20 19:04:12		Utvidet datamengde mobilnr				New	
<input type="checkbox"/>	INC0735570	2018-07-20 16:33:20		Install - Editor	Application / Software	Application Unavailable	3 - Moderate	Active	
<input type="checkbox"/>	INC0735548	2018-07-20 15:38:40		need a back up file saved on 19 july 2018	SharedDrive	Shared drive Folder/File Missing	4 - Minor	Active	
<input type="checkbox"/>	INC0735545	2018-07-20 15:31:02		Python34	Application / Software	Application Unavailable	4 - Minor	Active	
<input type="checkbox"/>	INC0735539	2018-07-20 15:14:37		FW: Ticket "Global Mapper" has been resolved	Application / Software	Configuration Issue	4 - Minor	Active	
<input type="checkbox"/>	INC0735536	2018-07-20 15:02:08		Connection to Wifi	Network and Firewall	WLAN Connectivity Issue	4 - Minor	Active	
<input type="checkbox"/>	INC0735530	2018-07-20 14:48:39		Templafly not visible	Application / Software	Application Unavailable	5 - Planning	Active	
<input type="checkbox"/>	INC0735526	2018-07-20 14:33:42		MailArchive + skype for business	Application / Software	Software Store	5 - Planning	Active	
<input type="checkbox"/>	INC0735511	2018-07-20 13:30:25		Salainen kansio julkisen kansion sisällä	SharedDrive	Shared drive access Issue	4 - Minor	Active	
<input type="checkbox"/>	INC0735509	2018-07-20 13:24:38		Mail Manager issue	Application / Software	Feature / Function Not working	4 - Minor	Active	
<input type="checkbox"/>	INC0735504	2018-07-20 13:18:40		New replacement laptop	Computer/Printer/Accessories	I Have a Question	4 - Minor	Active	

Figure 4. 1st line ticket queue, with identifiable information removed.

Figure 5 illustrates the process of ticket handling. The 1st line support employees normally view every ticket created and add information to all required fields. They may contact the customer for additional information or clarification, at this or any later point in the process. When the 1st line support employee decides they are able to solve the issue, they assign the ticket to themselves and attempt to solve it as soon as they can. It is possible for two employees to open the same ticket simultaneously. In these cases only one assign attempt succeeds. When the ticket is assigned to an employee, it is removed from the shared (1st line, global, or local) ticket queue.

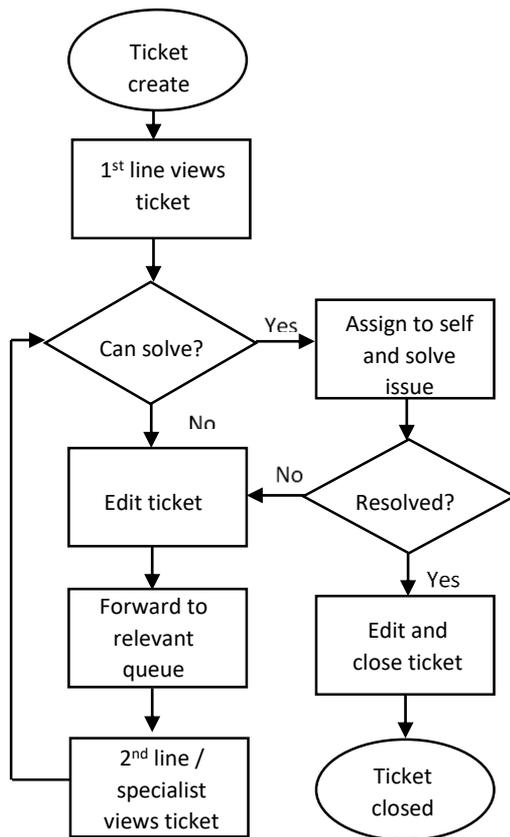


Figure 5. Simplified process of ticket handling within ITD-ERP.

If a ticket is solved quickly, the 1st line support employee adds a customer-visible resolution to the ticket and closes it. If the issue isn't solved quickly or requires specialist knowledge or local assistance, they set the ticket unassigned, write down the work they have done toward solving the issue, and finally forward the ticket to the correct queue. The 2nd line and specialists, upon taking or receiving tickets from their assigned queues also assess the issue and its solvability before assigning the ticket for themselves and attempting to solve it. There is a risk of a ticket being caught in a loop and being forwarded to other queues if no-one is able to resolve the issue. This is where management may step in to ensure the resolution of the issue.

In the simplest and perhaps most common scenario, only the 1st line employee and the customer are directly involved in the ticket handling. More complicated tickets require more people, assistance, and communication between individuals or groups of people.

When a new ticket is created using the customer portal, many fields in the ticket are pre-filled according to customer selections. The correctness of these fields needs to be checked by IT support when they receive the ticket. Tickets automatically created from customer emails have fewer pre-filled fields, and most of the information is copied directly from the free-form email message. Any non-English text is automatically

translated using Google Translate and added into the text field under the original message.

Tickets created by IT support are filled during or after contact with the customer. Figure 6 shows a new ticket with only a few automatically pre-filled fields. Fields marked by an asterisk are required, and these fields can either be filled by the customers in the customer portal or filled by IT support personnel. Each ticket includes history information and shows how the ticket was created and who have modified it and how.

The screenshot displays a web interface for creating a new ticket. At the top, there is a navigation bar with a back arrow, a hamburger menu, and the text "Incident: [redacted]". To the right of the navigation bar are several action buttons: "Submit", "Assign to me", "Resolve", "Submit to Global Desktop", and "Submit to Local Desktop".

The main form area is divided into two columns. The left column contains the following fields:

- Number: [redacted]
- * Caller: [input field with search icon]
- Location: [input field with search icon]
- Caller local time: [input field]
- * Category: [dropdown menu, value: -- None --]
- * Subcategory: [dropdown menu, value: -- None --]
- Impacted CI: [input field with search icon]
- Computer Name: [input field]
- * Impact: [dropdown menu, value: -- None --]
- * Urgency: [dropdown menu, value: -- None --]
- Priority: [dropdown menu, value: -- None --]
- * Short description: [input field with search icon]
- Technical short description: [input field]
- Short description translated: [input field]
- Description: [rich text editor with toolbar containing bold, italic, underline, link, unlink, list, and other icons]
- Description translated: [input field]

The right column contains the following fields:

- Opened: [input field, value: 2018-02-16 09:04:14]
- Opened by: [input field, value: [redacted]]
- State: [dropdown menu, value: New]
- Ticket Type: [dropdown menu, value: Incident]
- * Contact type: [dropdown menu, value: -- None --]
- Assignment group: [input field with search icon]
- Assigned to: [input field with search icon]
- Parent Incident: [input field with search icon]
- Child Incidents: [input field, value: 0]

Below the form is a "Notes" section. It includes:

- Watch list: [lock icon] [edit icon]
- Work notes list: [lock icon] [edit icon]
- Additional comments (Customer visible): [input field]
- Work notes: [input field with a yellow background]

Figure 6. New (empty) ticket in the ITD-ERP.

In each ticket, there are some fields that need to be set manually, which requires understanding of the scope, severity and possible resolution of the issue. IT support personnel may also have other, external information available that affects the handling of the ticket. For example, a large-scale issue that elicits several contacts from the customers doesn't require analyzing and editing each ticket separately. Therefore, members of the IT support should have constant dialogue with their colleagues.

ITD-ERP received a new messaging feature during the time this study was performed. It was tested by the employees, but not taken into wider use. External messaging software are used for communication. Several communication channels are available and they are used for different types of communication.

3.3. Research Questions, Methods, and Phases

The aim of the present study is to seek a better understanding of the contextual elements and their effect on software usability. Although we only consider one specific organizational context, we believe the results complement the existing research in the field. It is hoped that the conclusions of the study give insight into the multiple factors affecting the use of ERP systems and similar organizational software.

We introduce the research questions in Subsection 3.3.1. Subsection 3.3.2 gives an overview of the research methods. These are considered in more detail in Subsection 3.3.3, which also covers the phases of the research process. Subsection 3.3.4 introduces the steps used in data analysis.

3.3.1 Research Questions

We define the following three research questions.

Q1. How does the multicultural, non-collocated organizational setting affect the usability of the ERP system?

This is the main research question. In order to answer it, we have studied the usability of the system and the different contextual elements present during the use of the system. This is performed using multiple methods to ensure the validity of the results. The methods chosen are questionnaire, in-situ observation and semi-structured interviews. The observations are analyzed using Hertzum's images of usability.

By looking at the use situation from various perspectives, the aim is to be able to take more contextual elements into consideration and understand their effect on the perceived usability of the ERP system. Answering this question provides new empirical information of the effects of contextual factors into usability, which can also be used by organizations to improve the usability and user experience of their ERP systems.

Q2. How do Hertzum's images of usability work in usability analysis?

This secondary research question assesses the validity of the images as a research method. By using the images in an empirical study, we attempt to understand their usefulness in usability studies. We aim to discover whether the method offers any insights, perspectives or observations on the usability of the system. The method is assessed throughout the usability study process. The validation of the method may benefit future context-inclusive usability research.

Q3. What is the dominant image in the multicultural, non-collocated organizational setting?

This third and final research question may provide information on the dominance of certain elements to usability. These results may, to some extent, be extended to other similar organizations and can therefore be of use to other organizations either using or thinking of incorporating an ERP system.

3.3.2 Overview of Research Methods

The research was performed as a single-case study to understand the context of use of the ERP system, ITD-ERP. The study was performed in a large organization with global standing and an internal IT department. Case studies have been criticized for resulting in possibly biased conclusions [Yin, 1994], and this has been acknowledged when gathering, analyzing and reporting the results.

Throughout the research we had access to much of the organization's internal documentation and software, as well as physical access to an office with several IT support personnel. This easy access to information was essential when gathering background information about the organization, the IT department, and their use of the ERP system. Being familiar with the IT support has enabled us to observe their work without interference, albeit only in one location.

Multiple methods were chosen because they are believed to reveal more than one method alone, and to gain a better understanding of the usability of the system. Traditional usability analysis methods, such as think-aloud or heuristic evaluations, "*address only a subset of usability*" [Hertzum, 2010], and would therefore not have sufficed in our study.

It was found that in order to analyze usability from multiple different viewpoints needed in Hertzum's method of usability analysis, a lot more data was required than would have sufficed for a basic usability study. The use of multiple methods together was intended to help us appreciate the contextual factors and become sensitized to the use

situation. Hertzum intended his method of usability analysis to be a “*sensitizing concept*” [Hertzum, 2018], that would allow a more context-sensitive view into usability than in more traditional usability studies.

Recent research on usability and user experience evaluation has provided support for the use of multiple methods. The literature review by Robinson et al. [2017] found that mixed method (the use of both quantitative and qualitative methods on the same group of users) was used in over 40 % of recent studies, while Pettersson et al. [2018] found in their literature review that more than two thirds of the studies from recent years included several research methods.

We expected observation to provide most information about the situation in which ITD-ERP is used by the IT support personnel. Questionnaires were used to help reveal general attitudes toward the system and understand how the users perceive organizational rules and norms to affect the use of the system. Open-ended questions of the questionnaire were hoped to provide information about the biggest issues the users are facing with the system. Semi-structured interviews were used to deepen our understanding of the use of ITD-ERP and focus on specific aspects of its use (particularly its collaborative use, cultural differences, and the effect of organizational rules and norms, as suggested by the images of usability research framework).

3.3.3 Phases of Research and Data Collection Methods Applied

The first phase of the research, conducted from February to May 2018, included background research, an online survey and live observation. The second phase, conducted in June and July 2018, consisted of gathering data from the ERP system itself, and conducting interviews based on data gained in the first phase of research.

