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SURAKKA SAMI

PRODUCING A STYLE GUIDE IN SOFTWARE PRODUCT DEVELOPMENT USING THE LEAN UX METHODOLOGY

Master of Science thesis

Examiner: prof. Kari Systä
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ABSTRACT

SAMI SURAKKA: Producing a Style Guide in Software Product Development Using the Lean UX Methodology
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Lean UX is a novel framework for bringing lean philosophy to User Experience design. Traditional approach to design often becomes the bottle-neck in agile software development, requiring heavy up-front work. Lean UX attempts to solve this by applying lean principles to the design work. The framework was originally developed by Jeff Gothelf and Joshua Seiden.

Style Guides are a collection of guidelines, rules, standards and best practices. Their aim is to facilitate work by speeding up the design and implementation processes and making the products consistent at all levels throughout the processes.

This Master of Science thesis examines how Lean UX framework can be applied in producing a style guide. The thesis focuses mainly on the practical application of Lean UX, with the style guide serving as the vehicle for applying the framework. The contributions of this thesis are the practical application of the Lean UX framework and the synthesis of some of the best practices such as a canvas approach to the design strategy and application of the Google HEART framework together with Lean UX.

The thesis was written as a part of the UX team in the product development of Insta Response. Insta Response is a product family of mission critical emergency center applications. Some of the selling points for the product family are the ease of use and a seamless experience throughout the products. To better achieve this, a style guide was needed.

The Lean UX applied together with a UX Canvas and the HEART framework provided a solid foundation for taking the style guide from an idea to building and releasing the style guide. The canvas made the principles of Lean UX visible and concrete and allowed to perceive the relationships between the principles. The canvas also lent itself for integrating the HEART framework to the Lean UX process.

During this work, two iterations of the Lean UX Build–Measure–Learn loops were run producing two different Minimum Viable Products. The hypotheses and metrics were adjusted between the iterations based on what was learned.

The measured metrics indicated that the style guide was fairly successful in achieving its goals. However, some of the results indicate that another format for the style guide might be more efficient. In a wider perspective, the work conducted on the style guide formed a base for the UX team to adopt the Lean UX more widely with its practices.

TIIVISTELMÄ

SAMI SURAKKA: Tyylioppaan laatiminen ohjelmiston tuotekehitysprosessissa käyttäen Lean UX -metodologiaa
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Lean UX on uusi viitekehys, joka pyrkii yhdistämään lean-filosofian käyttökokemuksen suunnittelun kanssa. Ketterässä ohjelmistokehityksessä perinteinen suunnittelu saattaa usein muodostua pullonkaulaksi, sillä se vaatii paljon etukäteen tehtävää työtä. Lean UX pyrkii ratkaisemaan tämän tuomalla lean-periaatteet suunnittelutyöhön. Lean UX -viitekehys on alun perin Jeff Gothelfin ja Joshua Seidenin keksintö.

Tyylioppaat ovat ohjeiden, parhaiden käytäntöjen, sääntöjen ja standardien kokoelmia. Niiden tarkoitus on helpottaa työtä nopeuttamalla suunnittelua ja toteutusta, parantaen samalla tuotteiden yhdenmukaisuutta usealla tasolla prosessien eri vaiheissa.

Tässä diplomityössä tarkastellaan, kuinka Lean UX -viitekehystä voidaan soveltaa tyylioppaan laatimisessa. Työn keskiössä on Lean UX -viitekehyksen käytännön sovellutus. Tyyliopas toimii välineenä viitekehyksen tarkastelulle. Tämän työn tieteellinen panos on Lean UX -viitekehyksen käytännön sovellus ja eräiden parhaiden käytäntöjen syntetisointi viitekehyksen kanssa, kuten canvas-lähestymistavan käyttö suunnittelustrategiassa sekä Google HEART -viitekehyksen soveltaminen Lean UX -viitekehyksen kanssa.

Tämä työ kirjoitettiin osana Insta Responsen tuotekehitystä. Insta Response on hälytyskeskus sovellusten tuoteperhe. Tuotteen myyntivaltteja ovat helppokäyttöisyys ja käyttökokemuksen saumattomuus. Tyyliopasta tarvittiin näiden seikkojen tueksi.

Lean UX -viitekehyksen sovellus yhdessä UX Canvasin ja HEART-viitekehyksen kanssa tarjosi pohjan, jonka avulla viedä tyyliopas ideasta sen julkaisuun. UX canvasin käyttö toi Lean UX-periaatteet näkyviksi sekä auttoi periaatteiden välisen dynamiikan ja suhteiden hahmottamisessa. Canvas myös teki mahdolliseksi HEART-kehyksen saumattoman integroinnin Lean UX-prosessin kanssa.

Työn aikana suoritettiin kaksi iteraatiota Lean UX -kehyksen rakenna–mittaa–opi -sykliä. Kumpikin sykli tuotti erilaisen tuotteen (Minimum Viable Product). Tyylioppaan hypoteeseja ja metriikoita hienosäädettiin iteraatioiden välillä sen perusteella, mitä oltiin opittu.

Mittaustulokset osoittivat tyylioppaan olevan melko onnistunut tavoitteidensa saavuttamisessa. Osa tuloksista kuitenkin viittaa siihen, että toisenlainen formaatti voisi soveltua tyylioppaaseen paremmin. Laajemmassa perspektiivissä tyylioppaan tiimoilta laadittu työ muodosti pohjan omaksua Lean UX -viitekehys laajempaan käyttöön.

PREFACE

When someone studies for a long time at Tampere University of Technology (TUT), it is common to denote us as n^{th} year students. During my n years, I have learned to keep my study institution in very high regard. When someone graduates from TUT, one can be almost certain that the person has undergone a wide-ranging set of studies and has a skill palette that not many other institutions can match. I am proud to finally join the Tampere University of Technology alumni.

It has been a long and very edifying road alongside my role as a father to two sons, as an employee of Insta DefSec Oy and as an entrepreneur working towards my Master of Science degree. For making my graduation possible, I want to thank everyone who has supported me in my study endeavors.

I want to thank my director and examiner at TUT, professor Kari Systä for his thought provoking comments and his valuable insights during the writing of this thesis.

A well-deserved thank you goes to my colleagues at Insta. I want to thank Maija Wirlander who suggested this topic. I also want to thank my superiors Jukka Saari and Juha Nurmi as well as the Product Owners Arno Karppinen and Anttiolli Aho who gave me invaluable feedback during the thesis. All the test participants deserve my thanks although the ethics of a researcher require me to keep you anonymous – you know who you are: thank you!

This thesis would not have been possible without the support of my family. First, I want to thank my parents-in-law Tarja and Pauli Kauhanen, whose help was absolutely indispensable. You contributed more than you know. Second, I want to thank my own parents Veikko and Tiina Surakka for their support.

Finally, I want to thank my wife and sons: Anna-Lydia, Jonatan, Nooa. Thank you for waiting. Thank you for your patience and support throughout the years of my study. I love you.

Tampere, 24.5.2017

Sami Surakka

CONTENTS

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

BMC	Business Model Canvas
BML	Build–Measure–Learn
GSM	Goals–Signals–Metrics
GUI	Graphical User Interface (see also UI)
IID	Iterative and incremental development
LC	Lean Canvas
LSD	Lean Software Development
MVP	Minimum Viable Product
NPS	Net Promoter Score
PDCA	Plan–Do–Check–Act
PDSA	Plan–Do–Study–Act
PO	Product Owner
RQ	Research Question
SM	Scrum Master
SUS	System Usability Scale
UI	User Interface
UX	User Experience

1. INTRODUCTION

This master of science thesis examines how the Lean UX framework can be used in developing a style guide and what the creation of a style guide requires. The thesis was written as a part of the product development of Insta Response at Insta DefSec Oy.

The thesis focuses on the Lean UX framework and the style guide of the Insta Response product family. The purpose of the style guide is to enforce consistency of the visual outlook of the product, the interaction practices and the general feel of it. The need for a style guide was identified in following ways, among others:

- The developers were not sufficiently aware of the existing styles or user interface components
- There was a large amount of undocumented terms, visual guidelines and interaction practices related to the product development
- A considerable amount of the time of the UX designers was spent on defining things in wireframes – in extraneous detail.

