A comparative study between user research in academia and user research in commercially driven companies

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Abstract

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The following degree project is written within the department of Information Technology at Uppsala University. The subject studied is the difference between academic user research and such user research performed by professionals at commercially driven companies. Academic’s and professional’s agendas, interests and approaches seem to differ and consequently a gap emerges. To perform a comparison between academically defined and practically defined user research a case study and a literature study were conducted. During the literature study three main academic approaches to perform user research were studied and summarized in a unified view. The case study was performed over 4 months at Spotify in the User Research team to gain insights into how user research is conducted in a commercially driven company. The degree project shows that academics and professionals can benefit from each other. For example, academics can integrate various mix methods to better understand design and concepts and base assumptions on more reliable data. Professionals can benefit from academics by adapting a similar systematic approach to perform user research and have a larger impact on the development.
Popular scientific summary in Swedish

För att kunna skapa framgångsrika produkter och system i dagens samhälle räcker det inte med bra programvaruteknik. Allt handlar om att bygga produkter och system som passar in dess användares liv. Traditionellt har nya produkter utvecklats utifrån en brilliant idé som därefter har försökt matchas ihop med en passande marknad. Införandet av produkter som ständigt är påslagna, anslutna och alltid med bruna har satt nya krav på utvecklingen. Möjligheten att påverka människors liv har aldrig tidigare varit så pass stor. Vi har kommit en lång väg att integrera tekniken i människors liv och mycket kunskap har styrts från forskning inom människa-datorinteraktion. Den kunskap som kan styrkas av denna fältet har dock inte helt översatts till fler användbara produkter. 

Syftet med denna studie är att jämföra akademiskt accepterade metoder och tillämpningar av användarundersökning med sådan användarundersökning utförd på ett kommersiellt företag. De största skillnaderna mellan dessa två tillvägagångsätt studeras för att ta reda på om och hur dessa två kan ta lärdom av varandra.


Studien visar att akademiker och yrkesverksamma kan dra nytta av varandra. Till exempel, kan akademiker integrera ett flertal mixade metoder för att bättre kunna basera avgörande beslut på tillförlitlig data. Yrkesverksamma kan dra nytta av akademiker genom att anpassa ett liknande systematisk tillvägagångsätt av användarundersökningar för att öka inverkan på produktutvecklingen.
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1. Introduction

‘The Vasa ship is like a typical IT project’ – Greg Nudelman 2015 #FBTB2015

Vasa was considered a modern warship during her greatness days in 1628. The ability of fast and aggressive sailing, equipped with multiple gun deck and heavy customer made guns would make her an innovation of a kind. But as with most brilliant innovations, there were also failures and the ship sank after 1300 meters into her maiden voyage (Hocker, 2011). The story of the Vasa ship has many similarities with failed IT projects (Nudelman, 2015). Several IT projects fail every year due to uncertain goals, budgets and requirements, lack of support from the company board and absence of user involvement (Marcks von Würtemberg, 2010). In the United States, $250 billion are spent each year on IT application development in 175000 projects. Unfortunately, many of these projects fail every year and many executives believe one of the major reasons of the failure is lack of user input (The Standish Group, 2014). Many companies tend to underestimate the essentials of preliminary work in consultation with users when starting an IT project (Marcks von Würtemberg, 2010). The average percentage of successful IT projects that are completed on time and within the budget is 16.2% (The Standish Group, 2014).

1.1 Problem discussion

In order to create successful products and systems today, good software engineering is not enough. It is all about building software and hardware that fit together into the fabric of everyday life. Traditionally, new products were defined and built by engineers with a new bright idea and who went looking for an audience to offer the product to. The introduction of always-on, always-connected, and always-carried devices has put new demands on development (Beyer & Holtzblatt, 1997). The potential of having an impact on users’ every day lives has never been stronger for companies. The challenge is to find a design process that is sensitive to the larger world for the users, introduces the users to this world, and guides them to use what they have learned to make them use the product successfully (Beyer & Holtzblatt, 2015). We have come a long way of integrating technology in human life and much of the process has been substantiated from the Human-Computer Interaction research (HCI) (Beyer & Holtzblatt, 1997). HCI can be defined as the intersection between the social, the cognitive, the cultural and computing and technology (Beyer & Holtzblatt, 2015). However, the wealth of established knowledge recognized by the academic HCI research has somehow not fully been translated into more usable products (Constantine & Lockwood, 1999). Academically produced methods and practices might not always be feasible in a commercially driven company. If these two approaches can learn more from each other, potentially the percentage of successful and on-time IT projects can be further increased on top of the referred to 16.2%. Likewise, real world data could be integrated in academic research and teaching to inform future professionals about challenges and opportunities they might face when working with user research.
1.2 Purpose

The purpose of this degree project is to compare academically accepted user research methods and practices with such user research performed in commercially driven companies. The major differences between these two approaches will be studied to find out if and how these two can learn from each other for benefit. This study seeks to identify the differences between these two approaches and to propose suggestions for alignment and benefit.

1.2.1 Research questions

The research questions chosen for this degree project are the following:

- What are the main differences between user research methods and practices defined in commercial and academic context?
- In what way can these two approaches benefit from each other?

1.3 Delimitations

To be able to gain deep knowledge about the subject, the study is limited to a case study and is focusing on one company that has implemented user research methods and practices in their product development processes. Because of time limitation a few chosen projects form the basis of the case study. The chosen projects outlined in the case study determined the methods and processes that underlie the study. The company chosen is commercially driven and is developing an entertainment product. However, commercially driven companies generally are not limited to develop entertainment products only, but can also develop work-supportive systems. In the literature study a few user research approaches have been chosen to represent a unified academic view on user research. There are updated versions of these academic views, such as Beyer and Holtzblatt’s latest version of Contextual design (2015), which take into account the radically changed technology. However, these have not been evaluated yet and will there for not be further analyzed in this study.

1.4 Methodology in brief

The procedures chosen to gather information for this study are a literature study and a case study. The literature study presents the academically defined methods and practices of user research. To get a unified view of academically defined user research, three user research approaches are studied and summarized. The three user research approaches presented are Cognitive work analysis, Contextual inquiry and Usage-centered design. To investigate how current commercial practices and methods in user research compare to research defined in an academic context, a case study is performed. The case study is performed at Spotify in the user research team by primarily observing, planning and conducting user research projects. By given the opportunity to work in the user research
team, a deep knowledge about their methods and practices can be gained. The findings from the literature study and those from the case study will be compared and form the result of this study.

1.5 Thesis structure

The thesis has been structured as follows: 1. Introduction, 2. Background, 3. Theory, 4. General methodology, 5. Literature study, 6. Case study, 7. Comparison, 8. How these can learn from each other, 9. Discussion, and 10. Conclusion.

In 1. Introduction the subject, the purpose and the procedures of information collection of the study are presented. Further on a presentation of user research is presented in 2. Background. In 3. Theory a brief description of earlier studied differences between research performed in academia versus the industry is presented. The 4. General methodology describes the procedures used in order to compare user research in an academic setting and in a commercially driven company.

In 5. Literature study the result of the three chosen user research approaches are presented and analyzed in order to present a unified view of the academically defined user research. The 6. Case study presents a background of the company studied, the procedures of performing the case study, and the result and analysis from the case study.

The research questions are analyzed in 7. Comparison and 8. How these can learn from each other. The procedure of the study is discussed in 8. Discussion. In 9. Conclusions the thesis research questions are finally answered.

2. Background user research

User research is performed to figure out how people interpret and use systems by studying their behaviors, needs and motivations (Goodman et al., 2012). One of the main benefits of conducting user research is the ability to speed up the decision making, since the reasoning can be backed up by the research and can avoid the need to wrangle opinions. Another benefit of research is that it can reveal things that never would have been considered otherwise. If the problem is straightforward, it is possible to design a great system without conducting research. However, companies that start with poor knowledge or not enough information about their users may waste months or even years getting a system launched (Goodwin, 2009). It is not only important to find out who is using the product but how it is used and why. User research performed before or during development can affect the comprehensibility, usability and successfulness of the system. After a system is launched, user research can be conducted to improve it (Goodman et al., 2012).
2.1 Reluctance to user research

Even with all the benefits of conducting user research, there will always be people who underestimate it and express reasons for not conducting it. A usual barrier user researchers can meet are executives who are frightened that user research is time consuming and costly (Goodwin, 2009). However, even a small sample of user testing with co-workers from another department or family and friends, who are not familiar with the system, can still uncover common misunderstandings and problems with the experience (Goodman et al., 2012). Another misunderstanding is that market research and user research would be the same research. Many companies assume they do not need user research since they already have been provided information about the user through market research. Market research provides insights about how the system can be sold and perceived but not how it will be used. With user research an objective view of the development can be added to avoid stakeholders in the field falling in love with the initial idea and not wanting to face the reality of users struggling with or not understanding the system (Goodwin, 2009).