In the third and final phase, all data was combined and the results were analyzed using Hertzum’s method of usability analysis (see Figure 2). The usefulness of Hertzum’s method was considered throughout the study and analyzed at the end of the research.

Survey

As standardized questionnaires are considered more reliable than ad hoc questionnaires [Lewis, 2014], we chose to base our questionnaire on one of the available questionnaires. The USE questionnaire was chosen because it was comprehensive in considering multiple attributes of usability. It had also been designed to be easily understandable and general [Lund, 2001], which suited our needs.

Other questionnaires, such as the System Usability Scale (SUS), were also considered. Although SUS is one of the most widely used standardized usability questionnaires

[Lewis, 2014], we did not consider it sufficient as it concentrates mainly on ease of use. It also had some questions not suited for our target group.

Our survey, shown in Table 6, was based on the USE questionnaire by Lund [2001] (introduced in Table 4) and modified to suit our needs. The questionnaire, included as an anonymized version in Appendix A, was used to gather both qualitative and quantitative data. It was composed of basic demographic information, usability ratings, and six open-ended questions as well as a free-form comment field. The basic demographics were designed to ensure the anonymity of the respondents.

The basic demographics were age, gender, nationality, native language(s), country of employment, and service level (job title). We also asked the number of IT support personnel in their office, whether the employees had been working at ITD before or after ITD-ERP was introduced, and how much time they spend daily using ITD-ERP (see Appendix A). The usability rating statements are detailed in Table 6.

Usefulness		Ease of Use	
1 ITD-ERP helps me be more productive		9 ITD-ERP is easy to use	
2 ITD-ERP is useful		10 ITD-ERP requires the fewest steps possible to accomplish what I want to do with it	
3 ITD-ERP makes the things I want to accomplish easier to get done		11 ITD-ERP is flexible	
4 It saves me time when I use ITD-ERP		12 I can use ITD-ERP without written instructions	
5 ITD-ERP meets my needs		13 I can recover from mistakes quickly and easily in ITD-ERP	
Satisfaction		Ease of Learning	
6 I am satisfied with ITD-ERP		14 I learned to use ITD-ERP quickly	
7 ITD-ERP works the way I want it to work		15 I easily remember how to use ITD-ERP	
8 ITD-ERP is pleasant to use			
Collaboration			
16 I use ITD-ERP to find and share knowledge			
17 I use ITD-ERP to communicate ticket-related information to my customers			
18 ITD-ERP is the best way for communicating ticket-related information to my customers			
19 I use ITD-ERP to communicate ticket-related information to my colleagues			
20 ITD-ERP is the best way for communicating ticket-related information to my colleagues			
21 ITD-ERP makes it possible for me to work together with my colleagues			
Organizational Use			
22 ITD-ERP makes it easy to divide work			
23 ITD-ERP enables everyone to do an equal amount of work			
24 ITD-ERP helps the IT organization be more productive			
25 The IT organization supports and encourages me to collaborate through ITD-ERP			
26 The IT organization supports and encourages me to share knowledge through ITD-ERP			
27 I find it easy to follow the IT organization's rules and regulations regarding the use of ITD-ERP			
Ticket Language			
28 I check the original language of the tickets before selecting them from the queue			

Table 6. Modified usability ratings partly based on USE questionnaire.

Lund [2001] suggested that the USE questionnaire could be shortened by using only three or four of the more essential statements from each category. We held on to the categorization of usefulness, satisfaction, ease of use, and ease of learning while reducing

the number of statements from the original thirty to fifteen. This was done to comply with the time limitations of the respondents, who were answering the questionnaire during their work hours, and to ensure a maximal number of respondents.

Only two questions were left in ease of learning, because it was considered less important in an organizational system. This enabled us to focus on the three essential categories.

Some statements originally in the USE questionnaire (see Table 4) were left out for being similar with each other. For example, statement 1 was left out and statement 2 included, because of the words “*effective*” and “*productive*” used in the two statements. The words were not considered distinct enough to be used in a survey where most of the respondents have a native language other than English. Statements 13 and 14 in Table 4, on the other hand, were not considered necessary for a system the use of which is mandated.

All statements were modified to use the name of the system (ITD-ERP, as shown in Table 6). Statement 13 in Table 6 was changed to include the name of the system in order to make it unambiguous.

Usability studies often omit the effects of collaboration [Hertzum, 2010]. We wanted to use the survey as a means of gathering information about the alignment of the system into the organizational practices as well as its use in collaboration. Therefore we created categories for collaboration and organizational use, and designed additional statements to gather this information. The responses to these categories were treated separately from the usability categories based on the USE questionnaire.

Statement 28 in Table 6, about checking the language of the ticket, was added to discover whether the respondents had any preference about handling tickets in their native language. Although combined with statements for organizational use in the original questionnaire (Appendix A), it was treated as a separate statement during the analysis of the results.

These modifications were done to include aspects from different images of usability into the survey. While the modified USE questionnaire is best suited for discovering perceived usability of the system, the satisfaction attribute relates to hedonic usability and the categories of organizational use and collaboration add aspects of organizational usability into the questionnaire. The demographic information asked in the questionnaire was used to scope aspects of cultural as well as situational usability.

The USE questionnaire was originally intended for a seven-point Likert rating scale, but this was reduced to five in our survey. A 5-point scale was seen to provide enough options for the participants to state their opinion, while keeping the questionnaire simple and quick to fill.

All IT personnel involved in ticket handling (IT support, specialists and global business application specialists) were sent a link to the survey along with an introduction to the study and the purpose of the survey. They were also informed that participation was voluntary and all their responses would be anonymous and treated as confidential material. The questionnaire platform was E-lomake (<https://elomake.uta.fi/lomake>).

The original response rate for the questionnaire was around 20%. We extended the deadline and sent the employees several encouragements to participate. This helped the response rate to rise to nearly 30%. The questionnaire respondents are later referred to as P_n , where n is the identifying number for each respondent.

Observation

The IT support personnel working in one office were observed during their work. The setting included four IT support personnel working in one shared office within the premises of one of the organization's offices. Direct observation was seen as viable method to gain insight into the IT support work.

In observation we focused on the frequency and effects of walk-in customers or colleagues, and the frequency of local collaboration and vocal communication of the IT support personnel. The observation was conducted at different times of the day on different days over several weeks. This allowed us to get a picture of the support work as well as changes in the workflow and their effect on communication. Observation in multiple offices and countries was not possible with the resources available for this study.

Semi-structured Interviews

Five members of the IT support personnel, representing different cultural and national backgrounds, were asked to participate in short, semi-structured interviews taking place in July 2018. Four interviewees were chosen randomly from volunteers from different countries, while one was chosen by their team leader. One of the interviewees was a woman and four were men. Two had been working at the organization before the launch of ITD-ERP, while three had started after it was already in use.

One of the interviews was possible to conduct face-to-face, while others were conducted through video calls using Skype for Business. Four of the interviews were conducted with the participant sitting at or near their personal workstation. This enabled us to observe their work environment during the interview. The video call also enabled one interviewee to share their desktop view and illustrate the points they made about the system.

The frame of the interview (shown in full in Appendix B) was based in part on the answers received from the survey and the insights gained during the observation of the

work. The main questions are shown in Table 7. Supplementary questions (see Appendix B) were used where necessary to encourage the interviewees to answer in more detail. The interview participants are later referred to as I_n , where n is the identifying number for the participant.

1. What do you think about ITD-ERP in general?
2. Does ITD-ERP enable you to work in a way that you enjoy?
3. In what kind of environment do you normally use ITD-ERP?
4. How much do you collaborate with your colleagues?
5. What kind of things most affect the way you handle tickets?
6. Do you experience a sense of urgency in your work?
7. Do you keep aware of what is happening in the global IT support?
8. How do you think IT being global affects your work in ITD-ERP?

Table 7. Main questions for the semi-structured interviews.

Data Collection

In addition to the other methods used, data was also collected from within the organization and the ERP system itself. We gathered information from employees and management in ITD by asking questions and conducting informal interviews about the specifics of the system. The organization also provided statistics and charts about the ERP system and the organizational structure.

We assessed and tested some system qualities and functionalities, performing as an expert evaluator. This was done to validate the findings brought up by the survey and interview participants.

3.3.4 Steps in Analysis

A statistical analysis was conducted at the group level. We considered the usability of ITD-ERP for differently formed groups, based on qualities such as nationality, gender and age. We acknowledge the effects of the system usability on individual employees, and believe that these effects carry over from the individual level all the way to the organizational level.

Individual opinions are portrayed in the interview results. Although we considered only the IT support personnel, it is our hope that the results from the study will be applicable on all organizational levels, portraying the general usability of the system.

We have collected both qualitative and quantitative data using several methods. This triangulation helps validate the results and add to their credibility [Roberts et al., 2006].

Quantitative Data

Quantitative data was gathered first, using the questionnaire. The survey response rate was around 30% and the total number of respondents (n) was 50. The responses were converted from the Likert scale to a numeric scale. This was done by assigning each rating a numeric value, as shown in Table 8.

Rating	
Strongly disagree	1
Disagree	2
Neither disagree or agree	3
Agree	4
Strongly agree	5

Table 8. Conversion of the Likert scale to numeric values.

The converted Likert scale ratings are ordinal numbers, so their difference may not correspond with the difference of the attributes they represent [Lewis, 2014]. While this prevents measuring the quantitative difference between two ratings, we may still use the mean values to detect that differences exist. To calculate the median (respectively mean) score for each usability attribute and for each set group, we took the median (mean) score of all the responses within the category by a respondent, and chose the median (mean) value of these individual scores.

Due to the small sample size in our survey, we used mainly descriptive statistics. Pearson's chi-squared test was used to indicate the asymptotic significance (p) of the association between a certain attribute of the respondents and their responses to the usability statements, but the sample sizes are too small to consider these tests fully reliable. The chi-squared test results were complemented by showing the distribution of the responses where appropriate.

We used SPSS to assess the reliability and validity of our data. Cronbach's alpha coefficient is a classical way to determine the reliability of a questionnaire, with 80–90% reliability recommended for most studies [Roberts et al., 2006]. We calculated Cronbach's alpha for all our usability statements (including collaboration and organizational use), receiving an average score of 0,968. Considering only the statements under the categories based on the USE questionnaire, the reliability was slightly lower, 0,958.

The distribution of data was visualized using boxplots, while radar charts (spider charts) were used to visualize differences found in the results. Radar charts were based on the mean score of each usability attribute within each chosen group.

Qualitative Data

Open-ended questions in the survey and the interviews were designed to provide qualitative data about the system, by allowing the respondents to voice their concerns and opinions freely and choose which aspect of the system or its use to write about. We also added an open question for any free comments the respondents might want to add. This was done to avoid directing or confining the respondents to only answer our questions and leave any unrelated grievances or praises unstated.

There were five interviewees, who were chosen from among the same group of people who received the invitation to participate in the survey. The results from the interviews and the open-ended questions of the survey were analyzed to discover any recurring issues. We collected all responses that fell under the discovered themes, and chose quotes representative of the general view or opposing views of each issue. The quotes are written in verbatim, except spelling errors have been corrected. Clarifications are indicated with square brackets.

4. Usability Through the Images

To answer the main research question, we viewed the use situation within the specified context to understand how attributes like distance collaboration, cultural differences, and organizational norms and regulations affect the usability of the ITD-ERP. Looking at the usability of the system through each of the six separate images allowed us to focus on one viewpoint at a time, and explore its attributes and their effects on usability.

Sections 4.1 through 4.6 present the analysis based on the images of usability. Each section opens with a consideration of the relevance of a particular image to the present study, and continues with analysis of the results and comparison to the theoretical framework.