A notion of the fact that many strong brands have their own style guide documenting their design language serves as an underlying motivation for the style guide and this thesis alike. A tentative hypothesis was formed against this background stating that a style guide will improve and enhance the design process and leads to better quality end-product.

In this thesis, Lean UX methodology is examined for its applicability for developing the Insta Response Style Guide and releasing it to be a part of the product development process. Lean UX was selected as the methodology because of its inherent tendency for early deployment with minimal set of features, continuous delivery and improvement as well as the nature of failing quickly and inexpensively. These attributes were initially deemed well suited for the tight schedule, small UX team size and the living nature of the Style Guide as a document and its initially vague requirements.

The research questions (RQs) are listed below:

- RQ: How Lean UX can be applied to developing a style guide?
- RQ1: Why is the Style Guide needed in the first place?
- RQ2: How to get the project stakeholders to use and be aware of the Style Guide?
- RQ3: How to measure the success and utility of the Style Guide?

The first RQ serves as a main theme for the following questions and this thesis. The following questions are sub-questions for the first question. RQ1 aims to validate the need

for the style guide in before proceeding with the implementation. RQ2 calls for a strategy for the style guide and its distribution. RQ3 is about finding out appropriate metrics and using them to validate and verify the whole concept.

The thesis was written side-by-side with the first iterations of the style guide. The style guide itself was made as a side-project along with other project activities, even though the style guide might have called for stricter allocation separate from the day-to-day project activities.

The contributions of this thesis are 1) concretely applying the Lean UX methodology to internal product implementation, 2) utilizing a UX Canvas approach with the strategical planning and 3) applying Google's HEART framework within UX Canvas.

The thesis is structured as follows. This introduction provides a short summary of the problem field and the RQs. Chapters 2 and 3 serve as introduction to the context of the style guide and the background for the Lean UX framework. Chapters 4 and 5 detail the methods applied in the development of the style guide and the Lean UX framework in proper. Chapters 6 and 7 report and discuss the results of applying the style guide, respectively. Conclusions and future prospects are reported in Chapter 8.

Chapter 2 introduces the concept of a style guide and some of the utilities of style guides in general. It considers a broad context of a brand as well as the more detailed context of a product development. Chapter 3 is a description of the software development processes and methodologies as a context for the implementation of the Lean UX framework and the style guide. It also provides some details into the specific processes that are applied in the Insta Response development and the foundations for Lean UX.

Chapter 4 outlines the principles and methodology used to apply the Lean UX in detail. It is a synthesis of the Lean UX with an appropriate strategy canvas. Chapter 5 provides the steps that were taken to implement the Lean UX. In it, concrete methods are further synthesized into the strategy in greater detail.

In chapter 6, results from the steps taken in Chapter 5 are reported. The meanings of the results are discussed in Chapter 7. Chapter 8 summarizes the applicability of the methodology as well as outlines some future developments to the style guide and the adoption of the Lean UX framework.

2. STYLE GUIDES

This chapter describes the theoretical and practical foundations for the vehicle for the Lean UX framework: the style guide.

The first section 2.1 describes the basics of a style guide. It provides a starting point to consider the following questions:

- What are style guides for?
- Who uses a style guide?
- What are some of the benefits of a style guide?
- What traits different style guide share?

Section 2.2 discusses the role of a brand and its visual identity in conjunction with a style guide. Section 2.3 provides some requirements for a style guide of a product family within the context of the Insta Response development. Section 2.4 considers requirements towards a style guide in the context of software products.

2.1 Style guides in general

User Experience takes into account all of the interaction a person has with a company. This naturally includes the overall brand of the company, its services and products [1, 2]. The style guide should bring this characteristic of UX visible: the style guide should communicate the values of the company and carry them over to the end products they will be applied to.

Style guides are collections of best practices, rules, standards and guidelines. The purpose of a style guide is to make the design process easier and more straight-forward. The purpose is to reduce time spent on re-defining and reiterating basic things on every iteration and enable focusing on more complex design tasks [3].

A style guide is a living document aligned with the brand and features of a product, which means it requires maintenance as the product and brand evolves. A style guide is not meant to specify and cover all possible cases of design outcomes. Its purpose is not to kill the creativity of the designers – rather it is supposed to support it.

Style guides range from coding standards and natural language to visual brand guidelines. The context of use varies from style guide to another. One is used internally as a part of the development process, other externally as a part of visual brand identity.

2.2 Style guide and brand identity

Brand identity as concept is elusive. Brand denotes a displayed ownership of something. Identity as a term means being something – unique and individual, still with a sense of belonging [4]. A brand identity, then, defines the identity of its overarching owner, the brand. Brand identity constitutes of certain values and activities which the stakeholders of the brand can identify to.

Insta Group as a corporation has its own brand, and Insta Response as a product family has its own as well. Since the brand of Insta Response exists under the corporation brand, its own brand should not conflict with the overarching brand.

The Insta brand is about trustworthiness and expertise. The Insta value propositions are [5]:

- We do it right at first time
- We are worth your trust
- We are competent and successful together.

Performance, security and employee expertise are some of the key strategies with which the value is achieved. These themes are repeated in its various child organizations, such as Insta DefSec, which is the primary child organization responsible for developing Insta Response. The themes should carry on to the Insta Response Style Guide as well as to people involved with Insta Response, and its user interface.

The style guide defining the brand and identity of the Insta Group is by nature a very general one. It describes things such as the tone and voice of writing and generally applicable color palettes. The style guide of the Insta Response product family is a detailed extension to the style guide of the brand of Insta. It includes more concrete knowledge, such as domain specific information [6].

2.3 Style guide and product families

A product family, or a product line [7], can be defined as follows [8]:

> *"A product family refers to a set of similar products that are derived from a common platform and yet possess specific features/functionality to meet particular customer requirements."*

According to Kotler & Keller, a product family falls under the need family in the product hierarchy. The product hierarchy describes a six-level structure starting from the abstract needs going down to concrete items that satisfy the needs. A need family is the justification for the existence of a product family. [9] A product family is defined by Kotler & Keller as [9]:

> *"All the product classes that can satisfy a core need with reasonable effectiveness."*

This latter definition is more generally applicable, since it addresses the underlying *needs*, not the *requirements*. Identifying the true needs leads to better understanding of the stakeholders as opposed to abiding to the requirements. To understand needs, analysis of the stakeholders is imperative – following requirements does not *necessitate* this kind of in-depth analysis.

Insta Response product family belongs to the need family of public safety. The product family aims to satisfy the core need of high-availability emergency responses. The software can be considered mission critical to its users.

Insta Response product family has three main categories for its products: Insta Response Client, Insta Response Portal and Insta Response Field. Insta Response Client and Portal were the main focus from UI point of view during the thesis, and thus the focus of the Insta Response Style Guide. Insta Response Field is not in the scope of this thesis.

2.4 Style guides and software products

On the product level, a style guide has the generally identified benefit of keeping the product consistent [3, 6, 10]. Other benefits include less effort spent on reiterating through the same solutions repeatedly: the design process becomes more efficient.

A style guide can be a powerful tool in orientating people towards the domain of the product – its language, values and potential users. [6, 10] This will enhance communication and enable a more collaborative design environment. [6]

A style guide should include all of the visual elements, interaction elements and patterns, general design paradigms, color palettes and copywriting elements [3, 6, 10]. A style guide should be easy to use, up-to-date and concrete [3].

One of the most problematic aspect of user interface design is the discoverability and usability of design guidelines. [11] In order to respond to this problem, the style guide should be easy to search and effectively organized. Using examples of both successful and unsuccessful design solutions is recommended [6, 11]. This is more inspiring and easier for the design process than merely applying standards [6].

Insta Response Client is a Call Center application designed for high-availability call taking. Its users are the operators in a call center. The operators should be able to respond to emergency calls as quickly as possible, without unnecessary distractions.

Insta Response Portal is an administrative tool designed for maintaining the data the Response CC uses. It provides an interface for Create–Read–Update–Delete (CRUD) operations for almost all the data or objects used in Insta Response. Its users are typically the type of people responsible for leading the operations as opposed to the operative users using the Insta Response Client.