2.2 Conceptual models

To understand how to use systems¹ in daily life, an understanding of how they work needs to be created. Users create a conceptual model of how they believe the systems work. The comprehensibility of how systems work depends on the dialogue between the person developing and the person using them. They are not talking to each other in real life. As visualized in figure 1 below, the only way to communicate is through the appearance of the system itself, defined as a system image (Constantine & Lockwood, 1999). The designer expects the user's model to be the same as its own conceptual model, the design model. However, the designer will never talk directly to the user. The user model is a mental model created by integration into the system. The system image is an outcome of the physical structure of the system. If the system image does not make the design model consistent and clear, the user will end up with the wrong mental model (Norman, 2002).

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¹ Any end-product such as product, system or service is defined as a system
‘A good conceptual model allows us to predict the effects of our actions’ (Norman, 2002). If the designer provides the user with a poor conceptual model, the user will be forced to operate by rote and create her own model, which might be the wrong one. Providing the user with the right conceptual model is critical for good design, as seen in the design of a pair of scissors. The numbers of actions are limited, the holes allow something to be inserted, which is most logically the fingers, and by so the holes are affordances. The holes have two different sizes; one that only allows one finger to be inserted and the other allows several fingers to be inserted. The sizes of the holes provide constraints to the pair of scissors. The set of possible operations are suggested and constrained by the holes. However, the scissor will still work in the case of inserting the wrong fingers because of the mapping between holes and fingers. There is a clear relationship between operation and function, when moving the handle the blades are also moved (Norman, 2002).

The dialogue between professionals and users is based on a realization of having real people on the other side of the system. The dialogue begins with the users and their problems, which sought to be understood by the professionals developing the solution. User research can be conducted to understand the users’ problems and their behaviors. The user researcher can be any professional interacting and consulting with the users (Constantine & Lockwood, 1999). The user researcher should be able to communicate with both the professionals developing the system and the user. As visualized in figure 2, the user researcher is the bridge between the designer and the user. By performing
user research the users’ desires and behaviors can be used to create good conceptual models and to explore usability issues to make sure things are viable for the users (Norman, 2002). The user researcher’s goal is to understand the problem of the user by some means or another. It is not enough to ask the user what is wanted from the system or if the user likes or dislikes the system. The goal of the user researcher is to reach a higher level of understanding including things the user cannot describe in all cases. The user might not communicate what is really desired and needed by the system. To understand what the user really needs, both the context and the situation of the user must be studied. Another difficulty is to understand how users use the system and what issues they face in reality. Users often avoid describing situations when they have failed using a system and other times they might not even know they have failed to use it. To understand how the users interact with the system they are preferably studied in their own context using the system (Beyer & Holtzblatt, 1997). The characteristics of the users are an important aspect to consider when studying their conceptual model. The background and experience of the user should match with the conceptual model’s complexity otherwise misunderstandings of key system concepts could lead to problems in the system overall (Gemino & Wand, 2004).

*Figure 2. The user researcher acting as a bridge between the designer and the user (Norman, 2002)*
As digital entities become widely available, attention has shifted to understanding how users interact with information within digital environments. This has challenged the validity of existing conceptual models since there are difficulties associated with directly translating physical entities into the digital realm. An example of this is the need for users to create differentiated conceptual models for academic libraries and digital libraries (Stelmaszewska et al., 2005).

2.3 Where user research fits in

User research plays different roles depending on the development model the company is using. In an iterative development environment, as visualized in figure 3, results from the research can answer questions and guide the development in a certain direction. The user’s experience can be examined in a controlled, rapid, and consistent manner. Different techniques and methods are appropriate at different times in the development cycle. Interviews and focus groups are feasible in the beginning of the development phase to get an understanding of the users and their context. Usability tests are performed when the system is starting to be built, with the aim of discovering usability issues. In the end of the development phase data is collected from site analytics to evaluate the system use. The research methods are all performed in the Examination phase, which is re-visited iteratively after each cycle.

Figure 3. Sample research programs for Iterative development processes (Goodman et al., 2012)
If using a waterfall model, as visualized in figure 4, research is appropriate to be conducted in the beginning of the development process to specify the requirements from the user’s perspective and in the end, to evaluate a prototype or the finished system. The waterfall model has bigger demands on the research to set the requirements in the beginning of the development process, the Specify stage, than the iterative model. Research in the waterfall model can be made more iterative by conducting interviews and focus groups at the Design stage to find and evaluate early conceptual or usability issues. The results from the research can also inform the development teams about issues reported from the users before entering the Build stage. Finally, usability tests and site analyses are performed in the Test stage (Goodman et al., 2012).

Figure 4. Sample research programs for Waterfall development processes (Goodman et al., 2012)

3. Theory

Little has been written about the differences between user research methods and practices defined in commercial and academic context. However, in the HCI community there is an on-going discussion about research performed in the industry and in academia. There is a mismatch in the relationship between these two, where researchers view the practitioners in the industry as uninformed, while practitioners view research performed in academia as not being in touch with the reality of real world design (Gray et al., 2014).

Roto et al. (2009) conducted a workshop about user experience evaluation methods in academia and industrial context with representatives from both fields. The findings
from this workshop were that these methods are partly applied differently in an academia setting versus in the industry. The industry requires the methods to be light weighted, require few resources, and easily performed. In the exploratory stage of the product development, qualitative methods are preferably used. Quantitative methods are preferably used for benchmarking and marketing purposes. In academia, more attention is paid for being scientific in the evaluation methods. Quantitative results and validity are preferably emphasized as an additional viewpoint to qualitative analysis. The common characteristics of the approaches were the experimental aspects, not only usability and market research. There was a common view about the methods being comparative performed iteratively. The conclusion drawn is that in industry, fast and easy methods should be used mixed with long-term scientifically methods (Roto et al., 2009).

It has been written about differences between academic research versus R&D in the industry, which might be information touching the user research field as well. When working in an academic setting there is a larger independency around the topic of the research, the working time and deadlines. In contrast, when working within a company there will always be certain projects that are prioritized. Another difference is the more frequent and short notice deadlines within a company, which can put certain demands on the professionals and their work performed. Product launches are team efforts, which means there is no room for missing the deadline. Missing a deadline will affect the whole team and make the company lose a huge amount of money (Kennedy, 2011).

Barkhuus and Rode conducted a study in 2007 of the types of user-centered evaluation method used in research projects in HCI over a longer period. The result from this study showed that the majority of the methods where empirical, involving real users rather than analytical, where the design is analyzed without involving real users. 70% of the empirical methods had a quantitative character and 30% had a qualitative character (Lárusdóttir et al., 2014). Lárusdóttir et al. (2014) showed in their study about user-centered evaluation methods used by IT professionals that empirical qualitative methods are more often used than quantitative methods. The result from the study shows that IT professionals and researchers in HCI do not use the same types of methods when conducting empirical evaluation.

4. General methodology

To perform a comparison between academically defined and practically defined user research a case study and a literature study were conducted. To get an understanding of the academic methods and practices of user research an in-depth literature study was performed throughout the study. During the literature study three main academic approaches to perform user research were studied and summarized in a unified view. The case study was performed over four months at Spotify in the user research team to gain insights into how user research is conducted in a commercially driven company.
Studying one company and team allowed for an in-depth study rather than a wide-ranging one (Gerring, 2007).

4.1 Literature study

The literature study was performed to get a deep understanding of how user research is defined and practiced in an academic context. After a broad user research focused literature search a decision was made to focus on three approaches: Cognitive work analysis, Contextual Inquiry and Usage-centered design. The purpose of the literature study was to summarize the approaches and present a unified view of academic user research. The unified view of academically defined user research could then be compared with the findings from the case study to identify the gap between these two approaches. The literature study had the purpose of representing a methodology and not a stage in the process of empirical research (Comerasamy, 2012).

4.2 Case study

Through the case study, a deep knowledge about how user research is performed at a commercially driven company was gained. Many case studies set out clear aims and objectives at the start of the project and can therefore have different structures. The chosen structure of the case study performed was an instrumental case study since the goal was to provide insights into a subject and not into a specific setting (Stake, 2000). Although the case selected is studied in-depth, the main focus was on defining the differences between user research in an academic context and in a commercially driven company (Silverman, 2005). The case was looked at as a secondary interest, playing a supportive role to understand the studied subject. The choice of case was made because of its appropriateness for enhancing the understanding of the studied subject (Stake, 1995). A variety of procedures were performed during the case study including: internal observations and interviews as well as planning and conducting user research projects. Multiple procedures were performed in this study to adequately represent how user research is performed in a commercially driven company (Cohen & Crabtree, 2008).