4.1. Universal Usability

ITD-ERP is intended for organizational use by a specified group of employees. Hertzum [2010] considers universal usability to aim for systems that are “*as varied as humans are diverse*”. ITD-ERP is used by all IT personnel within the organization. While they may differ in age, education, and other personal attributes, they share the same specialized knowledge and have access to similar technology. Therefore, the variability is much smaller than it would be in a universally usable system. This still leaves many groups of users, from managers and developers to IT support and specialists, who each have different needs for the system.

Figure 7 shows a boxplot with the daily average worktime spent using ITD-ERP for both IT support personnel and specialists. A boxplot describes the distribution of the answers for this question. The border between the boxes shows the median value, while the upper and lower boxes portray the interquartile range. Whiskers show the upper and lower quartiles of the data, and the mean is shown as a dot.

From Figure 7, we observe that IT support personnel spend significantly more time using the ITD-ERP than specialists. Being frequent users of the system, they have less need for instructions or visual signs within ITD-ERP, while infrequent users and infrequent tasks require more help. I3, a member of the IT support group, referred to it as “*very high level*” and “*not an easy tool at all*”.

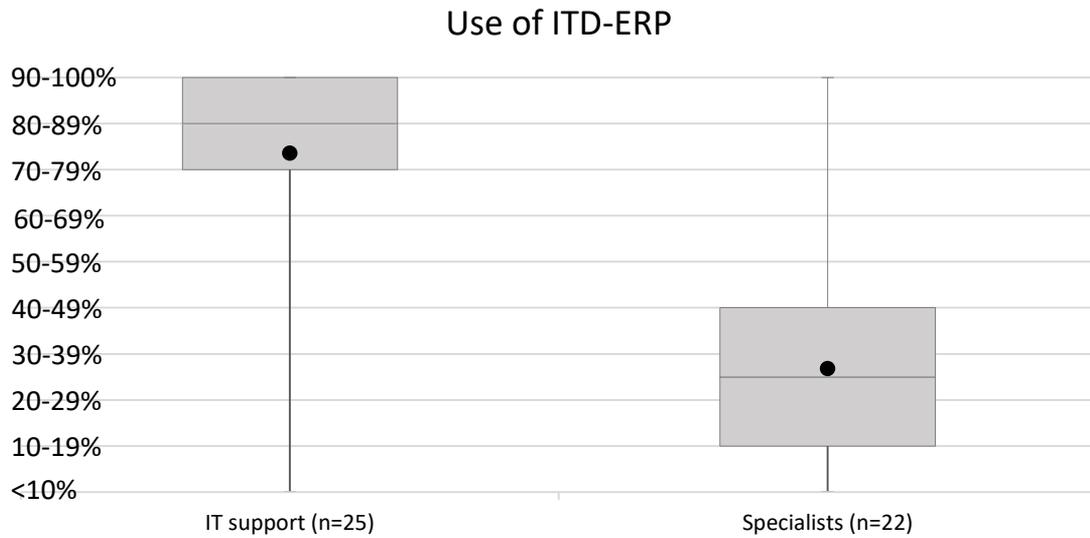


Figure 7. Boxplot of the percentual worktime spent using ITD-ERP.

We found that specialists rated the usability of ITD-ERP lower on all metrics when compared to IT support personnel (see Figure 8). Pearson's chi-squared test gives all four usability attributes and work position a low asymptotic significance ($p < 0,003$), suggesting a significant association between work position and perceived usability. Specialists work on tickets requiring special knowledge, but much of their work happens outside ITD-ERP and their use of the system is more infrequent.

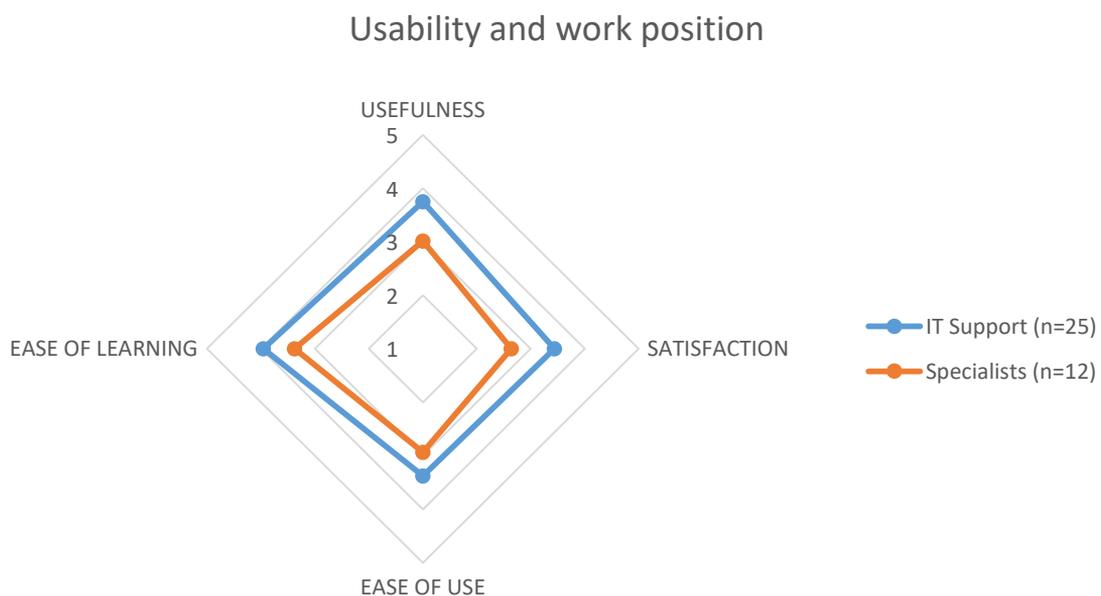


Figure 8. Usability metrics according to work position.

Our survey results suggest that the amount of time spent using ITD-ERP is one of the most significant attributes affecting its usability. Users who spend less than 50% of their workday using ITD-ERP find it less usable on all metrics than those spending over half their workday with the system (see Figure 9). Pearson's chi-squared test gave $p < 0,003$ for usefulness, satisfaction, and ease of use. For ease of learning, $p = 0,040$.

This may well explain the lower ratings of the specialists. ERP systems are complex by nature, supporting multiple tasks and functions and having a steep learning curve. Unless users have been accustomed to the system through continued use, they may perceive the system's usability more negatively.

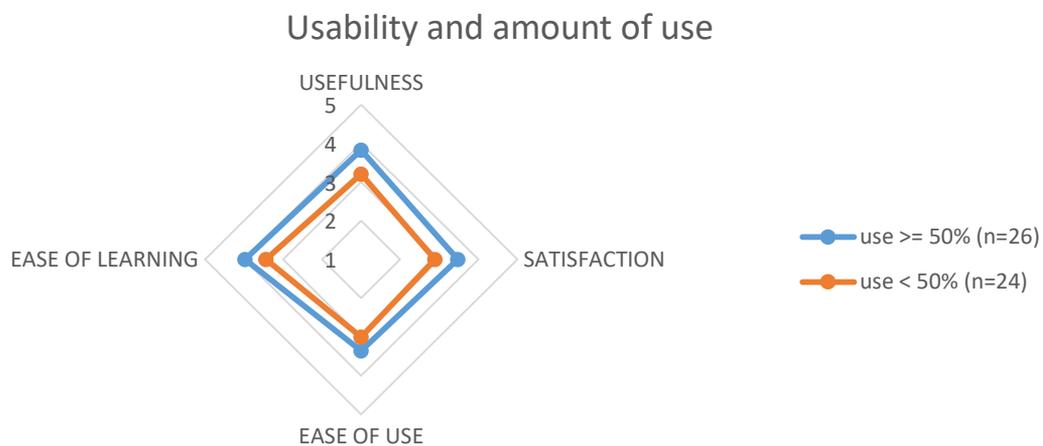


Figure 9. Amount of ERP use and its effect on perceived usability.

Frequency of use is only one of the many variables of user diversity. We also looked at the effects of age and gender on usability. Gender appeared to have little effect on how the users perceived the usability of ITD-ERP (see Figure 10). When looking at the distribution of the scores for individual statements, however, we discovered that male respondents were more likely to give a rating of 4 (or "Agree") in any category, whereas ratings by female respondents were more equally distributed. This explains the results from Pearson's chi-squared tests, which gave $p = 0,013$ for usefulness, $p = 0,130$ for satisfaction, $p = 0,426$ for ease of use, and $p = 0,003$ for ease of learning. For ease of learning, 66,7% of male respondents agreed with either or both of the statements, while responses other than "Agree" had a distribution similar to that of the responses by the female respondents.

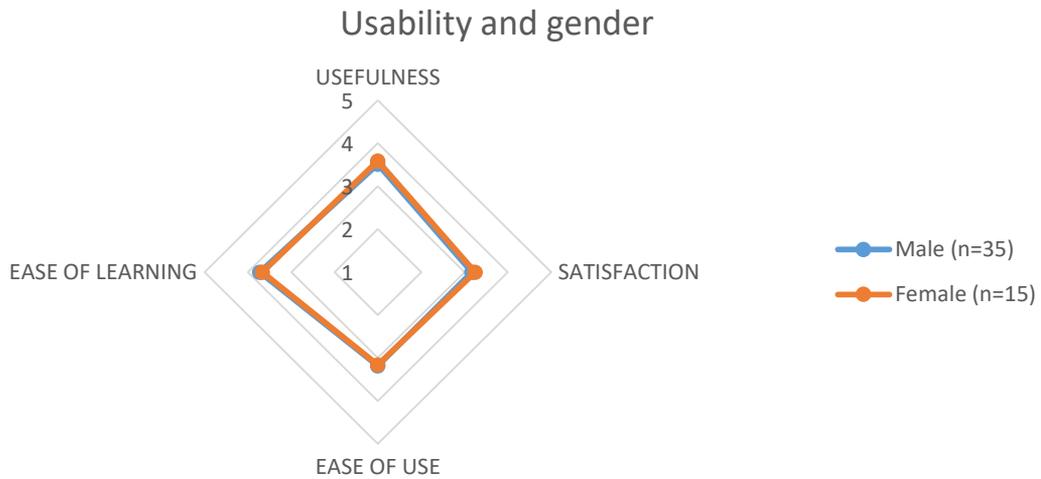


Figure 10. Gender and its effect on usability.

Age had only slight effect on perceived usability, as can be seen in Figure 11. The youngest user segment rated ease of learning a little higher than other age groups, with $p = 0,001$. Of the youngest user segment, 33,3% gave a rating of 5 (or “Strongly agree”) on either or both of the questions under ease of learning, whereas none of the respondents aged 40 or above gave the highest rating.

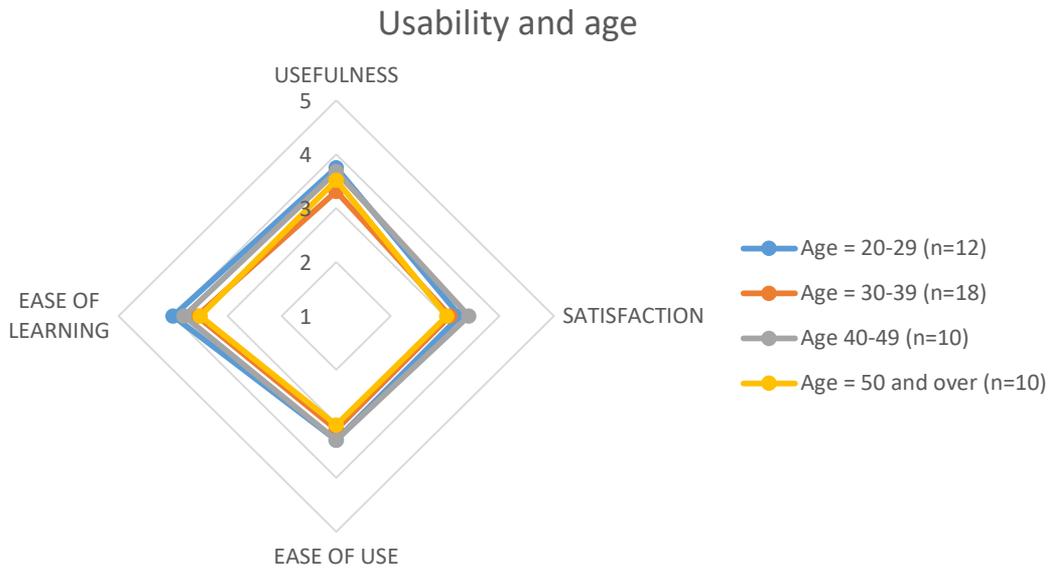


Figure 11. Age and its effect on perceived usability.