3. SOFTWARE PRODUCT DEVELOPMENT

Software product development is a vast topic on its own. It touches upon many multidisciplinary topics in addition to the actual software engineering: design in various forms, marketing, quality assurance, communication and other human relations to name a few.

The chapter is written from the Insta Response product development and its UX team point of view. In this chapter, the context of the Insta Response development is established. It describes the processes and methods applied in the product development as well as some of the processes and methods relevant to the UX work in Insta Response.

Additionally, this chapter describes the practical and theoretical background for applying Lean UX, which is discussed in Chapter 4. This chapter provides the implicit limitations for applying Lean UX from a process point of view.

3.1 Methods and processes

What are the most common methods and processes utilized in modern software development? More importantly, what kind of methods and processes can be observed in the current Insta Response product development?

This section starts with the historical foundations for modern software development, such as iterative and incremental development. Historical perspective is useful when adopting and attempting to understand some of the modern standards like ISO 9001 or ISO 9241.

3.1.1 Iterative and incremental development

Iterative and incremental development (IID) has been known for decades. Its invention is attributed to Walter Shewhart who, according to C. Larman and V.R. Basili suggested using an iterative plan–do–study–act (PDSA) loop to incrementally improve quality as early as in the 1930s. [12]

Even though IID has existed for a long time, it was not until the 1990s and Extreme Programming (XP) before it started to gain on the waterfall development model. XP today has been recognized as an agile methodology since 2001, employing IID. [12] The waterfall model is still relevant today, however: The study of Leo R. Vijayasarathy and Charles W. Butler shows that the waterfall model is still widely in use [13].

In the waterfall model software is developed sequentially. The development starts from specifying the requirements in detail. After the requirement elicitation, the requirements are analyzed and the design phase begins. The complete design is then handed over to the

implementation phase. The built product proceeds to the verification where the defects are fixed. The final product ships on to the maintenance phase. This is illustrated in **Figure 1** below.

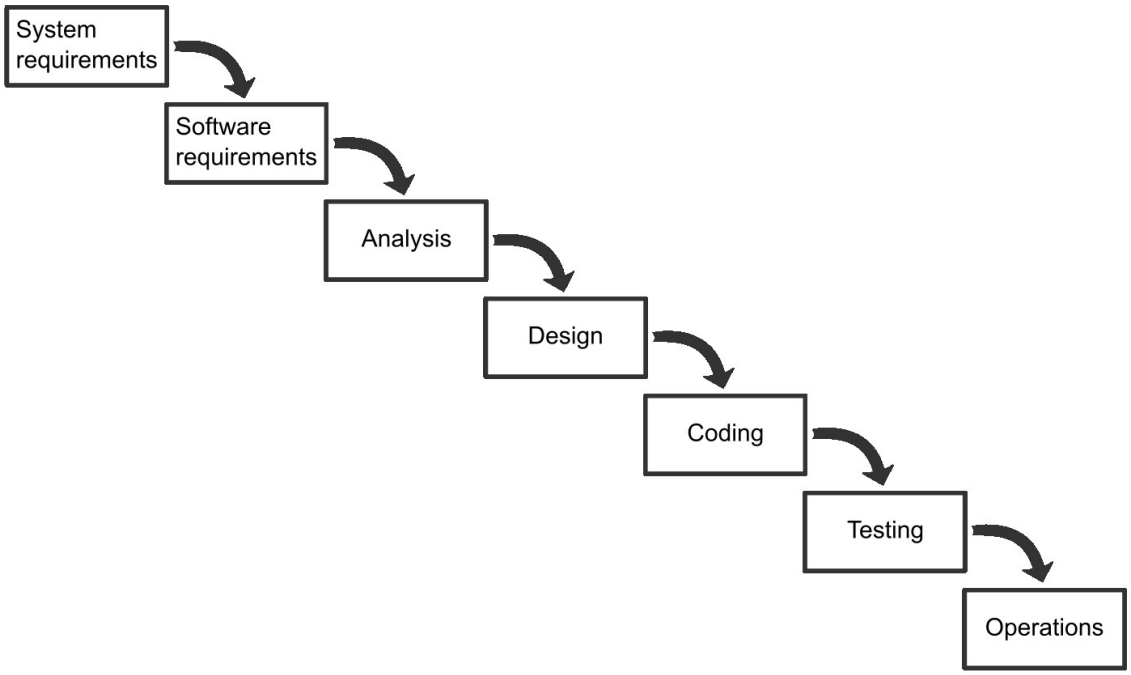


Figure 1. *Traditional waterfall model as presented by Winston Royce in 1970. [14]*

IID includes same process building blocks as the waterfall model but emphasizes short cycles to accept feedback and changing requirements throughout the development. The waterfall model has been criticized because of its inability to react to change – the people who will be using the product rarely know what they want, not to mention what they truly need. **Figure 2** demonstrates the relationship between waterfall process and IID-like processes.

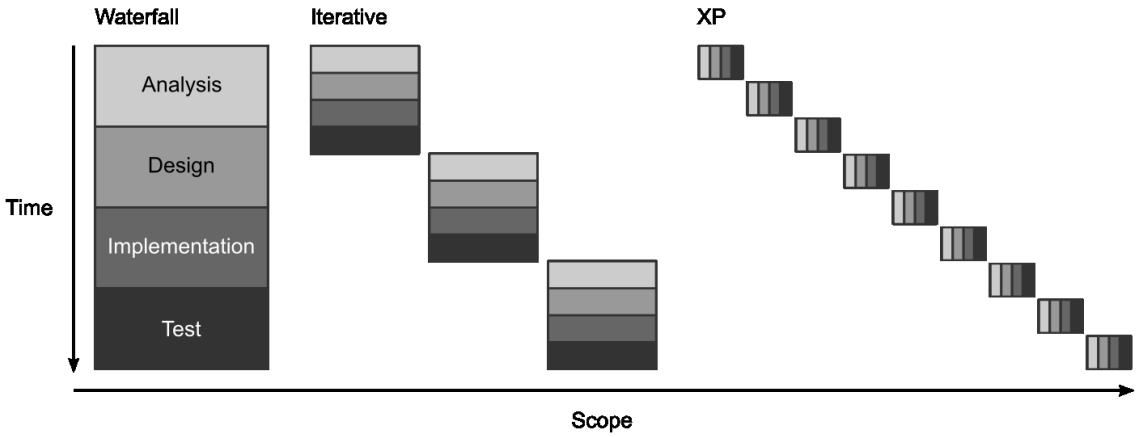


Figure 2. *Waterfall and IID process comparison as presented by Kent Beck. [15]*

By definition, an increment means “something gained or added”, or “a minute increase in quantity” [16]. In software development, this usually means added functionality. Iteration on the other hand means to repeat a procedure until the result is satisfactory.

An increment in the context of the Insta Response development process is used to denote a gain or change in the version of the product and the contents of contracts. Incremental improvement is achieved by consecutive iterations on multiple levels of the development process.

The different increments are iterations per se. They allow for a larger-scale negotiation of the price, requirements and scope of the content that goes into the coming version of the product. The requirements are refined and specified during the iterations taking place inside the increment.

IID is relevant for almost all software development projects today. It can be used for modifying the waterfall model to be less rigid. More importantly, IID is used as the underlying foundation for most modern Agile development frameworks [12], which are discussed later in this thesis.

Understanding the history of IID helps in understanding the context of state-of-the-art software development, such as Agile frameworks, or various modern standards like ISO 9001 and ISO 9241. The process of these frameworks and standards is remarkably similar.

3.1.2 ISO 9001

ISO 9001 is a standard for quality management systems’ requirements. It suggests using a process based approach through iterative Plan–Do–Check–Act (PDCA) cycle and risk-based thinking. The PDCA cycle exposes the system under inspection susceptible for

consistent analysis and measuring. The cycle can be applied on all levels from strategy to individual processes. The process is illustrated in **Figure 3**.

Figure 3. *The ISO 9001:2015 Plan–Do–Check–Act cycle. [17]*

The PDCA loop is essentially the same as the PDSA loop previously referred to. This means that ISO 9001 is, in principle, inherently compatible with IID methodologies, which have the essentially same process built into them.