5. Literature study

In 1979 the Three Mile Island nuclear power plant would write a devastating chapter in history books. A nuclear meltdown in one of its three reactors would cause America’s worst civilian nuclear plant accident. This is just one example of a complex and computer-controlled safety-critical system failing due to human factors (Gersh et al., 2005). Analysis after the Three Mile Island incident revealed critical user interface engineering problems of the reactor control systems’ user interface. Norman (2002) argues that these kinds of accidents are based on explanations made by humans, based on analogy with past experiences that might not apply in current situations. In this case operators pushed a button to close a valve that had been open previously for excess
water to drain from the nuclear core. The valve was defected, so this day it did not close properly. However, a light on the control panel indicated that the valve was actually closed. The purpose of the light was not to monitor the valve but working as an electrical signal indicating the valve was closed, a fact known by the operators. On this day the operators noticed a temperature increase in the pipe indicating that fluid was still flowing through the closed valve. The crucial part in this incident was that the operators knew the valve had been a bit leaky for the past few days and assumed this small leak would explain the high temperature. Moreover, they thought the temperature increase would not affect the main operation, but they were wrong (Norman, 2002).

Design principles and frameworks, ensuring skilled professionals to be able to operate safe and efficiently, have been required as a result of similar incidents. Apart from complex sociotechnical systems, similar design principles are needed to ensure ordinary people to be able to use any system. Improving the fit between humans and technology is a theme present in several types of system developments. If human interaction requirements are not integrated together with hardware and software requirements during the design stage, it will fall on the user to do that integration in addition to the work demands of the job at hand (Gersh et al., 2005). To provide the users a successful user fit system, so they can efficiently perform tasks, some kind of analysis before the design stage is necessary. The value of analysis been recognized in both the human factor and HCI communities. There is a strong linkage between analysis and design, since the analysis is not defined as an end in itself but a first stage in developing a system. Any kind of system for human work is based on certain set of assumptions. The difference between making the assumptions implicitly and explicitly is to set time to conduct analysis (Vicente, 1999).

There are several approaches for collecting and analyzing data for system design and development. They all have in common that the user is studied in some way and this will fall under the definition of user research. Three different user research approaches will be presented and represent a part of the development cycle. Firstly Cognitive work analysis is presented, which has evolved from Cognitive systems engineering and is usually used when developing complex socio-technical systems (Vicente, 1999). Secondly, Contextual Inquiry is presented, which is the first phase in Contextual Design and is mainly used when developing work systems for enterprises (Beyer & Holtzblatt, 1997). Thirdly, Usage-centered design is studied which can be used when developing software-based systems for numerous contexts and devices such as computers, servers, industrial electronics, or for the web (Constantine & Lockwood, 1999).

5.1 Cognitive work analysis

Cognitive work analysis, (CWA) is a framework used for studying work before designing a computer-based information system. CWA should be conducted with an ecological approach, meaning firstly study the environmental constraints that impose on the workers’ actions and, secondly study the constraints imposed by the human’s
characteristics. If conducting CWA the other way around, starting with the human’s constraints, the mental model of the user would drive the design of the system. Vincent (1999) argues that this could limit the design of the system since the user’s mental model could be wrong and this would affect the design negatively.

The concepts of CWA are based on cognitive systems engineering (CSE), visualized in figure 5. CSE is a field of system development including analysis design, iterative design, and evaluation of complex sociotechnical systems (Vicente, 1999). A sociotechnical system is one in which humans are provided essential functionality related to deciding, planning, collaborating and managing. In this context, complex refers to cognitive complexity, defined as activities such as identifying, reasoning, deciding, and solving problem. These activities do not need to rely solely on one user but are usually dependent on a whole team as well as interactions between human and technology. The purpose of using CSE is to reduce complexity of the system and support the human activities earlier mentioned. A few frameworks such as work-centered design, situation awareness-oriented design, decision-centered design, CWA, and applied CWA have formed the field of CSE. These frameworks have grown from different academic research traditions and have guided the evolution of CSE. CSE also includes Computational Modeling techniques to describe in detail how human perform complex cognitive tasks (Militello et al., 2009).

Figure 5. Techniques, Methods, and Frameworks of Cognitive systems engineering (Militello et al., 2009)

5.1.1 Principles of CWA

CWA emerged in response to demands for safer nuclear power plant control rooms following the meltdown of the Three Mile Island power plant (Militello et al., 2009). CWA primarily concerns the first step in the process of Cognitive systems engineering
where suggestions for design can be derived. The analysis is valuable to the extent to which it gives insights to the designer on how to create successful tools that effectively support the users. (Vicente, 1999). In everyday work life users are both assisted and constrained by the properties of the workspace and its structure. By developing functional work structures that both support and constrain work, a successful design for human work can be created (Lintern, 2013). CWA is a formative approach to work analysis that fits well with the demands of complex sociotechnical systems. A formative approach focuses on defining organizational and technological requirements that need to be satisfied to support efficient work. CWA focuses on the constraints and goals that shape the workplace regardless of the specific individuals involved. The people involved are not considered as users of a system but actors involved in work-related actions (Fidel & Pejtersen, 2004).

When studying socio-technical systems there are five dimensions, divided into two groups that need to be analyzed, as visualized in figure 6. The first group consists of Work Domain, Control Tasks, and Strategies and represents the characteristics of the environment. The second group consists of Social-Organizational and Worker Competencies and represents the characteristics of the organization and the people active in the environment.

Initially, in the Work Domain step, an understanding of the structure of the system itself is built. In a nuclear domain for example, an understanding of the structure of the plant itself would be built. By identifying the Work Domain it is possible to see the constraints it imposes on the action of the actors. It would be hard to understand why a person is acting in a certain way without knowing the environment they are acting in. One might think that a person’s actions are irregular and complex. However, it is the environment that is complex and not the actor behaving in a complex way. In Control Tasks, the tasks that are supposed to be achieved in the system are identified. Looking at how the tasks can be accomplished, without looking at who performs them, is done in Strategies. There might be several ways of performing the tasks and they can all be identified in this step.

In Social-Organizational, the people working in the domain and their internal relationships are identified, as well as responsibility areas. The objective of analyzing the organization is to determine the social and technical factors in a socio-technical system that can work in a way that makes the system as efficient as possible. In Worker Competencies, the specific competencies needed for each worker to efficiently fulfill the role are identified and analyzed.
5.1.2 Modeling tools

Different modeling tools are required to identify the five previously described dimensions. When identifying the Work Domain, a field description is used to map out the work environment. The field description can describe what is possible to do from a functional point of view. Then it is still up to the user to choose a particular action. The field description describes the constraints on the action and not the action in itself. In an analysis of Control Tasks, the modeling tool used is a decision ladder. The decision ladder can be used to develop control task models. In the Control Task analysis, the requirements are being identified, but not how and by whom. The decision ladder can be used as a template to identify the needs of the system associated with particular activities. The decision ladder can also be used as a template in making decisions about how these needs can be distributed across multiple actors in the organization. When analyzing the Strategies, an information flow map is used as a tool to analyze how the requirements are going to be completed. In complex socio-technical systems there are usually multiple possible ways of completing a task so this tool is used to map all of these ways of doing it.

Organizational factors are becoming increasingly recognized as having a positive influence in socio-technical systems. The modeling tools previously described will collectively give answers to this phase of analysis. By combining these tools a requirement inventory that the organizational structure must be capable of satisfying is generated. To identify the competencies in the worker competencies analysis, a modeling tool built on skills, rules, and knowledge taxonomy (SRK) is used. Each level in the taxonomy represents a category of human performance. The worker competencies analysis must draw from existing human capabilities and limitations. However, this
knowledge needs to be collected, organized and integrated with the requirements identified in the previous CWA phases described. The goal of the taxonomy framework is not to replace existing knowledge but to influence that knowledge to develop practical applications for systems design.

5.1.3 Methods used for collecting data

Three of the major methods of collecting data in CWA are interviews, self-reports, and observations. Apart from the three mentioned methods, there are other frequently used approaches, such as storyboards, mock-ups, usability trials, card sorting, simulator experiments, and automated collection of behavioral data. CWA needs a broader knowledge effort than many other analysis approaches since it is performed when creating systems with complex attributes. The insights are not limited to be collected from users but also from systems designers, engineers, systems scientists, and design documents (Vicente, 1999). To broaden the generalization of the study, three main principles are followed. A broad sampling is important, which means the data should be collected from several shifts, participants and sites. Secondly, multiple data collection methods are used, such as combining observations and interviews. Thirdly, multiple observers or interviewers can tackle the research in a varied way, which will bring more confidence to the study (Bisantz & Burns, 2008).

An interview is the most common method used in CWA and is usually held in a structured way. Interviews are efficient, because a deep understanding can be learned while avoiding logistical complications and heavy time investments. The interviews are seen as rich and best for collecting exploratory data. However, the interviews require the interviewer to have a deep knowledge that goes beyond understanding of standard information collection and analysis procedures. If findings from one interview are replicated across multiple interviews or during other information collection methods, they will be treated with greater confidence (Crandall et al., 2006).

Another variety of methods is based on the participants providing data on their own. They can provide the data from highly structured surveys to more open ended user diaries. This way of collecting data puts less demand on the time and interview skills of the person conducting the research. However, the data quality depends on the willingness, motivation and accuracy of the participant. Additionally, these methods assume that the participants are capable of reporting the right knowledge on their own (Crandall et al., 2006).