In addition to user diversity, writings on universal usability acknowledge two other challenges: knowledge gaps and technology variety [Hertzum, 2010]. Technology variety was not seen as an issue within the organization, as similar software and hardware are used in all countries.

Knowledge gaps may be caused by various reasons, such as organizational practices (different groups of employees entitled to different knowledge) or the use of different jargon. This latter issue was discovered in the survey results. IT support personnel need to assign categories for each ticket according to the type of the issue, but the categories have been set by designers or management. Four people (out of 25 survey participants who answered the open-ended questions) found the categories difficult to understand and use. *“Categories and subcategories are set up by people who don't actually work in IT support, so they make no sense to us who have to use them”* (P7).

4.2. Situational Usability

Situational usability considers usability to consist of the entire use situation. It is a key factor affecting the use of ITD-ERP, because the ERP system is used in the workplace alongside other daily activities in the office. As seen earlier in Figure 1, the tasks, tools, and users are all interrelated. These factors, as well as the changes in the overall context of use all affect the usability of the system for each specific user and use situation.

During our observation periods, we noticed that whenever a colleague walked in, everyone in the office joined in the conversation. Walk-in customers were also helped in unison and their issues discussed together. If their issue was straightforward (borrowing a headset, for example), the nearest or the first available IT support member assisted them. All external people entering the IT support room had a similar effect, and personnel offered their contribution to the discussion even when they appeared busy with other tasks.

Some of the factors of the use situation became apparent even during the interviews. One interview was interrupted by a walk-in customer, whom the interviewee promptly sent away by letting them know they were in the middle of a video call. Another interview was postponed, because the interviewee was working on two tickets simultaneously and had a remote access to both customers' computers. I3 estimated that half of his tickets come from customers contacting them directly, either by walking in their office, calling, or sending an IM message or email.

IT support work has a lot of temporal and situational fluctuation. Certain days of the month and week as well as certain times of the day are busier than others. Any changes related to the IT environment within the organization are also likely to elicit many new tickets and more work for the IT support personnel. This was seen when setting up the

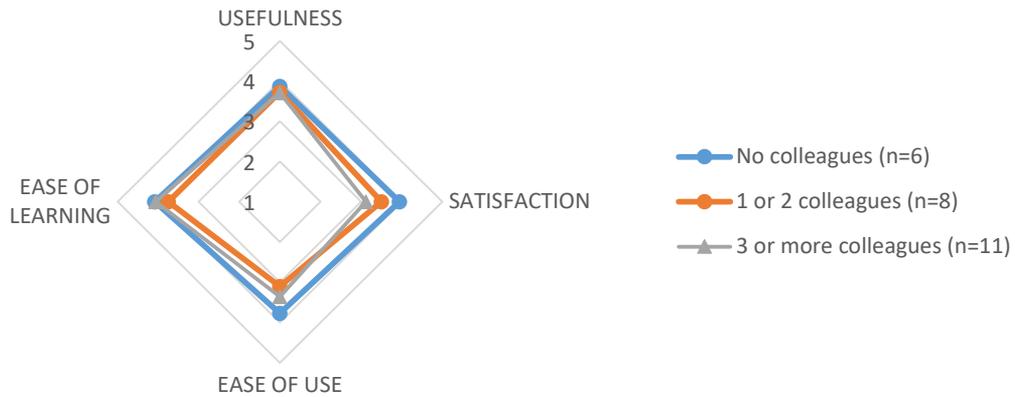
interviews: we were unable to get an interview from one office due to their busy work situation, which was caused by many of the employees being on a summer holiday as well as many local tickets assigned for their country. I4 told that they had recently received a lot of tickets in a short period of time, and considered the situation caused by it “*unprecedented for us*”.

Although all ITD employees work for the same organization in an office environment and use similar technologies, many differences still exist. In one office, all personnel work in an open plan office with people from other departments working alongside them, while others work in shared offices with other IT personnel, or alone in their personal office. The number of co-present colleagues seems to affect the IT support personnel’s satisfaction in ITD-ERP and its perceived ease of use.

Those working alone are more satisfied with ITD-ERP than those sharing their office with coworkers (see Figure 12). Although Pearson’s chi-squared test gives $p = 0,098$, which is higher than the commonly used threshold of 0,05, the distribution chart still indicates that people with more coworkers tend to disagree more with the statements, whereas those working alone are more likely to agree with the statements.

This could be the result of differences in individual work habits. For example, people react to disturbances differently; having coworkers share the same space requires everyone to accustomize to a similar way of working and communicating, which in turn may affect the perceived usability of ITD-ERP. On the other hand, this could also be attributed to coworkers’ influence on each other’s opinions. Wilkerson and Evans [2008] found badmouthing behavior between close colleagues to influence their cynicism toward the organization and its processes.

Usability and the number of colleagues in the same office (IT support)



Satisfaction and the number of colleagues in the same office (IT support), (%)

	No colleagues	1 or 2 colleagues	3 or more colleagues
Strongly agree	15,8	12,5	0,0
Agree	57,9	41,7	45,2
Neither disagree or agree	26,3	33,3	29,0
Disagree	0,0	12,5	25,8
Strongly disagree	0,0	0,0	0,0

Figure 12. The effect of the number of colleagues within the same office. *Top:* Mean scores for the usability attributes from each group. *Bottom:* Percentage of ratings given by each group.

4.3. Perceived Usability

Perceived usability is the result of the organizational rules and regulations, situational and cultural attributes, and the current mindset of the user [Hertzum, 2010]. Therefore, it is considered throughout the study within the other images of usability.

Perceived usability differs from person to person. For example, when asked to describe a situation where ITD-ERP has served them well, P34 answered “*When I have resolved an incident and the user has been happy with what was done*”, while P11 valued its ability “*to keep track on my tickets and worklog*”.

Usability survey results can be seen to portray perceived usability. In Figure 13, we show boxplots for ITD-ERP’s perceived usefulness, ease of use, and satisfaction. The fourth category, ease of learning, had two statements; “*I learned to use ITD-ERP quickly*” and “*I easily remember how to use ITD-ERP*”. Both statements resulted in the same interquartile range from 3 to 4, which is why they are omitted from Figure 13.

Looking at the results by category, we observe that most users agreed ITD-ERP to be useful and its interquartile range collapsed to the value 4, with 68% of the respondents agreeing and 18% strongly agreeing with the statement.

The ease of use of the ITD-ERP received lower ratings. None of the 48 respondents who responded to the ease of use statements strongly agreed ITD-ERP to require the fewest steps possible to achieve what they want to do with it. 37,5% agreed with the statement, while 31,3% either disagreed or strongly disagreed.

When asked whether ITD-ERP enables them to work the way they want to, 42% either agreed or strongly agreed, while 28% disagreed or strongly disagreed with the statement.

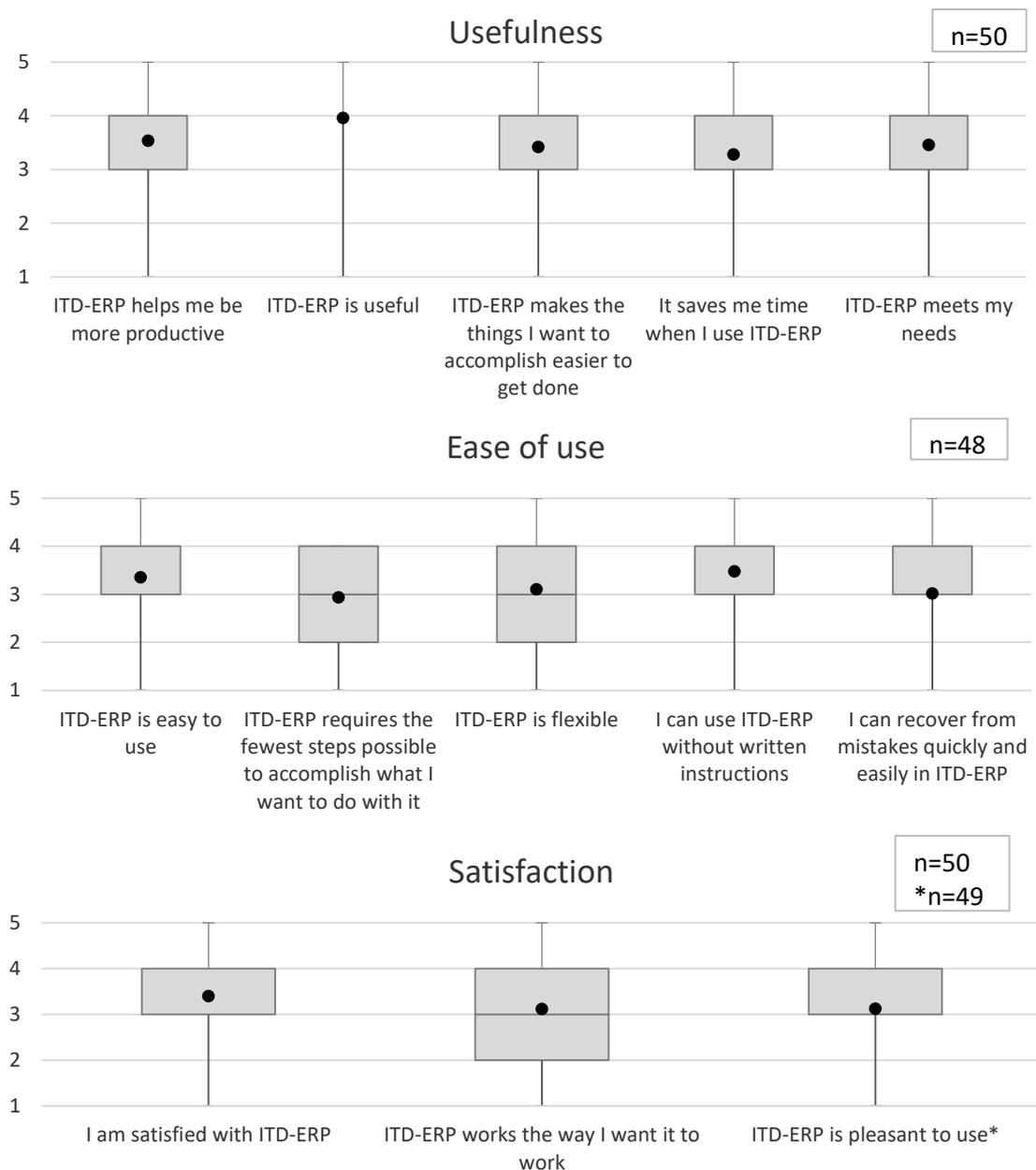


Figure 13. Survey results on general usability shown in boxplots.

The results show the respondents divided into three roughly equally sized groups taking either a positive, neutral, or negative stance on many usability considerations. Looking at all the results, the interquartile ranges tend to be toward the positive than the negative. While this may amount to more than a third of the personnel perceiving the usability of ITD-ERP positively, focusing on the issues noted by those taking the neutral view can help increase the usability and the number of satisfied users. Those users who do not already consider the usability of the system in a negative light are easier to bring to think positively about the system.