In addition to the PDCA loop, the standard promotes risk based thinking. This is achieved through analyzing risks and opportunities. [17]

Insta DefSec Oy has an ISO 9001 certified quality control process. [18] This means that all processes implemented in Insta DefSec and thus in Insta Response should be applicable with the ISO 9001 quality standard.

Another quality standard from the same ISO 9000 -series is the User-Centered Design Process, or ISO 9241-210. It employs a similar four-step process description to the ISO 9001.

3.1.3 User-Centered Design process and ISO 9241-210

User Experience is a valuable investment that has a good Return On Investment (ROI) [19-21]. To improve UX, a User-Centered Design (UCD) process is recommended [22]. ISO 9241-210 presents a standardized description of a UCD process, which is illustrated in **Figure 4**.

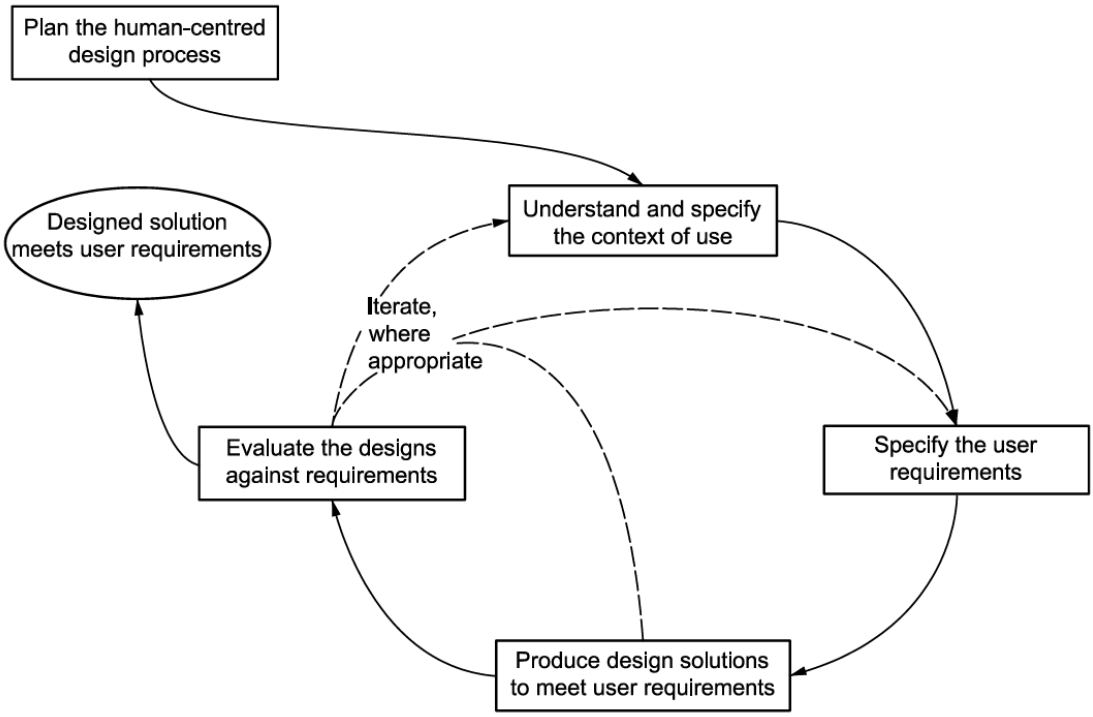


Figure 4. *ISO 9241-210: Human-Centered Design process. [22]*

UCD process should be part of the general project plan. The process starts with planning the human-centered activities. The plan should take into consideration appropriate resources (including human resources), the other development processes of the system, feedback and time allocation. [22]

After the planning, the process starts in proper. The first step is to understand the context within which the system and its users function. After gaining the understanding, the system requirements are specified. Against these requirements, solutions are provided. The solutions are then evaluated. Each step is iterated as per needed. When the solution is verified and validated, the process stops.

The UCD process described here is not formally a part of the Insta Response product development. Its steps and the user-centered philosophy are applied on day-to-day basis within the UX team, however.

All of these processes – IID, ISO 9001 and ISO 9241-210 aim to the outcome of a good quality software product that satisfies goals and needs of its stakeholders. Scaling the processes, however, may prove a challenge.

3.2 Challenges of a large-scale software development project

A concise and unambiguous definition of what constitutes a large-scale software development was hard to come by. Pernstål *et al.* describe large-scale development as being "systems of systems development" [23]. Kraut and Streeter have described large scale as having its age measured in years and being difficult to grasp or create for individuals or small groups among other things [24].

Insta Response can be considered large-scale, since its development constitutes of multiple teams and organizations with at least two individual software products, albeit the individual products are tightly bundled together. The age of the product family is indeed measured in years and it can be very challenging for individuals to conceive a holistic view of the product family and its functions and features.

Software crisis is a phenomenon that was first acknowledged in 1968. It was an observation that writing software is rarely successful amidst the growing complexity of software systems. According to a Finnish study carried out in 2013, five of the most probable reasons for a software project to descend into a crisis or to go wrong from the supplier's point of view are: [25]

1. Lack of communication
2. Differing views of the contents of the project
3. Failures in scheduling the project
4. Changes in the staffing of the project
5. Failure in quality.

These can be considered some of the top risks and challenges in the Insta Response development, as well. The overarching themes for large-scale development challenges are communication and coordination [23, 24].

Communication (1.) is key in maintaining the situational awareness throughout the organization. It helps avoiding overlapping work and repeating past mistakes. However, even the most rigorous communication is no panacea if there are many middle men. Broken phone effect – the meaning of the message is altered in passing is difficult to avoid even with the most transparent communication if it is second or third hand or more variety of information.

Customer deciding to change critical features and definitions (2.) at a very late moment into the development process is a common challenge in software development – rarely do customers know beforehand what they actually need. If the underlying needs are unknown, it is very challenging to know the right features to implement or question the requirements. If development cycles are long and rigid, responding to changing requirements can prove a great challenge.

Evaluating time (3.) needed to make a feature come to life is one of the hardest tasks in software engineering. It is hard even if there was knowledge of the correct features.

The realization of losing a key person (4.) can be a huge blow on the product development. When there are changes in staffing, necessarily some information is lost in the case if the changes lead to departure of human resources. This can be alleviated to an extent with proper documentation.

If everything is documented in detail, however, it necessarily contributes to the overall workload. If documentation is insufficient, it causes additional work by eventually forcing going through same problems and solutions in each round of an iteration or increment. Insufficient documentation also causes the quality (5.) to deteriorate: for example, the absence of a style guide will deteriorate the consistency of the GUI.

Pernstål *et al.* suggest that using Agile methodology such as Scrum would not solve the problems of large-scale software development if it was applied without supplementing methodology. They suggest adopting a lean approach to the software development in addition to agile practices. [23]

3.3 Agile and Lean methodology frameworks

Both agile and lean methodologies aim to address the problems prevalent to software development. There are other agile and lean frameworks in addition to Scrum, Lean Software Development and Lean Startup, but these two were selected for further examination because of their relevancy to the problem at hand. The former is used in Insta Response product development, and the latter is relevant as foundation to Lean UX discussed in Chapter 4.

3.3.1 Scrum

Scrum is an agile framework for solving complex problems. In Scrum, software is developed in increments or sprints, typically 30 days long or less. An increment constitutes of the product backlog items that were completed during a sprint. Sprint is the time which is reserved for implementing the backlog items. [26]

Scrum identifies three key roles. The Product Owner (PO) is responsible for communicating with the client and passing knowledge to the development team and prioritizing the product backlog. The Scrum Master (SM) is a facilitator whose primary responsibilities are helping the PO and the team members. The Team Members (TMs) are a cross functional collection of individuals, who ultimately implement the backlog items.

An increment in the Insta Response development is much longer than 30 days. The development takes place in two to four-week sprints, and one iteration of Response can take over 12 sprints.

To manage the Scrum practice, Insta Response development uses Atlassian's project management tools, such as JIRA and Confluence. JIRA is a project management system with issue tracking. Confluence is a JIRA compliant community-wiki style platform.

The Scrum backlog is collected in JIRA primarily as Epics, Stories, Bugs and Defects. Specifications are written in detail in Confluence. A typical specification in Confluence is linked with appropriate JIRA issue, with the requirements written in detail to the Confluence page, typically accompanied by detailed mockups and wireframes.