Observing people in their work setting is a frequently used method, which brings new opportunities to the research. Through observations, the series of complex activities, actors and objects can be studied. During these sessions the participants are asked to talk out loud when performing their work tasks. The challenge with the method is ensuring the observer is present during the right moment, otherwise critical elements and key dynamics can be missed (Crandall et al., 2006).
5.2 Contextual inquiry

Contextual inquiry is the first step in Contextual design, where the user researcher studies the users in their own context to collect the requirements of the system.

5.2.1 Contextual design

The idea of Contextual design (CD) is to develop a system based on the user’s needs and behaviors, rather than having team members defining ‘what the user wants’ based on anecdotes and personal opinions. CD can be used when refining or extending a system, designing for a new market or when driving long-term road maps (Beyer & Holtzblatt, 2015). CD consists of two phases with eight steps, as visualized in figure 7. The two phases are Requirement & Solutions and Define & Validate Concepts (Beyer & Holtzblatt, 1997).

The Requirement & Solutions phase starts with Contextual Inquiry (CI), where the user’s needs, desires and approaches are studied. After collecting insights from users, Interpretations sessions are used to ensure everyone in the team brings their own perspective on the data, but ultimately develops a shared view of the user’s needs. This is followed by Work modeling, which leverages the insights collected from multiple and different users and brings them together to create a single picture of the population the system will address (Beyer & Holtzblatt, 1997). These models are a lasting representation of the user’s world and needs. The consolidate data do not change much over time and can be used in multiple product rollouts, unless the industry changes drastically (Beyer & Holtzblatt, 2015). Further on, in the Visioning step the work is redesigned as a result of using the consolidated data to improve the design (Beyer & Holtzblatt, 1997).

The Define & Validate Concepts phase, starts with the team using Storyboards to create a definition of how people use the new system, from the previously defined Vision. The next step is to build and use a User Environment Design (UED), also described as a floor plan for the system. The floor plan describes each part of the system, how they work and fit together and how they support the user’s work without tying this structure to any User Interface (UI). In the following step the system is tested with users through Mock-ups and paper prototypes to be able to find problems at an early stage and fix them at a low cost. In Interaction and Visual Design the user and the designer sit down together and redefine the prototype to better fit the user’s work (Beyer & Holtzblatt, 1997).
Figure 7: The framework of Contextual Design (Beyer & Holtzblatt, 1997)

5.2.2 Principles of CI

The main premises of CI are to go to the user’s work, observe how the user works and ask questions about it. The interaction between user and interviewer should always be built on natural relationships, not on defined rules. There are many relationship models available such as a scientist/subject relationship where the scientist is the expert studying the subject and asking questions that the subject might not even understand. The parent/child relationship is another example where the parent tells the child what to do and the child will do that for approval. A less formal relationship structure that has shown to be successful when collecting data is the master craftsman/apprentice relationship. In this case, the user is the expert in their work and has the role as the master craftsman. The interviewer is not an expert in the user’s work and taking the role as an apprentice automatically adopts the humility, inquisitiveness, and attention to detail needed to collect good data. The apprenticeship’s model needs some modifications to fit into any design team’s needs. Unlike apprentices, the interviewer is not learning the work to be able to do it, but in order to support it with technology. To reach that point and guide the adaption of the technique, four principles are used. The four principles are described as focus, context, partnership, and interpretation (Beyer & Holtzblatt, 1997).
Before going out and observing the user, a *project focus* needs to be established. The focus can be established by first defining the problem expected to be solved. The second step is to broaden the focus beyond tool use and be able to identify potential problems and find new opportunities. Including the whole working process can make the focus expand. This can be performed by asking questions to the user that touch on how the work fits into the whole work life, where the work is happening, and how cultural and social context affect the work. The focus created from these questions will be used as a guide and not as a checklist when conducting the interviews. A clear focus is helpful to steer the conversation into a relevant context without taking the entire control from the user (Beyer & Holtzblatt, 1997). The focus of the project reveals the characteristics of the work domain and what work tasks need to be observed (Holtzblatt et al., 2005).

The principle of *context* is to go where the work is happening and observe the user using the studied work system. It is all about industry-standard field data gathering. The goal with CI is to understand the context of the users to be able to develop deep insights about their lives and apply these insights into a design problem. Usability testing, focus groups, and questionnaires are argued as methods bringing the user out from the context of their life. Without the richness of context insights revealed by these methods, it is impossible to gather information about users emotions, values, motivations, work- around, real world interruptions (Beyer & Holtzblatt, 2015). By exploring on-going work the user can stay focused on concrete details and summaries of the workflow can be avoided. On the other hand, the interviewer desires a detailed explanation of the user’s experience. The possibility of discovering detailed data increases if the interviewer is present during on-going work. Accordingly, interviewer can steer the user from sharing abstract details to being concrete. If the designer would create a system based on abstract insights, there is a little chance the system would be useful for real users. Abstractions can be avoided by letting the user return to real artifacts and events or spend time by replaying past events in detail (Beyer & Holtzblatt, 1997).

The idea of modifying the *partnership* to be more intimate and built on mutual power allows for inquisitiveness about the details of the work. The relationship is maintained by shared inquiry and discovery of the user’s work. The interviewer has the responsibility to keep an open and honest relationship with the user. The interviewer is neither visiting the user to get a list of questions answered nor to answer questions. The relationship should avoid being formal and as quickly as possible pass to be a partnership in inquiry. The goal is to obtain a shared focus and create intimacy with the user to facilitate getting good data (Beyer & Holtzblatt, 1997).

Gathering facts from observing the user and presenting it back to the team is not enough. *Interpretation* can be described as a chain of reasoning that turns facts from the observation into hypothesis, which is an initial understanding of the intent behind the fact. The hypothesis has an implication for the design, which will result in a design idea and the end product of the chain. For the design idea to work, the whole interpretation chain has to be valid. To ensure that the interpretation is right, the new design idea
should be shared with the user and validated. Sharing the interpretations with the user ensures that the work is understood correctly. An interpretation should be shared with the user when in middle of doing their work. One might think that sharing interpretations with users would bias the data. However, if introducing users to the wrong interpretation while working, the statement will perform like an itch and the users will rephrase the interpretation until it fits their own thoughts (Beyer & Holtzblatt, 1997).

5.3 Usage-centered design

Usage-centered design (UCD) is a streamlined and systematic approach to develop software closely fitted to user needs and is simple and easy to construct.

5.3.1 Principles of UCD

Models are used to understand users with respect to their relation to the system, their working intentions and the support they need from the system to perform their daily tasks. Streamlined techniques are used to make software-based systems usable and useful regardless of whether they are installed on desktop computers, mainframe servers, industrial electronics, or accessed via the web. The focus of UCD is on the work that users are trying to accomplish and on what the software needs to supply through the interface to help. Thus, the center of attention is the usage of a product or system rather than the user using it (Constantine & Lockwood, 1999).

The UCD process has a concurrent engineering approach, which means several activities are carried out parallel whenever practical, as visualized in figure 8. The process begins with three activities with the aim of establishing the basic nature of the requirements for the system. Firstly, a Collaborative Requirement Dialogue is negotiated between developers and users to create the requirements together. Secondly, the heart and the core of the process is Task Modeling where a complete overview of the work and the role that the system will support are defined. This activity is interacting with the third activity, Domain Modeling, which defines the interrelated concepts and constructs outside of the immediate scope of the design.

The Interface Content Modeling activity, defining what information should be presented to the user through the user interface overlaps Task Modeling. In Implementation Modeling, the visual design is revised. Operational Contextualization carried out with the initial idea adapts the design to operational and environmental conditions. The Standards and Style Definition is a concurrent activity dependent on other activities, since the design should not be standardized before a project is defined. Concentric Construction and Architectural Iteration are further on representing the implementation phase of the development.

Users are involved in the Collaborative Requirements Dialog, Domain Modeling, Task Modeling, Standards and Style Definition and Usability Inspection. The characteristic of
the process is dependent on the user engagement and can either be user-centered or user involving. Users can either be working in conjoint, with developers and create the end product together or by reviewing and providing feedback of the end product to developers (Constantine & Lockwood, 1999).

Figure 8. UCD activity model (Constantine & Lockwood, 1999)

5.3.2 Essential use cases

The key principles of UCD is to understand what the users are doing and what they are trying to do, and from that develop useful and effective tools. The first step is about understanding and learning the roles of the users and their relationship to the system being developed. The second step is about understanding and modeling the nature of the work the user is supported by. To learn what users really need to accomplish their work, as distinct from what they think they need or want, a dialogue between users and people developing a system is required. With the help of a dialogue, it is possible to gradually build a common understanding of the work and how to support it. The work can be modeled in different ways: for example by scenarios, concrete use cases, or essential use cases. They are all representing successive levels of greater abstraction and generalization that identifies user needs and intentions. The critical piece in UCD is task modeling with essential use cases. Essential use cases are based on the purpose or intentions of a user rather than on the concrete steps or mechanism by which the purpose or intention might be carried out. It includes only those steps that the user is interested in. By using essential use cases many possibilities appear and the design and
implementation of the user interface are moved from being solution oriented to problem oriented (Constantine & Lockwood, 1999).