4.4. Hedonic Usability

Hedonic usability emphasizes user's pleasure in using the system. In ITD, ITD-ERP is used because it is a worktool and its use is mandatory for the IT support personnel (but not to the customers). While personal pleasure in using the system may not be necessary to ensure the continued use of ITD-ERP, it should not be completely overlooked. Positive (and negative) emotions influence the way IT support personnel assess and use the system as well as affect their job satisfaction.

Hedonic usability considers the level of an individual, whereas we consider usability at the group level. We believe, however, that individual pleasure in using ITD-ERP will be visible even at the group level.

Interviews have been suggested as a means to get to the underlying reasons for personal pleasure elicited by a system [Hertzum, 2010]. When asked if ITD-ERP enabled them to work in a way they enjoy, the interviewees responded mainly positively. I4 was *"Largely happy with it"* and I5 said that *"Personally, I like the tool"*. I1 told having accepted the system but didn't connect it with enjoyment. I3 saw the system's potential but felt like it does not offer the best it can: *"[ITD-ERP] would be able to handle anything, but it needs to be set up that way"*.

ITD-ERP and the organizational processes and rules around it define the ways of working with the system, leaving employees with little freedom to choose their own ways of working. This may have a negative effect on the psychological feeling of pleasure in using the system. P26 considered it to be *"a huge bureaucratic [...] game that I have to play to be able to do my job"* and a *"barrier between me and my actual work"*.

While the means of handling tickets and organizing work are dictated by the organization, personnel have more freedom in the way they solve tickets. For example, the method of contacting the customer can be freely chosen according to personal preference. ITD-ERP offers some opportunities for self-expression and personal preferences in free-form text fields.

Considering physical pleasure, the aesthetic outlook of ITD-ERP was criticized by two questionnaire participants. P3 considered the interface “*quite messy*” while P7 saw it to be very old-fashioned. Overall, very few comments were made about any visual aspects of the system.

4.5. Organizational Usability

Organizational usability considers collaboration as well as the alignment of ITD-ERP and the organization, which includes the personnel, organizational structure, norms and rules, as well as the technical environment within ITD. Organizational usability encourages to either “*accommodate to people’s mix of skills, work practices, and resources, or to try to systematically alter them*” [Kling et al., 1996].

The responses to all statements under the organizational use section of the questionnaire are shown in Figure 14.

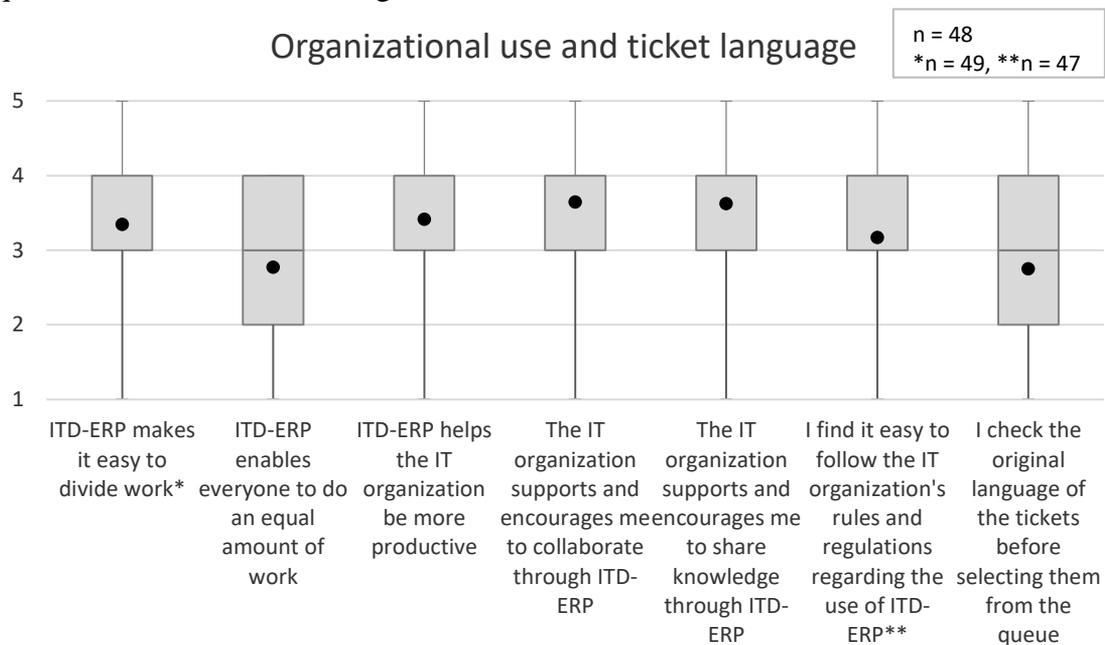


Figure 14. Boxplot for the organizational use section of the questionnaire.

4.5.1 Collaboration

The omission of users’ collaboration from traditional views of usability has been regarded as a shortcoming [Hertzum, 2010]. We have considered collaboration through the three elements introduced in Table 2; coordination, awareness, and common ground.

Coordination

With use of ITD-ERP, the individual focus is often on each employee’s own work. The cooperative nature of the work needs to be acknowledged when employees work on tickets from the same ticket queue. Understanding that one’s personal workload and work

efforts are in relation to their colleagues is imperative for understanding and working collectively toward the organization's larger goals. This may be easy to omit in ITD, where the focus is on personal ticket handling times and volumes instead of emphasizing the organization-level goals. Organizational goals are often known only by those with higher positions within the organization, such as ticket line managers or other superiors. The organization has an important role in supporting distance collaboration and the formation of a culture of collaboration [Olson and Olson, 2014].

Distance has a negative effect on informal communication, which affects the distribution of tacit, local knowledge. It affects the awareness about remote teams' work, and thus harms the trust between distant teams. This may have a negative effect on both actual and perceived performance of the group. [Noll et al., 2010.] Distant teams and colleagues are seen as less capable and reliable [Herbsleb et al., 2000; Olson and Olson, 2000].

When asking if ITD-ERP enabled everyone to do an equal amount of work, 14,6% of the respondents strongly disagreed with the statement. Figure 14 shows the distribution of the responses to the question. Some distrust issues were also present in the survey responses. P26 wrote that *"most people cherry pick tickets"*, while P4 stated that *"the fear of the SLA so colleagues want to move it off their desk and not accept responsibility"*.

Awareness

In the survey and interviews, many participants noted that ITD-ERP does not show presence information of colleagues and customers. IT support personnel have frequent IM communications with the people working on the same line and also across the entire ITD. Many groups, including the 1st line, also have daily or weekly informal online meetings to discuss their current work situation. They work on same ticket queues and toward the same goals, but this collaboration is not easily evident in ITD-ERP itself. As P26 stated, *"I don't see it even to have anything to do with collaboration. I'm just alone there with my tickets"*.

To know if a customer or a colleague is available requires stepping back from ITD-ERP and opening an external software to confirm their (online) presence. Several survey respondents hoped to see each other's online presence status within ITD-ERP or having an IM possibility in the system. Incorporating these kind of social awareness features into the system could help with distance collaboration and add social transparency. Social awareness can add trust between team members [Pallot et al., 2010] as well as improve their effectiveness [Gutwin and Greenberg, 1996].

When asked about their collaboration channels in the questionnaire, instant messaging software were mentioned the most often (18 times out of the 22 responses)

Email was mentioned by 9, direct phone calls by 5, and face-to-face interaction by 3 respondents.

During the later stages of the present study, some new collaborative features were implemented in ITD-ERP. For example, a field showing the local time of the customer was added in the ticket view. Tickets also received a feature to open a Skype for Business chat to the customer or the creator of the ticket. While availability information is not directly observable from ITD-ERP, this latter feature enables easier communication among colleagues.

Common Ground

IT support personnel collaborate in ITD-ERP in ticket handling and in the creation of the knowledge repository. They appear to use ITD-ERP to find and share knowledge more than specialists (see Figure 15). This was also shown in responses to the open-ended questions. Seven respondents, all support personnel, wrote about appreciating the use of ITD-ERP as an information repository.

Pearson's chi-squared test showed an asymptotic significance of $p=0,017$ for these two variables (job title and using ITD-ERP for knowledge sharing). This suggests a statistical significance.

Specialists have knowledge and access rights that allow them to perform tasks not available for the IT support personnel, so they do not have the same need to share information through the system. Orlikowski [1992] notes that the personnel of an organization that doesn't encourage collaboration may fear losing their power and control by sharing their knowledge. This could in part explain the specialists' lack of knowledge-sharing through ITD-ERP. While specialists use the system less for sharing information with their colleagues, they are nearly as likely as the support staff to use it to share information with the customers.

I use ITD-ERP to find and share knowledge (%)			
	IT SUPPORT (n=24)	SPECIALISTS (n=12)	GBA SPECIALISTS (n=10)
Strongly agree	16,7	0,0	10,0
Agree	50,0	25,0	40,0
Neither disagree or agree	25,0	8,3	30,0
Disagree	8,3	50,0	20,0
Strongly disagree	0,0	16,7	0,0

Figure 15. Questionnaire responses to the statement “I use ITD-ERP to find and share knowledge”.

An employee's input on a ticket, such as adding clearly stated and detailed information about the resolution of the issue, can help them as well as their colleagues later with a

similar issue. However, this requires trusting that others will expend the same amount of time writing down their ticket information. For ITD-ERP to properly function as an information repository, the trust issues between colleagues need to be solved.

4.5.2 Organizational Alignment

We consider the alignment of ITD-ERP into organizational practices through the four dimensions (accessibility, integrability, reliability, and social-organizational expertise) introduced in Table 1. Our survey respondents made thirteen mentions of issues regarding the alignment of the system and the organizational practices.

Accessibility

All ITD personnel have access to the system. As IT support personnel use the system as their main tool, they are more inclined to find organizational support and encouragement for its use, as shown in Figure 16. Pearson's chi-squared test gives the attributes an asymptotic significance of $p = 0,021$, suggesting a meaningful relationship between work title and the feeling of receiving support from the organization.

The IT organization supports and encourages me to share knowledge through ITD-ERP (%)			
	IT SUPPORT (n=24)	SPECIALISTS (n=12)	GBA SPECIALISTS (n=10)
Strongly agree	17,4	0,0	10,0
Agree	65,2	41,7	40,0
Neither disagree or agree	17,4	41,7	40,0
Disagree	0,0	8,3	10,0
Strongly disagree	0,0	8,3	0,0

Figure 16. Questionnaire results for the statement “*The IT organization supports and encourages me to collaborate through ITD-ERP*”.

One interviewee (I3) wished they had more access rights, so that they could calibrate ITD-ERP to their own needs. No other mentions of access rights were made in the questionnaire or interviews. While there may be some access rights issues present in ITD-ERP, they are not considered an important factor contributing to its usability.

Integrability

ITD-ERP was introduced some years ago but has undergone many changes since then, and the practices around the system are still being formed. During this study, the organizational structure of the IT support went through a change from separate 1st and 2nd line employees to everyone working both lines in rotating shifts. This would suggest that the software is not yet fully inscribed into the organization.

It is notable in the survey results that much of the critique was directed toward the fit of the system and the organizational structure, rather than the system itself. This is one of the main points in organizational usability, aligning the system into the processes that guide its use. As P2 put it, *“As it has to fit the purpose for so many, sometimes it’s maybe too much of a compromise, and that we have to adapt to the system whereas we would prefer the system as adapted to us”*. P34 wrote that *“[ITD-ERP] is a very good tool. I think [ITD] is still learning how to make best use of it”*.