Kuusinen [27] states that UX design is usually separated from the rest of the development process. This was true for a long time in the Insta Response development. Recently, however, UX team was integrated into another team. Separating UX into its own team can provide additional challenges such as difficulty to maintain a vision of the product, communicational hindrances and estimation of the amount of design input needed [27].

Working in a separate team has provided challenges to the UX work, such as requiring heavy design work up front. The UX team sees that the communication in the development of Insta Response has been very good, despite the scarcity of UX resources. Another challenge, however, has been responding to the needs of the teams on time. This has left the output of the UX team rather thin – volume has been gained at the cost of quality.

To respond to the requirements of agile development, lean approach to UX work is recommended [23, 28].

3.3.2 Lean Software Development

Lean Software Development (LSD) was first defined by Mary Poppendieck and Tom Poppendieck in 2003. "Lean" as a term was first used in 1980s, when it was used to describe the Toyota Production System way of approaching a manufacturing process. [29]

LSD is best understood as a framework of principles as opposed to being a practical guide for processes. The seven LSD principles are holistic optimization, removing waste, integration of quality, continuous discovery, fast delivery, inclusive collaboration and continuous improvement. [29]

Holistic optimization means taking into consideration the different access points to achieving value. This means evaluating the context and true needs for the software. That is something UX professionals have strived for since the coining of the term [2].

Removing waste is an important principle in many lean frameworks [3, 29, 30]. Anything that does not contribute to the ultimate value of the product is considered waste. One of the origins for the waste is using "large batches" [29] – creating and implementing big design up front, which ends up to not being something that was truly needed by the recipients. Lean advocates for small batch size [30].

Integrating quality means developing small, good quality features and integrating them into the whole. This was called "Top Down Programming" by Harlan Mills [12, 29]. Top Down Programming asserts that individually verified pieces can be more effectively integrated into the system than trying to create the whole functionality in one run.

Continuous discovery acknowledges that information is continuously uncovered and that information is constantly changing, and everything cannot be learned beforehand. [29, 30] This helps responding to changing requirements and emerging needs throughout the LSD process.

Fast delivery suggests adopting automation for detecting regression while releasing to production in a tight pace. It advocates releasing slight modifications continuously while taking into consideration the whole of the system; not just the software. [29]

Inclusive collaboration principle would have everyone participate working towards a common goal. This is achieved through distributing power and enabling everyone to make decisions and promoting collaboration and cross functionality between individuals [29]. Lean advocates people over processes, like agile does [3, 29].

Continuous improvement is achieved through methodical testing and analyzing of the system under inspection. This applies not only on the end product, but the processes in use as well [29].

LSD has paved way to a natural progression that is called the Lean Startup.

3.3.3 Lean Startup

The ultimate goal of Lean Startup is to pinpoint the aspects of a product that produce value for its customers and cut down the features that dilute the product [30, 31]. "Cutting down waste" and "working smarter, not harder" are the goals of Lean Startup [30].

Use small feature batches. Fix defects immediately. Release a new version whenever there is a new feature complete. Test the new feature with a relatively small sample – A/B tests. Innovation accounting. Build–Measure–Learn (BML) loop. Validated learning.

Minimum Viable Product (MVP) [30] These are the Lean Startup core concepts and techniques to achieve the goals.

Lean Startup is a collection of good quality control process practices re-branded. Its foundation is on Lean and Kanban, from which it heavily draws inspiration. The Build-Measure-Loop is a simplified process description of the PDCA or the UCD process, both of which share much similarities in their philosophy and processes.

Ries' emphasis with Lean Startup is in validating the findings and using actionable metrics. He also emphasizes the early launch of the product to better validate the product. Another important aspect of the Lean Startup is the notion that even if a product ultimately fails to fulfil its initial hypothesis, it can be used as a vessel for learning and as the base for the next iteration of the product, which can be dramatically different from the original hypothesis. Dramatically changing the product strategy and hypothesis is called a pivot.

Lean Startup introduced the Build–Measure–Learn (BML) feedback loop. The loop is illustrated in **Figure 5**.

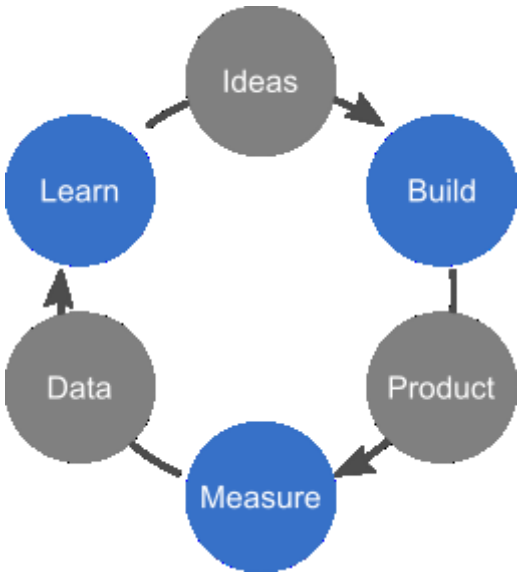


Figure 5. *Build–Measure–Learn. From the Lean Startup book by Eric Ries.*

One iteration of BML produces a MVP. The aim of the BML is to produce the MVP with as little effort as possible and as fast as possible [30]. During the build phase, The MVP features are implemented. In measure phase, data is collected for the last phase. The last step is the learn phase, where the product hypotheses are validated. Against these learnings, new ideas for the next MVP are formed and the process starts anew.

One of the foundations for Lean Startup is in Design Thinking [30]. Design Thinking is also one of the foundations for Lean UX, the subject of chapter 4.

3.4 Design Thinking

Design is an integral part of any engineering process. Design can range from functional specifications and object-oriented programming (OOP) design through visual design and UX design, all the way up to the design of the product strategy or even business strategy. Still, its status is not regarded as pervasive as it in fact is [32]. Design Thinking recognizes the holistic nature of design and asserts that any problem can be examined through design methods [3].

Design Thinking includes three overlapping phases: inspiration–ideation–implementation [33]. The inspiration phase includes the identification of the problem and its proper outlining. The ideation phase produces, in parallel, solution concepts to these identified problems. Implementation makes the abstract concrete, providing practical solutions and applications to the problems.

According to Dorst [32], at the core of design thinking is the process of abduction. This can occur in two ways. In the first variety of abduction, the wanted outcome (value) and the methodology to achieve it is known. This is called “closed problem solving”, and it focuses on discovering *what* needs to be done in order to solve the problem. The other variety for abduction is “open problem solving”, where only the wanted outcome is known; *what* and *how* something should be built are to be discovered. Of these two varieties, the former is more closely associated with engineering while the latter is associated with design. [32]

Design Thinking, then, requires understanding the context, the true needs of the target audience and other things out of the immediate scope of the problem at hand. [34]

In the context of this thesis, implementing the style guide can be thought to representing the first variety of abduction; the value (i.e. consistent look etc.) and methods to achieve value (i.e. the style guide) are known. The process of implementing the style guide with Lean UX, however, is closer to the second variety of abduction.

In adopting the Lean UX approach, the problem is framed in a form of a hypothesis: if Lean UX is used, a more consistent look and quicker development of the GUI are achieved. The next hypothesis would be: the thing to be created to achieve the value with Lean UX would be the style guide.

4. LEAN UX PRINCIPLES AND UX CANVAS

In this chapter, the principles and methodology for the Lean UX are laid out. Lean UX is a lean framework for conducting User Experience design developed by Jeff Gothelf and Joshua Seiden [3].

Jesse James Garrett defines UX being on five different layers, from which the first – the foundation is the strategy [35]. On the other hand, Osterwalder describes a similar structure definition for business process design, where strategy is at the planning level, a business model at the architectural level and the processes at the implementation level [36]. The structure goes from general to detailed in both definitions; a strategy is a plan to achieve desired outcomes.

The goal of the style guide – or its mission, was to improve the design process, enhance collaboration and to unify the look and feel of the whole Insta Response product family. The style guide had to fit in with the current development processes while enabling lean UX design. The style guide had to also fit in with the brand of the organization as well as make its own look and feel distinct.