5.3.3 Users in development process

As mentioned before, the primarily focus in UCD is to understand the work of the users and not to understand the users themselves. However, they are still important in the development process since they are involved in understanding the basic requirements and they are giving feedback on interpretations and design. One clear statement is that users stay experts of use and developers stay experts on development. The professional responsibility is never abdicated to users and developers will never be expected to do the work of the users. The users are not interested for themselves but for the roles they play in the system being built.

The Collaborate requirement dialogue is the first step in the system development process. It is usually starting out with a brainstorm activity between users and the professionals developing the system. In the end of the system development process the users play a big role in giving feedback about the system. During this stage the users are being observed while interacting with the system and asked questions about their actions. The usability inspection technique preferred is heuristic evaluation. The evaluation consists of a two-pass inspection procedure. First, the entire user interface is reviewed in order to understand its overall arrangement. Secondly, individual interaction contexts and their contents are examined (Vicente, 1999).

5.3.4 Joint essential modeling

To develop the core models of UCD there are several techniques that can be used. The idea of using formal and systematic modeling techniques is to understand the users’ needs. The most efficient approaches include collaboration between users and developers. Usually a combination of several approaches is defined as being most effective to use in the modeling phase. Joint essential modeling (JEM) is a process for collaborating with users to develop system requirements. The three approaches forming JEM are Consolidation modeling, Collaborative modeling and Concurrent modeling.

In Consolidation modeling designers, analysts or anyone responsible for the user research conducts separate observations and interviews. The findings are later on merged together after discussions and models are built from this result. This approach separates the information gathering and interaction phase from the modeling and consolidation phase.

In Collaborative modeling, users and developers work together from the start. The immediate interaction between these two groups can solve problems efficiently and quickly since they sit together through the whole modeling phase.
In *Concurrent modeling* is used when the modeling phase is undertaken in several teams. During Concurrent modeling, different teams can interact and share insight with each other simultaneously.

JEM brings together users, analysts and managers to accomplish systems requirements and defining the design of systems being built. The basic objective of JEM is to jointly develop user roles and define essential core models, which later on can form abstract prototyping with users. These activities are defined as collaborative design activities rather than collaborative analysis and can be less time-consuming than Collaborative design activities. Developers individually building the system gather feedback from users instead of having users in the design stage (Constantine & Lockwood, 1999).

### 5.4 Literature summary

The three studied approaches have structured frameworks as visualized in figure 6, 7 and 8, with clear goals and phases. They all have a work-based focus rather than a user-centered focus. The studied approaches are performed in the development of work supportive systems where structured goals of the systems are defined. Cognitive work analysis (CWA) is performed to reduce complexity of the system and support user activities such as deciding, planning, and solving problems. In Contextual inquiry (CI) the principle is to go where the work is happening and observe the user using the work system to understand their goals. Likewise, in Usage-centered design (UCD) models are used to understand users in relation to systems, their working intentions and the support they need from the system to perform their daily tasks.

In CWA the humans’ constraints are studied after the environmental constraints, and the user mental model is argued to not lead the development. CI is considered user-centered, however the user is deeply studied to get a detailed understanding of the work and its context. In UCD, the usage of a system is deeply studied and not the user itself. It can therefore be argued that user research is performed with the interest of firstly understand the environment and the work performed by the user and secondly the user itself.

Much of the content in CI and UCD are similar. Contrary, CWA is a framework mostly used to understand socio-technical systems and the challenges customized to these specific systems. It is therefor not feasible to use this framework when analyzing smaller systems or independent parts of systems. When analyzing smaller systems, the process used in CWA is consider time consuming and labor intensive. However, when studying a complex socio-technical system this approach adds capabilities to support both human cognitive performance and system engineering. The complex socio-technical system must be designed and developed correct the first time, to avoid emergencies like the melt down of the Three Mile Island nuclear plant. There is no room for trial and error over time, hence approaches that are effective for other systems, may not be appropriate for this developing complex systems.
Even if CI and UCD have similar approaches to user research, there are some important differences worth mentioning. In CI the information collecting approach has a consolidate nature, where in UCD the approach has more of a collaborative nature. The consolidated data is defined as not much changeable over time and can be used in multiple projects. However, in both of these approaches the user is considered as an expert in its field and the professional’s as an expert in developing the system. In CI a lot of attention is paid to understand the context of the work and not to develop and design systems with suitable UI. The methods used for collecting data are supporting analyses and requirements rather than software and design. CI and UCD can be combined in a framework, with CI considering being used to create requirement specifications and UCD to support the design of the software and the interface. Since CI is more feasible for evaluating an already existing system, UCD can be used when there is little or no context to observe before developing the system. In both Contextual design and UCD users are involved in an early stage of the development process, where concepts and ideas are explored.

The most common approach to collect information in these three frameworks is by having a dialogue with the users of the system. The methods used are empirical, which means they are involving the user in the study. In CWA, the most common method is in-depth interviews, followed by self-reports and observations. In CI, field-studies are performed where the user is studied in its own context while performing its work. Interviews are held in combination with observations where the user is interpreted while performing its work. In UCD the users are involved in collaborative design activities, which is performed by brainstorming sessions. During the usability inspections in the later stages of UCD, the most common method used is heuristic evaluation.

6. Case study

6.1 Background Spotify

Spotify is a Swedish music streaming service providing its users with over 30 million songs via searching for artists, albums, titles, labels and genres and including both small independent and major labels. The service was launched in Sweden 2008 by Daniel Ek and Martin Lorentzon and has since been spread to 58 countries and has over 75 million active users where over 20 million of them are paying subscribers. The service is available on multiple devices, such as computer, mobile phone, tablet and home entertainment systems (Spotify, 2015).

The mission of Spotify is to give users ‘The Right Music for Every Moment’. That is the narrative of the company and what Spotify wants its users to expect from the service. The products are always aiming towards fulfilling this mission while also achieving the core values; easy, personal and fun.
Spotify is a part of the music streaming industry, which generates a revenue that exceeded 1.6 billion dollars in 2014 and accounts for 23% of digital revenues (IFIP, 2015). The music streaming industry has been growing tremendously during the last couple of years. Despite the tremendous growth, the industry is criticized for not paying musicians enough money (Rivalfox, 2015). Among Spotify’s competitors in this industry are: French music streaming service Deezer, Google’s Songza, Apple’s Beats Music and Jay Z’s Tidal (IFIP, 2015).

6.1.1 Agile teams at Spotify

Spotify is known for the way the engineers work in small teams following an agile approach. The engineers are divided into around 70 small teams, called squads, the basic unit of development at Spotify, as visualized in figure 8. The teams are designed to feel like mini start-ups and are self-organized. They have different missions such as building and improving the iPhone client, developing features, scaling the backend system, etc. Every squad has a product owner who is responsible for prioritizing the workload, but does not define how the work is done. Multiple squads working in related areas are grouped into tribes, which are then grouped into alliances. This model of scaling has both advantages and disadvantages. The advantages are that the teams are autonomous and have direct contact with their stakeholders and have no blocking dependencies from other squads. However, this can be a disadvantage as well since a developer in one team can struggle with an issue that another developer in another team knows the solution for. Groups called guilds are created for people with similar interests to share knowledge. The teams have an independent structure, each provided with skills and tools needed to design, develop, test and release to production, however knowledge is still shared between different areas. If squads were fully autonomous with no communication between teams, it would be pointless to be one company. In many organizations people with similar skills are “pooled” together into functional departments and “assigned” to projects, but Spotify uses a matrix weighted towards delivery. The primary dimension of the matrix is the vertical, where people are placed in squads, self-organized to deliver a great product. The other dimension is the horizontal, ensuring knowledge sharing across squads (Kniberg & Ivarsson, 2012).
6.1.2 Development process at Spotify

At Spotify all major product initiatives go through four stages: Think it, Build it, Ship it and Tweak it, as visualized in figure 9. This flow is used to reduce the risk of building the wrong product that does not improve the overall experience of using Spotify or delight the user. A new product idea can come from anyone in the organization and often emerges from hack weeks at Spotify. If the management team approves the product idea, a small cross-functional team is created to enter the Think it stage. The cross-functional team often consists of a developer, a designer and a product owner. In the Think it stage, the group discusses what and why a product should be built with an outcome of a product definition and several prototypes. The product definition should include a narrative that tells the product story for launching the product to the world. In the Build it stage, the cross-functional team is expanded and includes several people within development, testing, marketing, design, etc. The goal of the Build it stage is to build a minimum viable product (MVP) using iterative methods in an agile

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2 Hack week happens twice a year and anyone in the organization can participate. The participants are focused on a new product idea from the Think it stage to the Build it stage.
environment. The *Ship it* stage is about launching the product to all of Spotify’s users gradually, by beginning with 1% of the users. The idea of launching the product to a small percentage of the user base is to iteratively evaluate and improve the product before launching it to the whole user base. When the product is available to all users, the *Tweak it* stage is entered and the focus is on product improvement. The product is tested through A/B tests until it reaches a local maximum and fulfills the definition of a great product.