One issue concerned the correct way of using ITD-ERP. For example, four survey participants and two interviewees mentioned ticket categories not matching their real needs. The other concern was about the work practices regarding ITD-ERP, such as shifting between the 1st and the 2nd lines, and working to SLAs. P23 wrote that *“We are required to perform different jobs in [ITD-ERP] on alternating days and this affects our ability to hone focus on one service discipline which hinders all disciplines in the transition between them”*. P34 wrote about SLAs that *“Sometimes these are unreasonable because of the way we handle tickets within [ITD]”*.

It can be considered an organizational coordination problem when the value of a system depends on how individuals and groups use the system together [Kling et al., 1996]. The users should be able to see the value they create when they use or add information to the system. With ITD-ERP, the tickets can be used as a reference for new similar incidents and as a global resolution database, but each member of the ITD should see the benefits and consider them worthwhile to write the resolution down clearly. It may be easier to close a solved ticket quickly, especially when there are SLAs to follow. Thus, regulations such as SLAs may work against the system becoming a valuable resolution database. There should be clear benefits or incentives for writing ticket information down in more detail.

Reliability

Reliability of ITD-ERP is crucial for the IT support personnel to handle their work tasks. Four respondents in the survey as well as one interviewee mentioned the system being slow. P17 wrote that the *“lack of speed is an irritation factor in daily use”*.

Apart from the slow response of the system, few mentions of its reliability were made in the survey. One interviewee brought up the effect of system updates on their work. I1 told that features of the software are changed, leaving them to figure out how to work with the changed system. I5 said that new features are implemented all the time, although they did not see it as an issue.

Information reliability appears to be a more significant issue than system reliability. As tickets often come directly from customers, the information they contain needs to be

validated by the IT support member who first handles the ticket. For example, I5 told that customers often create the wrong type of ticket for their issue, and the type needs to be reset manually by the IT support personnel.

There was some concern about the reliability of ticket handling by the IT support personnel. P11 considered it necessary to *“teach people how to handle tickets”*. P11 also wrote that *“since people don’t update the work log [...] I have to start troubleshooting from scratch”*. Three participants mentioned other IT support personnel forwarding tickets incorrectly, while ticket information not being updated was raised by two respondents.

Many participants considered the knowledge contained within ITD-ERP to be helpful in their work (six mentions). P23 considered it to be helpful *“When there is information in the notes related to what has already been done to resolve an issue outlined in the incident ticket”* while P18 wrote that *“if there are notes and all information marked down in the ticket, it can be used later to find solutions to same kind of issues”*.

Social-organizational expertise

Training and manuals for ITD-ERP have been provided for all IT support personnel, and instructions and reminders about its proper use are sent occasionally by email or through IM channels. New features are normally implemented without training the IT support personnel, and the use of these is learned through other means. This may lead to a situation where the new implementations are not adopted, negating the benefits of the implementation, while the users *“continue to conduct their practices outside the system”* [Sumner, 2009].

One interviewee stated that while there may be notifications about these changes, they do not read them. According to Orlikowski [1992], if *“people do not appreciate the premises and purposes of a technology they may use it in less effective ways”*. Educating the IT support personnel about the underlying reasons about ITD-ERP and its use regulations could help them appreciate the system.

With so much importance placed on ticket handling, there are no incentives to take time away from it to learn the system. Encouraging this kind of self-learning could positively influence the perceived usability of ITD-ERP.

Informal help from colleagues about the use of ITD-ERP is easily available through the various online communication channels. Some are able to reach out to local colleagues as well. I1 told that when they are working at the office, they are able to ask their colleagues for help on how to use ITD-ERP.

4.6. Cultural Usability

The IT support personnel are located apart, in different offices and countries across the globe. The organization has a strong presence in the Nordic countries and most of the IT support personnel work locally in their native country, which results in a majority of support personnel having a Nordic cultural background. In our survey responses, Asia, Europe, Middle East, and North America were also represented. ITD staff have been arranged one global get-together, where cultural differences, cultural education and group bonding were the main topics.

Cultural usability considers the match between the ITD-ERP and the various cultural backgrounds of the IT support personnel. Usability may be perceived differently according to cultural preferences [Frandsen-Thorlacius et al., 2009]. Although the same interface of ITD-ERP is used globally, IT support personnel may consider its usability differently according to their cultural background. This may help understand why Nordic respondents rated the usability of ITD-ERP lower than other Europeans or Asians (see Figure 17). Pearson's chi-squared test gave usefulness, satisfaction and ease of use $p < 0,001$ and ease of learning $p = 0,021$.

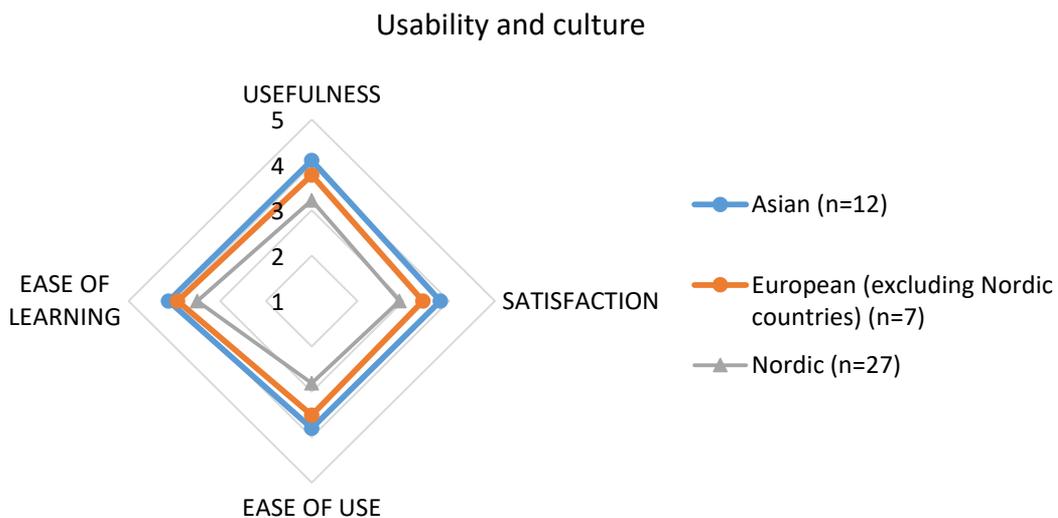


Figure 17. Effects of cultural background on usability.

The use of ITD-ERP is mandated and there are regulations and rules that affect the way tickets must be handled. The Nordic countries are characterized by low power distance, femininity, and individualism [Hofstede et al., 2010]. These characteristics do not follow the goal-oriented, authoritarian way of working required in ITD-ERP. As can be seen in Figure 18, Asian respondents gave the highest ratings whereas the lowest ratings were given by Nordic respondents. The proximity of the mean and the median as well as a

small interquartile range and short whiskers in the boxplots for Asian and European respondents suggests that they share a similar view of the usability of ITD-ERP. Nordic responses have more variability.

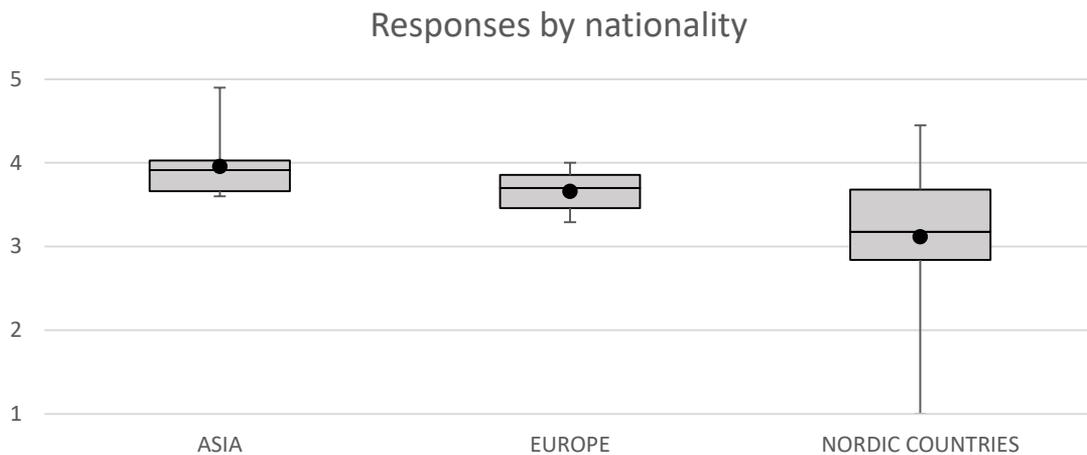


Figure 18. Responses by nationality, summarized over usefulness, satisfaction, ease of use, and ease of learning.

One of the most visible characteristics of culture is language [Callahan, 2005]. Originally, ITD-ERP was intended to be used entirely in English, but after implementation it was discovered that non-English speakers preferred writing down more complicated information in their native language. Native languages were also used when writing down information that was set visible to the sender of the ticket. Also, the original ticket information was often written by the customers in their own language and therefore not translated. Translations were made by hand using Google Translate, until this was implemented in the system.

At the time being, new tickets are automatically translated using Google Translate and show both the original text written by the customer and the translated version. The effectiveness of the translation depends largely on how the ticket was created – tickets created in ITD-ERP portal are translated better than free-form emails, which have a lot of unnecessary information within the translations. In terms of Callahan [2005] (see Table 3), this is related to the discourse style, which is important for interaction with the system. The understandability of the discourse style may rely on the success of the translation.

English is used as the organizational language within ITD, and the interface of ITD-ERP is English. English courses have been offered for all IT support personnel and proficiency in English is required, making the interface language known to all users. When solving local tickets, communication with the customer is mostly carried out in the

local language, but all tickets need to have their stages and resolution written down in English as well. This has resulted in non-native English speakers having to write the necessary information in tickets twice – both in English and in their native language. This can be seen when looking at the effect of the user’s native language on usability (see Figure 19). English native speakers rated the usability of ITD-ERP higher on all metrics than non-English speakers, with $p = 0,013$ for usefulness, $p = 0,191$ for satisfaction, $p = 0,012$ for ease of use, and $p = 0,076$ for ease of learning.

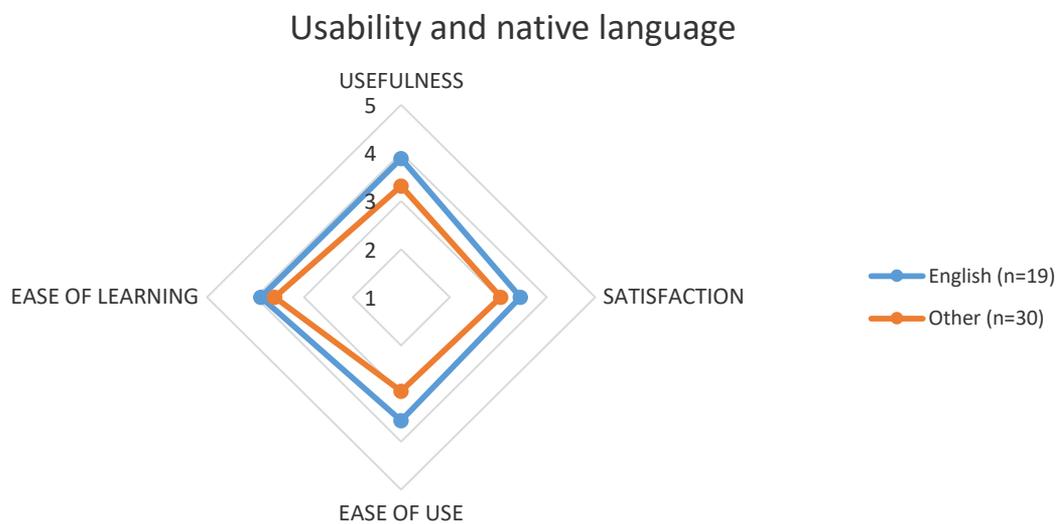


Figure 19. The effect of user’s native language on usability.