It was assumed that the development process of the style guide would have to meet the quality criterion of ISO 9001. The development process of the style guide should also fit in with the existing Scrum process. It should also follow the user-centric philosophy of the UX team and preferably be compatible with the ISO 9241-210 standard user-centric design process.

Lean UX was seen as a viable and novel option to other approaches, such as ISO 9241-210, since its principles and philosophy are built upon the user-centricity of Design Thinking and the Agile manifesto [3]. It is also built upon the philosophy of Lean Startup that essentially includes the BML loop, very much akin to ISO 9001 PDCA cycle. The primary reason why Lean UX was chosen as the method due to its novelty in the industry, and the challenge of providing concrete insight into how to take Lean UX into practice.

4.1 Principles

Lean is best understood by assimilating the lean principles. Lean is about synthesizing the lean philosophy and lean principles together with a set of industries' best practices. It is not a traditional framework that one can readily apply to solve problems. Rather, it requires and even assumes to be tailored specific to the context where the problems are solved. [29, 37]

Conceptually, a framework based on Lean (such as Kanban) is generally a better fit for UX than a framework based on Agile (such as Scrum). [28] Lean UX tries to bring together the best aspects of both Lean and Agile in the context of UX design.

Lean UX promotes design facilitation instead of relying on one designer to dictate the course of the product. It emphasizes on achieving outcomes instead of deliverables. Lean UX builds on three foundations: Agile, Lean Startup and Design thinking.

The original Lean UX book describes a set of fifteen principles which form the base of the Lean UX framework [3]. Many of these principles have overlap. Liikkanen *et al.* present a more concise set of six principles [37]. For contrast, the original LSD has a set of seven principles (see chapter 3.3.2) [29].

The original set of fifteen principles is a rather lengthy one, and the principles presented in the article by Liikkanen *et al.* cover the original principles more concisely. The principles for Lean UX are [37]:

1. early customer validation vs. releasing products with unknown end-user value
2. collaborative cross-functional design vs. lonely hero design
3. solving user problems vs. adding cool features
4. measuring key performance indicators vs. undefined success metrics
5. applying appropriate tools flexibly vs. following a rigid methodology
6. nimble design vs. heavy wireframes or specifications.

The first principle, early validation, helps to reduce waste by not carrying out lengthy plans or projects that are not needed. This helps in responding to changing requirements and time-allocation challenges, which are some of the riskiest areas in software development. Early validation can vary from informal ad-hoc usability evaluation to more formal usability and regression testing. The style guide of Insta Response was validated both through informal and formal usability methodologies.

Collaborative cross-functional design, the second principle, helps to overcome difficulties in communication, which is the riskiest part of software development from the suppliers point of view [25]. This helps to share understanding and thus possibly better avoid information gaps, reiterating same problems and solutions time after time, and other problems when there are changes to the staffing of the project (which was another one of the riskiest parts in software development).

The “lonely hero design” is regarded an antipattern in Lean UX. It is argued that “heros and gurus” do not share their thoughts or their work. [3] A hero designer strives to be irreplaceable and to bask in the admiration of others. This is a step closer in realizing the risk of ruining collaboration. It also grows the risk of changes in the project staffing – when the hero leaves, a huge chunk of information potentially leaves with the hero.

The third principle of focusing on solving problems promotes user centricity in addition to the obvious problem focus. The principle helps to reduce waste through gaining an understanding of the customer. This allows delivering the value the users need. The principle is essentially the same as the holistic optimization principle of LSD. Understanding the true underlying needs of the target audience requires applying a user centric mindset and "getting out of the building" to the context of the users to gain understanding [3].

Measuring key metrics is the fourth principle. Measurement is key to catching possible regression and in determining if value and vision are being achieved. The metrics should be actionable and meaningful; they should reflect the outcomes wanted to be achieved. Metrics are essential to the Learn part of the BML loop, and they are the thing that enable the continuous discovery and learning.

The fifth principle of applying a flexible mindset and appropriate tools promotes critical thinking over blindly following some process. This emphasizes the need of understanding the problem and understanding the ones having the said problem instead of shoehorning some predefined process or methodology in – each problem is unique and it is doubtful that any kind of silver bullet exists.

The final principle of nimble design promotes continuous discovery and learning. It advocates for the small batch size and making over analysis [3], where there is no big design up front and testing and validation focuses on smaller subsets frequently executed.

4.2 Process and Methods

The Lean UX uses the BML process (see **Figure 5**) with one implicit step made visible, which is declaring assumptions [3]. The step is obviously present in the BML loop as well, since nothing could be built without any preliminary assumptions – explicit or implicit. At the heart of the Lean UX as well as lean in general, the scientific method is applied [38], tailored to the context of the problem.

The Lean UX book identifies assumptions, hypotheses, outcomes, personas and features as methods for vision and problem framing. An assumption is a high-level hypothesis, and hypotheses are different aspects of assumptions. Outcomes are described being the signals that indicate the validity (or invalidity) of the hypotheses. Personas is a widely used UX technique, which is used for user segmentation. Personas represent the target audience. Features are the solution for the problems of the target audience. [3]

To validate the vision and problem framing, Lean UX uses the Minimum Viable Product (MVP). In building the MVP, continuous validation is key for deciding the viability of the product. MVPs can range from advertisement-like smoke tests to fully interactive and functional prototypes. [30]

Incidentally, the Lean UX framework describes producing a style guide as being a method for boosting and enhancing the design process during product development. In the Lean UX book, Gothelf argues that the style guide should be approached like any other product. [3]

A systematic approach to the vision framing can be drawn from a canvas approach, such as the Business Model Canvas or Lean Canvas [39]. This approach was adopted with the style guide, and a more appropriate version was remixed: the UX Canvas. The methods of vision framing are synthesized into the UX Canvas.

4.3 UX Canvas

The Business Model Canvas (BMC) [40] and the Lean Canvas (LC) [41-43] provide a way to visually categorize and document a business model. Since there is no direct cash flow related to the style guide, some modifications are needed.

Osterwalder's one-page BMC template is distributed under Creative Commons Attribution-ShareAlike 3.0 Unported (CC BY-SA 3.0) license [44]. This means it is free to use and to be refined further, while referencing the original BMC. There are several spinoffs already, and while some of them were more suited to the purpose of the strategy of the style guide than others, none were accurate enough. A new version of various canvases was remixed for the strategy model of the style guide.

An adapted version of the canvases was synthesized by the UX team for the style guide. Since the project was aimed primarily to internal stakeholders, the most dramatic changes were changing the "Cost Structure" and "Revenue Streams" to "Hypotheses and Risks" and "Signs of Success" to be better applicable and more representative of the nature of the Style Guide and more in line with the Lean UX principles, processes and methodology. The resulting canvas is illustrated in **Figure 6**.