![Diagram](image)

*Figure 9. The development process at Spotify (Kniberg, 2013)*

### 6.1.3 User research team at Spotify

At Spotify many decisions are based on collected user analytics data and it is known as a fast-paced data-driven company. During the last years it has been observed that analytics data alone is not sufficient for all service and experience decisions. User research and user-centered thinking has been introduced to make the product even better. The user research team is accountable for defining, planning and conducting user research and delivering insights back to the product, design and marketing organizations (Spotify, 2015).

The user research team was created in 2013 in Spotify’s Stockholm office to introduce a deeper user-centered perspective to the development process. In the beginning, the user research team was mainly focused on performing weekly user testing sessions to include real users’ insights as quickly as possible at low-cost. The organization has responded positively however, it has been challenging to all the needs and requests in the organization with a small team and a low budget.
The team today is a group of five, with two researchers in the New York office and three in Stockholm and is an international team with different professional backgrounds. The team members define the strategic research needs, but also receive research requests from stakeholders across the company. The stakeholders can be designers, product owners or a whole team. When the research is performed as an initiative of the user research team, the motivation is to collect and share user insights that tell a valuable story to the organization and inform the company priorities. Research initiatives can also be driven by need to explore a specific market, a new opportunity, or to challenge implicit assumptions. The team sits together within the Design team although they collaborate with multiple squads. They have regular activities such as briefings, lunches, workshops, off-sites and social activities to build team cohesion.

6.2 Methodology

The case study was performed in the user research team by observing, planning and conducting research projects. Conducting projects together with the team allowed for a deep knowledge about how they perform user research to be gained. Apart from performing actual user research, qualitative interviews with key people in the were conducted to get an understanding of their background. Visits to Spotify’s offices in London and New York were made with the goal of observing how research is conducted in different offices with additional facilities and a more varied user base than in Stockholm.

6.2.1 Interviews

The team interviews were both formal and informal in structure focused on collecting data to enable a deeper discussion around specific interest areas. The formal interviews had a semi-structured approach allowing respondents to openly represent their experiences in the user research team (Creswell, 2009) and were held with the team leader of the user research team, two lead user researchers and two user researchers. The interviews uncovered a broader perspective of methods and practices performed at Spotify over time. The interview questions are found in appendix A.

6.2.2 Observations

Several research sessions were observed to understand how the user research team conducts their work and the methods they use. Some sessions observed included user interviews, usability tests, users diaries, and focus groups. In addition to research sessions, findings and insights presentations, an off-site visit, and visits to other offices were also observed or conducted to study how the user research team works in natural and appropriate environments (Cooper & Schindler, 2003).
6.2.3 Practical

A practical application was conducted, performing different user research methods in two projects, the Global Moments and Running studies to better understand how different methods are used within Spotify including: interviews in users’ homes, interviews in context (running), usability testing, guerrilla testing, and 1:1 interviews. The data from these sessions were analyzed and the resulting insights presented to different teams within the company.

6.2.4 Global Moments project

In the Global Moments project users’ behaviors, needs, and media trends were studied over a couple of months to identify opportunities for Spotify and the role of different media types in users’ lives. The participants were within the Spotify target audience and between the ages of 15 and 34. The research project was a cross-functional initiative between the user research team and the Consumer Insights team with participation from seven researches in total. The research approach consisted of weeklong online user diaries followed by 1:1 interviews in participants’ homes. Around 100 participants completed the online diaries and 35 participants were chosen to take part in the in-homes interviews. In total the research project delivered 700 days of diary entries and more than 70 hours of in-homes interviews. The markets explored during the study were Brazil, UK, Sweden, USA, and Germany.

The online user diaries had several activities for participants to complete each day during a weeklong period. First, the participants were asked to share their daily schedule and a bit of information about themselves. Second, they were asked to draw a map of their home indicating where they consumed media and on what devices. Third, they were asked to create an entry each time they consumed media during three days by posting pictures, videos and descriptions of their context. Fourth, they completed one day without any media and were asked how it felt and what they had missed the most during that day. Finally, the participants were asked to share the shows they could not live without and their most used mobile apps.

The most interesting participants were asked to participate in longer 1:1 interviews in their homes when the online diaries were completed. Meeting with the participants in their homes created a deeper understanding of user needs, behaviors and trends as well as how, where and why they consumed media.

Several researchers, with different researchers visiting different countries based on their language and country background, conducted the research. During this degree project one in-home interview was moderated and two interviews observed in Sweden and three in-home visits were observed in the UK. Three researchers performed the interviews together with one researcher moderating and the others taking notes, photos, and recording the sessions allowing the moderator could focus deeply on the conversation with the participant.
When the data collection was completed, all the information and artifacts were collected and stored including notes, pictures, videos, collages, and maps of participants’ homes. Data from the online user diaries was also collected and stored.

The information was then interpreted and shared with the rest of the organization. Given the scale of the research project, the full interpretation and analysis was not completed during this degree project. However, several workshops were held across the organization with the purpose of communicating the research and sharing initial insights. Poster boards were created for each market containing information like screenshots, drawings, and photos from both the diaries and the in-home visits and placed in the New York and Stockholm offices. The purpose of creating boards was to share insights from the research project and to create empathy for the users. The boards were placed in common areas of the office, to reach the largest audience possible. Pictures of the boards are found in appendix A.

6.2.5 Running project

The second research project was an on-going project joined during the degree project. The research was performed to support the team in building a new music experience for running. The feature was in the Build it phase, and thus required a different research approach than in the previous described research project. The research sessions consisted of usability tests, 1:1 interviews and in context observations of users interacting with the product while running. For this project, close relationships developed through close communication with the squad. As a result of these relationships, it was possible to understand the squad’s view of user research and further understand the agile approach used by the engineering teams.

Three usability rounds were conducted through 30-45 minute 1:1 interviews in the usability lab with 5 participants. The sessions were structured from a discussion guide that was written beforehand and used as a supportive tool to remember what topics needed to be discussed and what features were to be tested. During the first usability tests, a prototype was tested to gain early usability feedback and the findings were reported back to the squad developing the feature. Action points were given to the squad based on the findings and the prototype was tweaked and used in the second round of testing for further evaluation. In the last round, the actual product was tested both in the usability lab and with users during runs. Pictures of the design iterations are found in appendix B.

Three rounds of running sessions were performed in a park nearby the Stockholm office with three to five users in each session. The purpose of running with users was to evaluate the user experience of the feature in the context of use. These sessions were 30-45 minutes long and each had a different focus. In two of the sessions, it was important to understand the quality of the music suggestions, and how well the music matched the tempo the users were running at. In the third session, the focus was to test content developed by Spotify especially for running. By observing users in the right context,
several usability issues were discovered that would not have been found otherwise. One of the findings was that the users put the phone directly in the pocket when starting a run, which put certain unanticipated demands on the UI. After each running session, an interview was performed to discuss what worked and what did not work well in the experience.

6.2.6 Setting

The setting chosen for the case study was within the user research team at Spotify in Stockholm. Spotify was chosen because of accessibility, the ability to provide data readily and quickly, and the presence of practical influences for guidance (Silverman, 2005). The user research team sits within the Design team, so an understanding of the designers’ work could also be built during the degree project.

6.3 Result

6.3.1 Types of user research

User research is performed in different ways at Spotify and is categorized into two types of user research: *formative, and evaluative*.

*Formative* research is often performed as a first step in the development process to lead the company in the direction of the users’ needs and behaviors. The *formative* research has the goal of exploring new phenomena and to find and create new opportunities for the business to explore. *Formative* research is used to influence the company and long term the product development strategy and investments. *Formative* research should be performed before or during the *Think it* stage to make sure the insights are leading, rather than trailing, the development. *Formative* research helps the organization build something centered around actual user needs instead of what the organization believes the user needs.

*Evaluative* research is performed during the *Build it* stage to explore and test products that are being developed. *Evaluative* research helps the organization change the design and features investments during the development phase. The insights from the research are used to inform product tweaks prior to shipping to real users. Several methods can be used during this phase, but user testing or A/B testing are used most commonly. It can also be performed in the *Tweak it* phase when the product has been released to users and there is an opportunity to evaluate what’s working and not working in the real product in real world use.

6.3.2 User research methods

The user research team leverages several different research methods and depending on the nature of the project, including size, budget and timing, a mix of methods is aimed to be used. The stage of development and whether the research is meant for exploring
vs. evaluating also places constraints on the research methods. Some of the most used methods by the user research team are *interviews, user diaries, surveys, focus groups, usability tests, and guerrilla tests*. The user research team is also getting more and more involved in guiding A/B tests as a result of close cross-functional collaborations with data analytics teams.