Many tickets include information in languages that use non-ASCII characters such as å and ø. While text can be written in English, names cannot, and therefore inserting non-ASCII characters may cause difficulties. For example, if an English IT support employee sends a response through ERP to a Swedish customer named Åsa, they are left with a problem of finding a way to insert the letter Å in ITD-ERP (a character map has not been implemented), copying it from elsewhere on the ticket, replacing Å with the similar-looking letter A, or omitting the name from the text. This issue was acknowledged by Callahan [2005], who considered the ability to enter proper fonts to be critical for interaction with the system (see Table 3).

There are not many formats used in ITD-ERP. Time has been displayed in the YYYY-MM-DD format. This method of displaying date information works well in a global system, because it makes it less likely to mix the day and month information. The DD-MM-YYYY or MM-DD-YYYY formats are likely to be understood according to cultural norms. Displaying the month in text form, however, would make the date explicit.

It is common in organizational systems for the graphical outlook to follow the organization's style and color themes [Callahan, 2005], which is true for ITD-ERP as well. The visual appearance of the system wasn't commented on much during the survey or interviews, suggesting that there are no significant issues with the appearance. I3 considered it "*prettier*" compared to another ERP system they had previously worked with.

Hybrid cultures are formed from shared educational, personal and work experiences and ideologies [Guzman et al., 2008]. ITD support staff have a similar education, knowledge and level of expertise in IT. A majority, 64% of the survey respondents have been working at ITD since before ITD-ERP was introduced (several years ago), so they have experienced the deployment of the system as well as the simultaneous globalization of ITD. These commonalities may downplay their cultural differences [Hertzum et al., 2011] and even help create a common organizational culture.

The interviews suggest that people still collaborate the most with colleagues within their own country or office. Three interviewees told they ask their local colleagues for help first before contacting other colleagues over an IM software. I4 thought that a global environment "*makes it a bit harder*", because "*a lot of interactions are through notes in [ITD-ERP]*" instead of being able to speak directly with their colleagues.

5. Analysis and Discussion of Images of Usability

In Chapter 4, we looked at the usability of ITD-ERP through each individual image of usability, following the discovery and integration phases (phases 1 and 2) of Hertzum's [2010] usability analysis method (Figure 2).

In Section 5.1, we first continue phase 2 by choosing a dominant image, and then proceed to challenge that image in phase 3. In Section 5.2, we analyze the usefulness of Hertzum's method of usability analysis. Section 5.3 proceeds to final discussion.

5.1. Working with the Images of Usability

In the third research question the aim was to uncover the dominant image in the multicultural, geographically dispersed organizational setting. Organizational usability emerged as the dominant image after considering the importance of each image of usability to the overall usability of the system. With both collaboration and the integration of the system into organizational practices being considered, it was the image we studied most extensively. While this may overemphasize its relevance, its features also elicited the most comments during the interviews and the survey.

5.1.1 Considering Dominant and Supplementary Images of Usability

Organizational usability is concerned with collaboration and the organizational alignment of the system. Many of the usability issues found in the study are directly or indirectly linked to these two attributes. For example, cultural differences can be considered as a factor affecting distance collaboration [Noll et al., 2010]. Considered as such, there were some trust issues regarding cultural differences in ticket handling that were brought up in the interviews and questionnaire results. However, it is more likely that these stem from organizational issues rather than cultural differences.

Both situational and organizational usability take the usefulness of the system into consideration. However, the images differ when considering the element of process vs. outcome. In organizational usability, the person using the system is often not the one to benefit from its outcome. [Hertzum, 2010.] When it comes to the use of ITD-ERP as an information repository, all personnel are likely to benefit from it. Issues of distrust in others expending the same amount of resources writing down information on tickets may lead to users not seeing the outcome to outweigh the expense. In technology acceptance studies, perceived outcome has a stronger effect on the inclination to use a system than its perceived ease of use, but they typically assume that the user is the one benefiting from the outcome [Hertzum, 2010].

Organizational usability is the only image that explicitly deals with collaboration (as opposed to focusing on individual users). This element of individual vs. collaborative

includes the notion that with organizational systems their use may be mandated. [Hertzum, 2010] This reduces the importance of hedonic attributes in the system.

Organizational usability emphasizes the dynamic nature of usability [Hertzum, 2010]. The system and the organizational practices are still in the process of being aligned with each other. Even without these changes the perceived usability of the system may change with time. This requires considering the long-term use of the system (Hertzum's usability dimension of short-term vs. long-term, see Subsection 2.2.7).

Perceived usability can be considered a supplementary image. It was essential in the present study to understand the effects that certain contextual factors have on the usability of the system. These factors affect the usability of the system through its users and the way they use and perceive the system (see Figure 2). Perceived usability also results partly from organizational attributes of the system use [Hertzum, 2010], making it interrelated with organizational usability.

5.1.2 Challenging the Dominant Image of Usability

We have chosen the dominant and supplementary images of usability. Now, we move on to challenge this view and consider the usability of the system through the other images of usability. Hertzum's five dimensions central to usability (see Subsection 2.2.7) are used to help with this task. We begin by considering perceived usability as the dominant image.

Perceived Usability

Perceived usability is the contributed effect of all factors of usability that enter the user's perception. It considers usability as a result of organizational, situational, and cultural attributes as well as the current mindset of the user [Hertzum, 2010]. It cannot be considered without including these factors. Perceived usability also permeates all usability considerations that rely on more than a static analysis using a set of heuristics or guidelines. Every study that incorporates users and a system will have to rely at least partially on perceived usability (objective vs. perceived).

Perceived usability focuses on the individual, subjective experience rather than considering usability to be a shared experience of a group of users, which is the view taken in organizational usability (individual vs. collaborative).

Both organizational and perceived usability consider usability to change over time (short-term vs. long-term use). Whereas organizational usability considers change in usability to be borne of the system's continual alignment with organizational practices, perceived usability also considers other factors to affect usability over time. Perceived

usability can change slowly over time but also very rapidly, for example as the situation of use or the personal mindset of the user change.

Considering the usability of a system through the perspective of its users, rather than taking the top-down, organizational view, allows to consider usability at a more personal level.

Universal Usability

Organizational usability, considering usability at a group level, does not give much consideration for the differences in skills, knowledge and personal traits and preferences of the individual users. Universal usability, on the other hand, focuses on these differences and on the way they affect the usability of the system (individual vs. collaborative). As shown in our results, groups within ITD viewed the usability of ITD-ERP differently, likely due to their different frequency of use.

Many questionnaire respondents noted ticket categories to be difficult to use and understand. Whereas organizational usability considers this issue a part of the integration between system and organizational practices, universal usability sees it as caused by a knowledge gap between different groups of people: the IT support and the designers of the categories. This view allows us to understand the underlying reason, the difference in jargon used by the two groups, which can help solve the issue.

Universal usability principles suggest naming the categories in a way that they match the real needs of the people using the system (individual vs. collaborative). This approach would improve the memorability and learnability of the system and make it easier for both new and infrequent users to master.

Situational Usability

Organizational usability considers the use of the system in an organizational setting, but does not include issues such as the physical surroundings of individual users. Situational usability focuses on the entire use situation and puts more weight on the environment and context in which the system is used (individual vs. collaborative).

ITD-ERP is used for organizing and handling tasks, but many tasks as well as much of the communication involve the use of separate software. Situational usability allows us to consider how these systems work together and how this interoperability affects the usability of the system.

While organizational usability also includes the notion of system alignment with the organization's IT infrastructure, in situational usability the perspective of the individual user is emphasized and the focus shifted accordingly.

Hedonic Usability

Unlike organizational usability, hedonic usability does not consider attributes such as accuracy or task completion time relevant for enjoying the system [Hertzum, 2010]. This, as well as many other attributes of hedonic usability make a strong contrast with the performance-oriented image of organizational usability (performance vs. pleasure).

Hedonic usability focuses on the user's subjective pleasure in using the system [Hertzum, 2010]. It includes factors such as visual appearance of the system and the ability to express oneself using it. This individual, subjective view of usability is largely omitted from organizational usability (individual vs. collaborative).

Hedonic usability includes the notion that finding pleasure in using the system is as important, if not more so, than enjoying the outcome [Hertzum, 2010]. Because IT support personnel conduct much of their work within ITD-ERP, their expended resources outweigh the outcome they receive from using the system (process vs. outcome). While organizational usability acknowledges this disparity, it has little to offer towards resolving the issue. Increasing hedonic attributes in the system could help increase enjoyment in the use process itself, lessening the importance of being able to enjoy the outcome.

Cultural Usability

Culture can affect the way people view usability and which usability attributes they value. Organizational usability tends to see all employees as one group, or group them according to their job title, whereas cultural usability groups them according to their cultural attributes. This allows considering a different set of attributes that may affect the usability of the system (individual vs. collaborative).

In this study, we grouped the questionnaire respondents into three geographically distinct groups, and discovered a difference in how these groups rate the usability of ITD-ERP. We also studied the effect of language, and noticed a difference between native and non-native English speakers.

Nordics rated the usability of ITD-ERP lower than other groups, which may result from their cultural attributes and their mismatch to the system and the organizational regulations for its use (objective vs. perceived). Taking a more thorough view of the cultural attributes could help understand the reasons behind the difference in ratings, and find possible solutions to bring up the Nordic usability ratings.

5.1.3 Conclusions from the Images of Usability

The images of usability were considered through five dimensions suggested by Hertzum [2010], all of which were found to be relevant during the challenge phase. The individual vs. collaborative dimension rose as the most important, with the objective vs. perceived being second.

Considering the dimensions, some images took an opposing view to usability. For example, hedonic and perceived usability focused on individual view as opposed to the organizational, collaborative focus. Other images, although sharing the same dimensional view, contrasted each other by considering different sets of attributes or taking a different perspective.

The dimensions helped us recognize which aspects of the images of usability had received less attention during the study. Comparing hedonic and organizational usability through the dimension of process vs. outcome, for instance, made us understand our lack of consideration for the ways the IT support personnel can benefit from using the system.

5.2. Assessment of Hertzum's Method of Usability Analysis

The second research question was how well Hertzum's images of usability work in usability analysis. We have analyzed the process of working with the images of usability throughout the research process, and in this section consider the findings.

Whereas usability studies are often conducted with a specific focus or viewpoint, Hertzum [2010] suggests looking at the system from several different points of view. These images first need to be formed, and a different set of methods and data collection techniques are required for each individual image. Where resources are limited, studying multiple images thoroughly may be impossible. There is a risk of forming shallow or imprecise images that, when analyzed, may give vague or incorrect results.

With only a limited amount of time available, we had to choose research methods that would allow us to study usability through multiple images simultaneously. Trying to take several viewpoints into account in one questionnaire, for example, was not a straightforward task. Many of Hertzum's images of usability overlap in a way that the same elements can be found in different images, but considered from different viewpoints. This added to the difficulty, as the same elements had to be considered from different perspectives. We consider these difficulties to arise from the scope of the method. It would require much more resources to reach its full potential.

The idea of considering multiple images of usability and the change in perspective and focus increases the overall understanding of the usability of the system. While the analysis method itself is easy to use, the scope of the research needs to be large to effectively accommodate the requirements for researching and analysing several images

of usability. We do not know how the small scope of the present study and the limited number of methods used may have affected our results. If more suitable methods had been used and more information gathered for the image of cultural usability, for example, would it have risen as the dominant, or at least as a supplementary image?

Despite the difficulties caused by the scope of the method, we found that taking different perspectives into the usability of the system allowed us to notice attributes we would not have considered relevant otherwise. For example, universal usability made us sensitive to the system's learnability, and allowed us to view it from the perspectives of different groups within the organization.