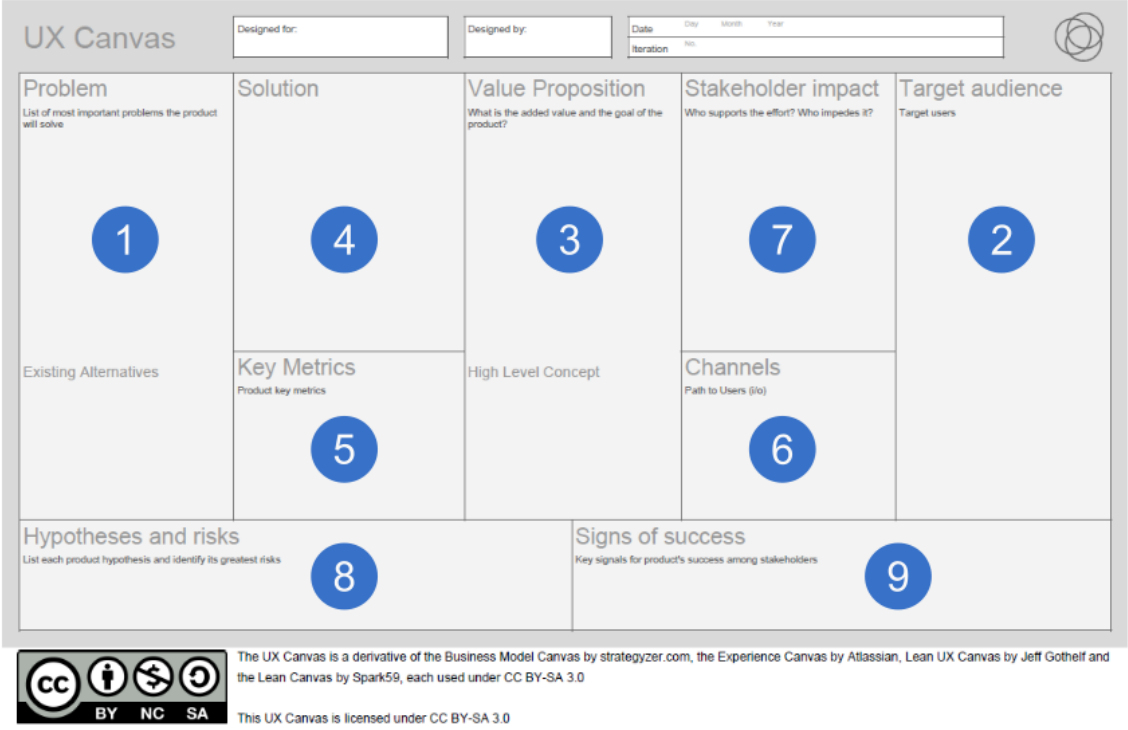


Figure 6. *The consolidated UX Canvas. Adapted from the Business Model Canvas by strategyzer.com, the Experience Canvas by Atlassian, the Lean UX Canvas by Jeff Gothelf and the Lean Canvas by Spark 59. Licensed under CC BY-SA 3.0.*

The UX Canvas synthesizes Atlassian's version of the Experience Canvas [45], Ash Maurya's Lean Canvas [41-43] (LC), Jeff Gothelf's Lean UX Canvas [46] and the original BMC [40]. This chapter is laid out after the structure of the UX Canvas.

The canvas can be thought to be divided into two themes. The first, left-hand side of the canvas is the product side. The second, right-hand side of the canvas is the human (user, customer, stakeholder etc.) side.

The BML loop can be observed on the canvas. The build part is the solution: the solution and features are what is getting built. Quite naturally, the measure part is the key metrics section. The learn part of BML is harder to explicitly point from the canvas; almost every section on the right-hand side of the canvas is something that is a source for learning.

The UX Canvas was mapped with the Goals–Signals–Metrics (GSM) process of the Google HEART [47] framework. HEART is a framework for measuring user experience. HEART is an acronym of its five metric categories: Happiness, Engagement, Adoption, Retention and Task success.

The GSM process can be observed on the canvas (see **Figure 6**). Value (callout № 3) is equal to Goals: value is the outcome to achieve. The other two are self-explanatory: Signs

of success (callout № 9) is equal to Signals and Key Metrics is equal to Metrics (callout № 5) in the HEART framework.

The canvas is filled in an order that goes from general to specific (see **Figure 6**, callouts 1 to 9). The two most defining and general aspects for the development of the style guide are the problem framing and identifying the audience; what and to whom. After that, the value of the product (i.e. the style guide) should be determined: what value delivered to the audience by solving the problem.

More specific aspects are addressed after framing the problem, audience and value. Next, the actual solution (or its features) are determined: how a problem is solved so that a value can be delivered. The solution should be quantifiable in order to be actionable, so appropriate metrics are required.

After describing the solution, the channels for how to deliver the value to the audience are examined.

The rest of this chapter focuses on walking through the sections defined in the canvas. In each following section, a piece of the canvas is broken down and explained in detail. All starts with observing a problem and the ones that are having the said problem.

4.3.1 Problems

First part of defining the vision and filling out the UX Canvas is to properly outline the problem and the product requirements. The problem-centricity is a crucial philosophy in Lean UX [3, 30, 37]. The most defining aspect for the subject of the thesis, the Style Guide, were the problems it was set out to solve.

The business model canvas does not have a section called problems or requirements. Rather, it has “Key partners”. Maurya specifically changed this section to be “Problem” to emphasize the problem-solving purpose of the tool. [43] Other reviewed adaptations of the canvas tools [45, 46] tended to have the problem section specifically included.

For an internal product such as the style guide, the Key Partners section is not very relevant if at all. This is why the UX Canvas adopted a similar approach to the other canvases [43, 45, 46] by including the Problems section.

The Problems section on the UX Canvas included a sub-section called “Existing alternatives”. This section would include current solution alternatives to the problems. The existing alternatives should be reviewed for reusable content and reviewed why they are not solving the problems the style guide would solve.

While identifying the problems is key, equally important is to identify the ones who are having the problems. Only by identifying the target audience could meaningful solutions be envisioned.

4.3.2 Target audience

Equally important part of the vision definition in addition to the problem statements is to determine who will be the stakeholders of the product in addition to the problem identification. User-centricity is an essential paradigm in Lean UX [3]. The user segmentation should be done in parallel with the problem outlining since they will greatly impact each other. The problem space will rule out certain type of stakeholders, and the user segmentation will specify further the requirements and detail the problems.

Target audience could very well be the first thing to address on the UX Canvas. This approach might underline user-centricity even more, although users are essential either way. In this case, the problem statements would be the next thing to address on the canvas.

When assumed problems and audience are recognized, it is time to proceed defining the value propositions.

4.3.3 Value propositions

After identifying what problems are getting solved and who are having said problems, the value of the product (i.e. the style guide) should be evaluated against these findings. The assumed value is formulated into the consumer-centric value propositions of the product. The Value propositions section should document this.

Value is the outcome wanted to be achieved, just like the Goals in the Google HEART framework [47]. As such, the value is a central piece to any product. If a product has no value – that is, it does not solve any problems for anyone, it is useless.

To create value, a solution must be devised. The value of the solution should be measurable. After value is created, it must be delivered.

4.3.4 Solution

The solution should reflect on what is defined in the Problems, Target Audience and Value propositions. Based on these sections on the UX Canvas, the minimum viable feature set should be defined. These are the features that will make up the Minimum Viable Product (MVP). The MVP is the core product of the Lean UX [3, 30].

The Solution section should define how a problem is solved so that value creation is achieved. It is the bridge from the problem to the value. In addition to taking into consideration the problems, target audience and value propositions, the solution section might have to be revisited upon defining the Channels section.

4.3.5 Key metrics

To know the right features are being implemented, the use of the product should be quantifiable. This is a key principle for Lean UX. [3, 30, 37] For an internal project, it is difficult or impossible to find metrics that are straight quantifiable in cash flow. Softer, more qualitative focused data is a natural choice.

Through measurement of the performance of the product it is easier to determine if the development is going to the right direction. The metrics should strongly reflect the solution and the goals of the product. This way, they metrics can be more actionable and changes in the solution can be observed through the metrics.

In choosing the proper metrics, a framework such as the HEART can be utilized. There are five categories to metrics in HEART: Happiness, Engagement, Adoption, Retention and Task success [47].

Happiness is used for metrics that measure attitude. It is used for things like usability or recommendation likelihood. The two former categories are typically measured with tools like System Usability Scale (SUS) or Net Promoter Score (NPS), respectively. [47-49]

Engagement is a category for behavior-indicating metrics during the use of a product on a user level [47]. The metrics in this category are usually used to measure the number of actions within a product, or the intensity of use. Engagement metrics can correlate with Adoption and Retention metrics, which are measured more typically on the product level as opposed to the user level.

Adoption is a category used for measuring the number of gained users within a time period. Retention measures how many of the gained users can be acquired as regular users.

Task success, like engagement, is used to measure behavioral metrics on the user level. Task success metrics are used to measure if the product can successfully be used to achieve the goals of the users. The metrics include typical usability metrics like time on task and error rate. [47]

In software products, web is a typical channel for distribution. This is an asset for metrics, since web as a platform lends itself for various measurements.

4.3.6 Channels

A product can rarely succeed solely by the merits of its features. Choosing the right distribution channels and launch tactics is necessary in distributing and launching any product. To facilitate adoption of a product, communication is in key position [50]. Communication is key to collaboration as well, which is another essential principle in Lean UX [3].

The Channels section describes the channels that are utilized to deliver the value of the product to the target audience. The channels are highly dependent on the solution. The solution may pose constraints on the channels, such as technological ones, and vice versa: the channels may dictate technological constraints on the solution.