*Interviews* are performed primarily to explore user needs and behaviors to influence the product development. The interviews usually have an open or semi-structured approach allowing the user researchers understand and analyze the user needs and can be held in the usability lab, on the street, during runs, in users’ homes, etc. Interviews in users’ homes are held to explore the context and constraints of users’ everyday lives in their real world environment. Ensuring that the respondent feels comfortable in the interview is an important objective. When the respondents feel comfortable, they will be more open and honest with their responses and show more natural behaviors. In-home interviews also allow the researcher to see how the participants’ interact with products in their own context and gain insight into how people are actually using the product.

*User diaries* enable collection of insights on a daily basis and over an extended period of time or during a time that is difficult to observe. They can also be used to study the user’s everyday life and let them share everything from schedules, pictures, videos and general comments. The information from the user diaries can be used in different ways, both collected in a qualitative and a quantitative way.

*Surveys* are performed widely, usually mixed with other methods such as interviews, focus groups, guerrilla tests, and A/B tests. The surveys can be created quickly at a low cost with a large number of participants. The survey can be used in both a quantitative and qualitative way, by varying respondent by using either open ended or closed responses. The surveys are often sent to users within the Spotify’s user base where a request is sent to the analytics team to help with identify a group of Spotify users that fit the requested participant profile. The survey is sent to the minimum number of people required to get a representative response to avoid unnecessarily spamming the user base. The tools used for surveys are SurveyMonkey and Qualtrics. They provide online survey software and an insight platform with questionnaires. Qualtrics is more powerful and has more functionality but they have both the same value proposition. The user research team works with the analytics team to create a deep understanding about the users and their behaviors.

*Focus groups* are used to explore new areas of interest through participant discussions and uncover interesting patterns and trends. When focus groups are performed at Spotify, a second researcher often takes notes to avoid the interviewer having to write down insights while moderating the focus group. The note taker usually sits in the room next to the participants to avoid interference in the session is preferred.

*Usability testing* is one of the most common research methods at Spotify and is used during the *Build it* and *Tweak it* stages to identify early usability issues that can be
communicated to squads and fixed during development. Often a second session of testing is used to evaluate any product tweaks from the initial round of testing. The usability testing sessions are usually 30-60 minutes in length and consist of both open-ended and closed questions enabling both exploratory and evaluative research in the same session. The usability tests are mostly performed in the usability lab in the office.

Guerrilla testing is a method used by the user research team for getting extremely rapid insights from users with no cost. The guerrilla testing sessions are usually performed in coffee shops, parks, train stations and open squares to get early feedback on prototypes and features when under time pressure. Guerrilla testing is usually performed when the user researcher receives an urgent request from a stakeholder. This method removes the time and costs associated with recruiting so it can be executed immediately, without expense, however it is less contained and will not ensure representative insights.

Squads that are nearing the Ship it stage or are in the Tweak it stage perform A/B tests. The user researcher works with the squad to add more insights from other channels, such as surveys and usability tests to help them relate the metrics back to user behavior, which they know most about. The tool for A/B tests on the Spotify website is Optimizely which collects visitor data, targets optimized experiences, and integrates data across platforms. Changes to the website can be tested against the current design to determine which produces the best result using metrics such as conversion rates, number of sign-ups, click-rates, and subscription purchases. For A/B tests on the Spotify product a home-built A/B platform is used so that the test metrics can be customized and to ensure the product can handle an increased amount of data. The A/B platform delivers information to the users’ devices at login to ensure they receive the correct experience for their assigned cell. The platform controls all experiments and can start, stop and experiment or change the cell sizes. When the experiment is completed the platform computes business metrics automatically.

6.3.3 Communication

At Spotify, the user researchers spend their time divided between conducting research and communicating findings. There is a vision of the team leader that the team should spend equal time on both. The team has gained a lot of insights from recurring issues observed during several research sessions that are considered obvious to the user researchers, but have not been internalized outside of the team. Communicating insights to the rest of the company is critical to influence and grow the habit of using a user-centered approach and incorporating these insights when developing the product. Research findings are shared to the rest of the company through reports, poster boards, video recordings, pictures, workshops and briefing meetings.

Sharing insights in Google slides reports is the most common method to enable easy and quick sharing and collaboration across the organization since the rest of the organization uses Google productivity tools. The reports focus on communicating insights to be shared as soon as possible and are communicated to stakeholders in
person to discuss the findings and the next action points. Depending on what type of research is performed, the next step of the process varies depending on the degree of impact the research is having. For example, after discovering new patterns and trends in a focus group a survey to a large group of participants might be conducted to see if the same patterns and trends hold true in the broader population. After usability tests, the designer might want to re-design a feature and do another test to evaluate the re-designed product experience.

A broad research study combining user diaries and in-homes interviews can lead to teams re-thinking the design of the whole product. This type of research project can be communicated in many ways. One communication strategy can be to create physical boards with information and pictures collected during the research placed all around the offices to educate the rest of the organization and create empathy. The boards are used to both communicate research findings and to educate the organization about user research.

The findings can also be used to educate teams in the organization through user research led workshops allowing others to interact with the data in a way that is relevant to their discipline and develop empathy for the users. Creating empathy enables those developing the product to relate to and incorporate real users needs. Workshops also facilitate cross-functional collaboration and knowledge sharing.

Pictures and video recordings are considered essentially useful for creating empathy when teams cannot attend the sessions in person. Pictures and videos can be used to support arguments and insights the researchers are communicating and convey feedback directly in the words of the users. They are also used to show the rest of the organization who the real users are and give them a voice and face.

### 6.3.4 Usability lab

Spotify has three usability labs (user labs), one each in Stockholm, London and New York and the user research team conducts research with users in these labs. The user labs consist of two rooms with a one-way window separating them and allowing for observation and note taking from the adjacent room. The interviewer shares the video and sound recording via Google hangouts so teams can observe remotely and send questions to the interviewer through Google Hangout chat. The audio-visual facilities differ in sophistication across offices; New York has professional built in video and sound, the Stockholm office has a handmade camera glued to a paper stand, and the London office has basic voice intercom technology.

### 6.3.5 Recruiting

A recruiting firm in each city handles the recruiting for all types of research: interviews, user diaries, focus groups and usability tests to reduce the time spent by researchers looking for participants. When recruiting participants for surveys, the analytics team
identifies users in the database that fit the recruiting profile or the team pays an external company for access to a user panel. When performing guerrilla testing, the user researcher selects participants from a coffee shop or any public space based on who is present. A structured screener is used when it is important to get participants that fit a specific profile or when looking for participants that are not Spotify users. The target audience for participants is usually between 18-35 y/o, a mix of women and men, using mobile devices, and a mix of non-Spotify users, Free users and Premium users. Research about a certain feature or area often requires more specific participant attributes, for instance, when testing the running experience, participants that run 1-2 hours per week are required.

6.4 Case summary

The user research performed at Spotify has a user-centered focus and a goal of delivering user insights to the product, design and marketing departments. User research is performed to support the development of an entertainment product, to accommodate users who are using the product in a variety of ways with different goals. For instance, some users are using the product to enhance their running capacity with the help from the music, where others want to listen to music at home to focus better when studying. There is a clear emphasis on understanding these users and their needs, behaviors and expectations. The user research team delivers these insights by evaluating the product with users during the development. The insights from usability tests are presented back to the product and design teams to tweak the experience iteratively during development. User research is also performed to explore new user trends and patterns. Performing formative research helps the team discover new concepts and content and to understand whether to bring those insights into the product. Insights can also be shared by placing boards all around the offices in New York and Stockholm to communicate user stories and create empathy.

Spotify is known for its successful agile environment, with the four stages of product development: Think it, Build it, Ship it, and Tweak it. User research can be performed during all stages of the development to impact the product. Today there are no clear guidelines when user research is most efficiently used or most impactful. Early stage cross-functional teams often do not include a user researcher, limiting user input in the concept and idea stage. User research and the agile environment could be better integrated with one another. Engineering teams are working in an agile with rapid and iterative development. The products are launched early to get feedback quickly by 1% of the users, so the product can be tweaked when launching to a larger user base. The environment asks for quick insights, which does not always match the cadence of the user research team. The user research team has the goal of delivering insights back to other departments, and is not always aligned to product development. Considering the team’s small size, their involvement and impact it reaches many projects. However, in some projects, due to limited capacity, user research is not conducted at all and products are released without usability testing.
The user research team performs a mix of empirical methods, both qualitative and quantitative and working with the analytics team and consumer insights teams to understand experience and content needs. The methods most frequently used are interviews, user diaries, surveys, focus groups, usability tests, guerrilla tests, and A/B tests. The methods are used qualitatively and quantitatively. Quantitatively through formal approaches with structured questions and large-scale data, and qualitatively through open-ended questions and discussions with the users during research session.

The user research can be informal, unstructured and briefly planned, by visiting coffee shops and talking to a few users to get quick feedback on design or content or it can be structured and planned, inviting users to the office to give comments on design and concepts. This enables the development teams to get quick feedback on the product and the users are relaxed and open for discussing the user experience, intuitions and reflections. Limited participant numbers and lack of structure may result in findings that are not reliable enough to base further work on. Formal methods are performed to measure the usability of the product with all users performing the same tasks under similar conditions, to give reliable data. Various mix methods are performed to better understand the design and concepts and to base assumptions on reliable data.