Choosing the dominant and supplementary images of usability, challenging them and comparing and contrasting images was effective. The process helped us to understand the nuances between different images of usability, and to change focus between them. The method allowed us new insights into the usability of the system, as well as showing us the importance of changing our perspective. Considering each image of usability alone as the dominant image made us aware of their limited scope.

5.3. Final Discussion

When applying Hertzum's [2010] images of usability and the method of usability analysis in an empirical study, we had inside access to the organization and many of its employees were known to us. Therefore, we had to take extra care to be impartial when gathering and analyzing data. We aimed at transparency by recording the research process in as much detail as possible.

Informal discussions inside the organization were very informative. They allowed us to keep up with the changes to the organizational practices and the ERP system. However, we had to keep in mind not to consider the opinions of the few local employees to portray the general opinions of the entire personnel.

The USE questionnaire has no global reliability rating or information of its validity [Lewis, 2014], and therefore we must consider the issues borne from choosing it. The questionnaire was shortened and the statements slightly edited. Standardized questionnaires have a specific set of questions presented in a specific order and format, and even a slight variation from these could render the results invalid [Lewis, 2014]. However, the USE questionnaire was designed to be shortened if necessary [Lund, 2001], and if robust enough, questionnaires "should be able to tolerate some deviation from specification" [Lewis, 2014].

The response rate of the survey was around 30%. The low response rate may be explained by the fact that the personnel were asked to participate in the survey during their work hours. As mentioned in Chapter 4, the organization offers little incentives for

taking time away from ticket handling. Whether the non-respondents would have given different answers or raised different thoughts about the usability of the system cannot be deduced from this sample.

Conducting the research in an organization provided its own challenges. For instance, remote observation was not possible due to the multiple privacy issues regarding the use of a live video feed. Instead, we arranged to observe only one office live, but included questions about the work environment in the interview. Being able to choose from a wide array of methods helped us be more flexible and change the approach when necessary. It would have been beneficial to collaborate and communicate with the development team of the system. Many new and significant implementations were made into the system during the present study. Some of these made it necessary for us to make changes or revisions to the presentation of the results. This could have been avoided by closer communication with the development team.

The primary research question, formed at the start of the research process, was to understand how the multicultural, non-located organizational setting affects the usability of the ERP system. We considered each individual image of usability through both its theoretical framework and appearance within the studied setting. We discovered the dominant image of usability to be organizational usability, and supplemented it with perceived usability.

We also contrasted the dominant image of usability with other images in order to appreciate the different perspectives they offer. The different attributes were seen to both complement and counteract each other. The organizational setting diminishes the importance of hedonic usability attributes. While the existence of cultural differences is unquestionable, their importance may be diluted in an organization where people with a similar work experience and specialized knowledge collaborate as a team. Being geographically dispersed across the globe creates its own issues, most significantly with trust between collaborators. These can, at least partially, be overcome with further integration of the system and the organization, as well as increasing coordination, mutual awareness, and common ground between collaborators.

We can answer our main research question by saying that cultural, organizational, and distance factors all play a part in the way users perceive the usability of the system. While organizational attributes have the strongest effect on the usability of the ERP system, cultural and distance factors, along with the other factors considered throughout the study, contribute to it. This was perhaps the main finding of the study; that changing the perspective or focus may offer novel insights into the usability of a system.

Considering the six images of usability was seen to widen the overall understanding of the scope of usability studies. They offered a comprehensive view of the commonly

taken perspectives and aspects into usability, and familiarizing with them can be beneficial to anyone new to the field of usability.

The main results of the study, as well as information about the biggest discovered issues and their improvement suggestions, will be provided to the ITD-ERP design team. Its distribution to all personnel involved with ITD-ERP, especially the team leaders, is recommended. The results are hoped to help the planning and implementation of new features, as well as improve the overall alignment of the system and the organizational practices.

Many features are still being implemented into the system. It would be interesting to renew the study within the next few years to see how these changes have affected the perceived usability of the system. Hertzum [2010] recognizes the importance of studying usability over a longer period of time, and considers his method of images of usability to require supplementary methods for including the long-term aspect. Renewal of the study would allow us to explore these methods, as well as compare the changes in the organization, the system, and its perceived usability between the two studied instances.

To validate Hertzum's [2010] method of usability analysis and to consider its applicability in different contexts of use, further empirical studies are recommended. It is our hope that our results and analysis of Hertzum's method may assist future researchers appreciate the value gained from a change of perspective.

6. Conclusions

The aim of the present study has been to understand how a multicultural, geographically dispersed organizational setting affects the usability of an ERP system. Additionally, our aim has been to uncover the dominant factor in this setting and to explore the usefulness of our chosen method of usability analysis.

The study was conducted as a single case study in a large international organization, with a focus on the ticket handling process of the IT support personnel. Because ERP systems are common in organizations and may be used as the main worktool, more focus on usability considerations is needed to ensure a satisfactory, effective and efficient use experience.

Usability, being a wide concept, is often divided into smaller attributes in order to define and study it. Hertzum's [2010] images of usability were chosen as the method of usability analysis, because it considers usability through six distinct images: universal, situational, perceived, hedonic, organizational, and cultural. The method was therefore seen to divide the entire use situation into smaller, more easily approachable components. Including multiple contextual factors into the present study was seen as a challenge which could be overcome with Hertzum's method.

We applied a mixed method approach, gathering data through a usability survey, semi-structured interviews, as well as live observation. By using both qualitative and quantitative measures, we hoped to increase the validity of the results.

Organizational factors were considered to have the largest impact on the perceived usability of the ERP system. However, the attributes of each image of usability were found to contribute to the overall usability of the system. Considering all six images of usability offered an extensive view into the different aspects and foci of usability studies. Switching between the different perspectives helped us understand the underlying reasons behind usability issues. It rose as the main finding of the study that changing the perspective or focus may offer novel insights into the usability of a system.

By conducting the usability study using Hertzum's method, we explored its usefulness in practical usability research. Considering the different images of usability highlighted some of their strengths and weaknesses. While the method would have required a larger scope of study to provide enough data to consider all images of usability equally, it nevertheless brought forth dimensions and perspectives that would easily have been missed by narrower approaches.

We recommend further research in order to widen the scope of study. Looking deeper into each of the six images of usability and considering them in a more equal measure will help validate the findings of the present study, as well as help assess the scope of study needed to provide reliable results.

By providing the organization with the results of the study, including information about the biggest issues discovered and the related improvement suggestions, we hope to bring practical benefits to the organization and the ITD personnel. Applying Hertzum's method in the context of an actual organization has highlighted its strengths and shortcomings, as well as shown its potential as a method for future research. It is our hope that our results may also assist future researchers appreciate the value gained from a change of perspective.

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Appendix A

ITD-ERP Usability Questionnaire (Anonymized version)

This survey is conducted as a part of a Master's thesis work by Anne Jeronen at the University of Tampere, Finland. The thesis aims to discover the effects of multicultural, non-collocated organizational environment on the usability of ITD-ERP. I hope to find ways to improve the usability of ITD-ERP and help the organization offer a more efficient and pleasant use of ITD-ERP.

The results of the survey are analyzed statistically and no identifying information will be published. All your responses are anonymous and treated as confidential!

The questionnaire is divided into three sections. Demographics contains basic demographic information. Ratings has 28 statements to be rated. Open-ended questions has 6 questions and a field for other comments.

Only the demographics are required, but please answer as many questions as you can!

The questionnaire should be filled and saved within two hours from opening it to ensure no data is lost.

Demographics

Age	<input type="radio"/> 19 or younger <input type="radio"/> 20-29 <input type="radio"/> 30-39 <input type="radio"/> 40-49 <input type="radio"/> 50 or older <input type="radio"/> Do not wish to disclose
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Gender	<input type="radio"/> Female <input type="radio"/> Male <input type="radio"/> Other / Do not wish to disclose
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I have been working at the organization since	<input type="radio"/> before ITD-ERP was introduced <input type="radio"/> after ITD-ERP was already in use
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The number of IT support personnel in my office is	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 or more
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The percentage of my average workday spent using ITD-ERP is	<input type="radio"/> less than 10 % <input type="radio"/> 10-19 % <input type="radio"/> 20-29% <input type="radio"/> 30-39% <input type="radio"/> 40-49% <input type="radio"/> 50-59% <input type="radio"/> 60-69% <input type="radio"/> 70-79% <input type="radio"/> 80-89% <input type="radio"/> 90 % or more
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Nationality

Native language(s)

Country of employment

Service Level

IT Support

Specialist 1

Specialist 2

Ratings

Usefulness and Satisfaction Ratings

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
ITD-ERP helps me be more productive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP is useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP makes the things I want to accomplish easier to get done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It saves me time when I use ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP meets my needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP works the way I want it to work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP is pleasant to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Ease of Use and Learning Ratings

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
ITD-ERP is easy to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP requires the fewest steps possible to accomplish what I want to do with it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP is flexible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can use ITD-ERP without written instructions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can recover from mistakes quickly and easily in ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned to use ITD-ERP quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I easily remember how to use ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Collaboration Ratings

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
I use ITD-ERP to find and share knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use ITD-ERP to communicate ticket-related information to my customers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP is the best way for communicating ticket-related information to my customers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use ITD-ERP to communicate ticket-related information to my colleagues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP is the best tool for communicating ticket-related information to my colleagues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP makes it possible for me to work together with my colleagues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Organizational Use Ratings

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
ITD-ERP makes it easy to divide work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP enables everyone to do an equal amount of work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITD-ERP helps the IT organization be more productive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The IT organization supports and encourages me to collaborate through ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The IT organization supports and encourages me to share knowledge through ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it easy to follow the IT organization's rules and regulations regarding the use of ITD-ERP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I check the original language of the tickets before selecting them from the queue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Open-ended Questions

Briefly describe a typical ticket you handle in ITD-ERP.

Describe a situation where ITD-ERP has served you well.

B I U S

Describe a situation where ITD-ERP has not served you well.

B I U S

Beyond ITD-ERP, how do you work together with your colleagues to solve tickets?

B I U S

What would improve you and your colleagues' collaboration within ITD-ERP?

B I U S

List some of the IT organization's rules and norms that affect the way you handle tickets within ITD-ERP. Explain how they affect your work.

B I U S

Any other comments about ITD-ERP?

B I U S

Proceed

Save Prefilled form URL

Thank you for your participation in this survey!

Please remember to submit your answers by pressing 'Save' above!

Appendix B

Preliminary questions used as a basis for the semi-structured interviews.

Interviewee no.:

Office/country:

Gender:

Worked since before / after launch of ITD-ERP:

1. **What do you think about ITD-ERP in general?**
 - What are your feelings toward the system?
 - What do you like the most?
 - What do you like the least?
2. **Does ITD-ERP enable you to work in a way that you enjoy?**
 - Does it help you in your work?
3. **In what kind of environment do you normally use ITD-ERP?**
 - For example, what kind of space are you in and what is happening around you?
 - How do your surroundings affect the way you work in ITD-ERP?
4. **How much do you collaborate with your colleagues?**
 - Who do you collaborate with the most?
 - Do you collaborate using ITD-ERP?
5. **What kind of things most affect the way you handle tickets?**
 - Does it make a difference in the way you fill a ticket if you need to forward it?
6. **Do you experience a sense of urgency in your work?**
 - What affects or causes it?
7. **Do you keep aware of what is happening in the global IT support?**
 - For example, are you aware of what your colleagues are doing?
 - Does it affect the way you work?
 - How about local situation?
8. **How do you think IT being global affects your work in ITD-ERP?**
 - Are there any cultural differences that have become apparent through using ITD-ERP?
 - Do they affect the use of ITD-ERP?