The user research team is very flexible and adjusts the methods and practices according to the stage of the development. The different types of user research are categorized in two groups: formative, and evaluative. The Global Moment project is an example of formative user research where media trends and patterns were studied along with user behaviors and needs. The insights from the project have an opportunity to influence the organization in many ways, both in existing projects and in future projects. The impact of the user research is harder to measure than in evaluative projects, such as the running project. The running project required evaluative research with a few users invited to the office to give feedback on the product and findings quickly communicated to the team developing the product. The preparation of the usability test took a couple of days, and consisted of activities such as meetings with the team developing the product, recruiting the users, creating a discussion guide, and preparing the usability lab. The Global Moment project, on the other hand, had a planning and preparation phase of a couple of months.

In formative studies the users are studied in their own context, during in-homes visits, by in-depth interviews or focus groups. These methods are discussion based taking place between the user and the user researcher. In evaluative studies, the users are studied in usability tests or A/B tests to evaluate assumptions and see how they interact with the product.
7. Comparison

After studying how user research is performed in an academic setting and in a commercially driven company, similarities and differences have been discovered. The first research question presented in this degree project is about defining the main differences between these two fields. Further on, these findings are presented and analyzed.

The academically accepted user research methods and practices studied are performed when developing work supportive systems. In the studied commercially driven company the user research methods and practices are performed to understand the goal of users within an entertainment product. When studying a work supportive system the goals are easier to define than the goals of users using an entertainment product such as a music streaming service. Users will have several different goals when using a music streaming service compared to employees in an organization using a work supportive system. The users of a work supportive system will generally use the system with the same goal since it is associated to their daily work tasks. An entertainment product can be used in various situations and for users to achieve various goals. The user goal of an entertainment product is simply not as distinct and easy to map as that of a work supportive system, where the very purpose is given. This puts heavier demands on the user research methods and practices performed when studying an entertainment product than when studying a work supportive system.

In the academic approaches the knowledge about the users’ performances is privileged over the knowledge of the users. The context in which the users are performing their tasks and how the tasks are performed is studied at firsthand. While in a commercially driven company, the user is playing a central role in the research. The needs, behaviors and expectations of the user are studied to get a deep understanding of the target-users. These insights are shared with the rest of the company to remind them of who the real users are. Considering it is harder to define the goal of a user using an entertainment product than one using a work supportive system, it is understandable that more effort and time is spent on understanding the user in-depth. Communicating insights to other teams in the organization also plays a large role in commercially driven companies. The knowledge tends to be locked in the user research team if time is not spent on transferring insights, understandings and feelings for the users to the rest of the organization.

Academically accepted user research methods and practices are following a structured framework with clear goals. The practices can distinctly be defined in structured steps, performed either concurrently or consecutively. User research is performed on an ongoing basis and is especially important in early stages of the development process. The approaches are normally performed in projects using the waterfall development model. User research is performed using formative studies in the beginning of the process and evaluative studies such as usability inspection in the end. In a commercially
driven company the framework of when and how the user research is being performed is not as structured. The main difference in the structure of the performance is not about a commercially driven company using an agile development model and the academicals performing user research in a project using a waterfall model. The difference is about the commercially driven company not having structure guidelines of where in the development user research should be performed to best impact the product and best support the organization.

The most common methods used to collect data in the academically user research are field-studies, interviews, observations, brainstorms and usability inspections. The methods have a structured characteristic where time, effort and deep knowledge are needed. The methods used in a commercially driven company have a different characteristic depending on the project. The methods can differ from in-home interviews to usability tests, which put different demands on the research. The in-home interviews require deep knowledge that goes beyond understanding of standard information collection and analysis procedures. Usability tests do not require as much effort and time as the in-home interviews and can be performed on a basis when it is most needed. In a commercially driven company, methods are performed both quantitatively and qualitatively depending on the purpose of the user research. The user researchers are flexible in combing methods to best answer the questions required for the project. Commercially driven companies have a tradition of making key decisions based on collected user analytics data. Qualitative methods that incorporate analytics are appreciated, since it is not understandable by some that findings can be drawn from just studying a few users. Since commercially driven companies have a tradition of making key decisions based on user data, user researchers in these companies use both quantitative and qualitative methods to be sure the data is reliable and not questioned. Conversely, in the academically defined user research the characteristics of the methods are rather qualitatively defined than quantitatively.

8. How these can learn from each other

Commercially driven companies would benefit from adapting a systematic approach to user research methods and practices. The agile environment puts challenges on user research to fit into the development process. Agile methods are well suited for developers working in teams, where their needs and work are the center of the process. One concern of this focus on developers is that user research does not have a clearly defined role and place in the development process. By adapting a systematic approach with guidelines of best practices, user research will have a larger impact on the development.

By planning and conducting user research in the beginning of the development, the team already has concepts and a design to follow. The user research team can always be one step ahead and consequently lead the development instead of just supporting it. The
development will be much more user focused if it is lead by the user researchers delivering insights from the users and not only confirming the assumptions drawn by stakeholders. It is less costly to develop a product that fulfills users’ needs from the beginning to the end rather than trying to match it in the end of the development process. In the end of the development process, the product will already be built and resistant to large changes.

Qualitative feedback is necessary during the development process with user research preferably performed iteratively during the development to have the greatest impact. By performing evaluative user research during the development process, the knowledge of the users can be transferred to the team developing the product and maintain that learning attitude. Some data about users does not change much over time and can be used in multiple development processes. The data should be shared and easy found by development and research team members to avoid performing redundant user research.

Most of the user research methods and practices performed in academia are labor and time intensive. Academic methods and practices will be limited if they are not adapted for innovative research. The academic field can benefit from the commercially driven companies by adopting research methods and practices that are eclectic and that can reduce the workload. User researchers in commercially driven companies are flexible and use multiple methods for collecting data. They use both quantitative and qualitative methods and collaborate with analytics and consumer insights teams to design studies and better understand the findings.

As users’ professional life and personal life are becoming more closely aligned, work supportive systems will need to be designed to better fit into people’s life. Today people can work almost anywhere: at home, in a coffee shop or from a beach. The need of always being online and connected has put new demands on the products and systems users are working on. Borrowing characteristics and features from the users’ entertainment products that already are valuable for them, can enhance work supportive system. If work supportive systems are designed to better fit user’s life outside work, the users will need to be studied in a manner where personal needs, behaviours and expectations are taken into account.

9. Discussion

This study has been focused on a single case study and the findings will be challenging to generalize since only one company was studied in-depth. This knowledge can be refined and improved by studying multiple companies. To get a more reliable view of how user research is performed in commercially driven companies, a survey could have been sent out to several professionals working with user research in different industries.
Likewise, it would have been useful to send out a survey or perform interviews with researchers performing or studying user research. The results from the survey could have been compared to get a more clear view of the differences between academic’s and professional’s approach to user research.

The study contributes with a rich understanding of how user research is conducted at Spotify. The above-mentioned results can provide aspects and insight that can guide other students to focus their studies on how user research is performed in other companies and compare with theoretical frameworks used in further agile environments. The knowledge from this study can be used for companies to open up for discussions on how they perform user research and what they can do to work more efficient and make a larger impact on the product development.

10. Conclusions

The purpose of this degree project was to compare academically accepted user research methods and practices with such user research performed in commercially driven companies. The findings from the literature study and those from the case study have been compared and will further on answer the research questions.

*What are the main differences between user research methods and practices defined in commercial and academic context?*

User research practices in an academic context are following a more structured approach than the user research practices in a commercial context.

In academically user research compared to user research in commercially driven companies the knowledge about the user’s performance and its context is privileged over the knowledge of the user and its needs, behaviors and expectations.

User researchers in a commercial context are further flexible to use a mix of methods compared to the user researchers in an academic context.

*In what way can these two approaches benefit from each other?*

Commercially driven companies would benefit from adapting a systematic approach to user research methods and practices. Particularly focusing on performing user research before the start of development and evaluating the system through out the development using iterative methods. Finally, unchangeable data about the users should be seized and used in multiple projects.

Academicals would benefit from using a mix of methods when performing user research and privilege the knowledge about user’s life and merge these insights with the work related user research.
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Appendix A

Interview questions

1. Can you tell me about yourself and your professional background?

2. Can you tell me more about your previous workplace?

3. Can you tell me how you performed user research in your previous role?

4. Can you tell me about a user research study you performed at your previous workplace?

5. How did you perform user research in the project?

6. If you compare how user research is performed at Spotify and at your previous workplace, can you tell me about the similarities and differences?

7. What do you think the user research team is good at?

8. What do you think the user research team can be better at?

9. How do you think the user research team will work in the future?
Appendix B

Boards from the Global Moment study

New York office
Appendix C

Design iterations of Spotify running

Design 1: 18th March

Prototype - Category page

Prototype - Detecting tempo

Start Running

Detecting Tempo

What's your tempo?
Design 2: 9th April