In addition to technological constraints, the channels (and the solution) might have social constraints. These constraints (and possible enablers) are examined in the Stakeholders section.

4.3.7 Stakeholders

Stakeholders are the human element which will either improve or impede the product adoption and distribution. A study focusing on launching new products suggests that the stakeholder theory is applicable when planning for a product launch [50].

A stakeholder is any person or party who is affected by the existence of the product (the style guide in this case). The Stakeholders section on the UX Canvas should identify at least the ones who can have a positive or negative impact on the performance of the product.

While the section will probably have overlap with the Target audience, it should also take into consideration the people who are not directly involved in consuming the product. In the case of the style guide, for example, this could be the management of the project who will not probably peruse the style guide painstakingly, but will still heavily impact upon the development and launch processes of the style guide.

Each of the sections of the UX Canvas so far have been largely built on hypotheses. These hypotheses should be identified, analyzed and validated.

4.3.8 Hypotheses and risks

Each hypothesis includes a risk of the assumption being wrong. Each risk implies a cost should an assumption prove to be wrong. This contributes to waste in the form of time and effort, in the very least. In this sense, the “Hypotheses and risks” section of the UX Canvas form the “Cost Structure” equivalent of the BMC for the development. The risks

should be minimized by constantly validating and revisiting the hypotheses. Hypothesis statements are a central method in the Lean UX [3].

The hypotheses cut through the whole canvas. They can be formulated into hypothesis statements as follows: *Problem [problem statement] will be solved by [solution] and it will benefit user [persona] by delivering [value proposition]*.

By identifying and analyzing the risks related to hypotheses, the canvas tool conforms to the risk based thinking requirement of the ISO 9001 standard – assuming the need to comply with the standard. After analyzing the hypotheses for their risk factor, it is easy to prioritize which of the hypotheses is the most critical one to validate first.

The most critical hypotheses are the ones which can cause the whole effort to fail. If this kind of fundamental hypothesis fails, a pivot is required.

To determine if the hypotheses are failing or valid, the Key metrics should be observed. The metrics will trigger a signal when they cross a threshold set in the Signs of success section.

4.3.9 Signs of success

The previous section, Hypotheses and risks, was more about the product development going into unwanted direction. The Signs of success section on the UX Canvas represents the success factors of the product. The signs of success are the outcomes which are what Lean UX strives to achieve [3].

The Signs of success can be mapped into the Signals of the HEART framework [47]. The signals to be observed are thresholds to the metrics and trends in the metrics.

The success of the product means that it is delivering the value. In this way, it can be interpreted as the ROI of the product; similar to the “Revenue streams” on the original BMC and LC.

5. STYLE GUIDE AND LEAN UX IN PRACTICE

In this chapter, the steps to put Lean UX into practice are described. The chapter focuses on the Build–Measure part of the BML process. The findings (i.e. the Learn part) are reported in chapters 6 and 7.

Before the official release of the style guide, two iterations of the BML cycle were carried out. During the first cycle, the UX Canvas was filled out and a NPS smoke test was executed to validate the decision to implement the style guide. During the second cycle, the style guide was partially developed and a pilot test was run on the style guide in progress. The official release of the style guide marked the beginning of a third cycle of the BML process.

The first BML cycle began with the filling out of the UX Canvas.

5.1 Filling out the UX Canvas

The canvas was placed to a relatively visible spot in the office to make the work transparent and open for communication. The positioning sparked the interest of a few people during the project. The canvas can be observed in **Figure 7** below, with filling in progress.

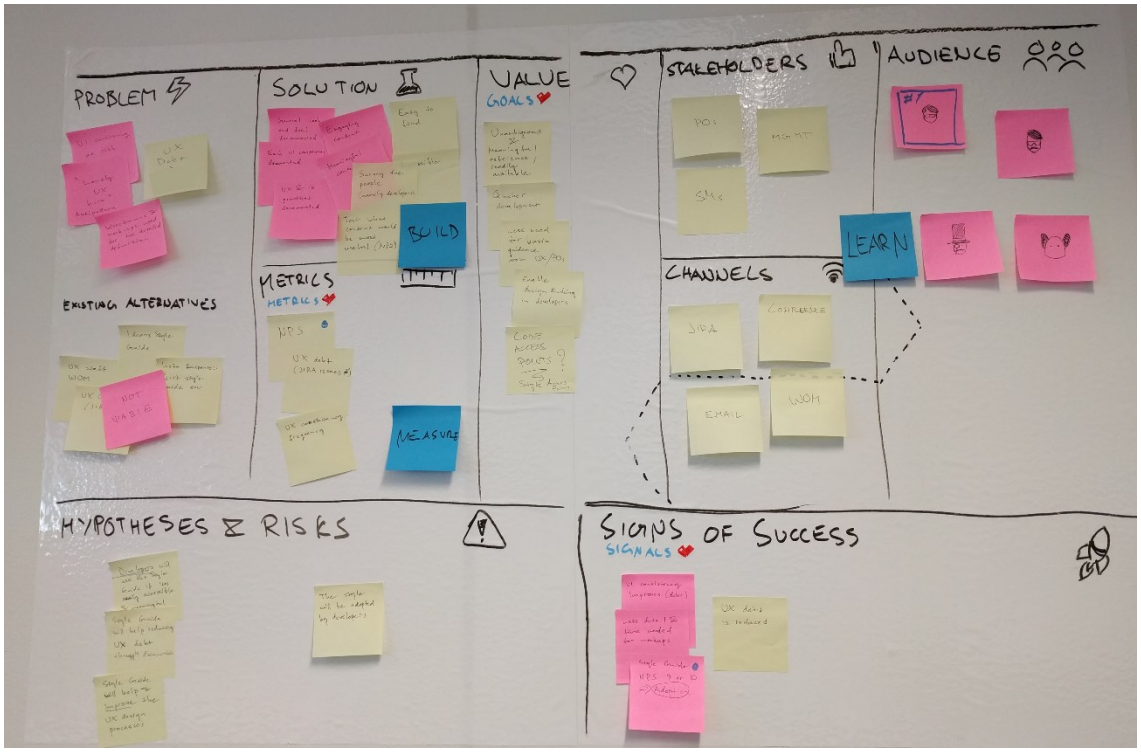


Figure 7. *Filling out the UX Canvas, first iteration.*

The canvas was filled by the UX team in the order illustrated in **Figure 6** in chapter 4.3. First two sections filled were the Problems and Target audience. After these, the Value section was addressed. Then, the Solution, Key metrics, Channels and Stakeholders sections were filled respectively. After this, the Hypotheses and risks was filled. Finally, the Signs of success section was described.

5.1.1 Problem framing

Several problems were identified in the current UX process employed at Insta Response which could at least partly be solved by the style guide. The identified problems were:

a) Misuse of wireframes
b) Lack of documented principles
c) Same problems iterated without truly needing to do so
d) Unawareness of governing and common principles
e) Traversing the "lonely hero design" antipattern
f) UX debt status in JIRA.

The wireframing process was not optimal (a). Wireframes were expected to be created in high detail, fast pace and usually in color. They were the primary means to communicate design decisions with customers in addition to text-heavy specifications.

Wireframes should be quick to come up with, omitting color and details [35, 51]. The purpose of the wireframes is not to be representative of the visual design nor to depict interaction in detail. Wireframes can be used to communicate some of the design decisions, but relying on them too much is not optimal.

Since the UX team was relatively small sized, the documentation of the underlying design principles was not seen as a priority (b). Ultimately, this resulted in a myriad of silent information, which, in a case of changes in staffing for example, is a huge risk.

The non-existing documentation lead to reiteration of same arguments over design decisions on the course of time (c). A different designer landed on a similar solution that a previous designer had already done earlier. This waste could have easily been avoided with a style guide.

UX team was struggling with applying the undocumented principles, and so were the developers (d). On multiple occasions, an already implemented solution had to be revised to make the defective UI implementation in line with the rest of the UI.

The design process relied heavily on the judgement of the UX designers (e). Feedback was gathered, but the design process was much less collaborative as it could have been.

During the development of the style guide, a concrete, initial metric for UX debt was established. All JIRA issues which were of the types “bug” or “defect” and were cosmetic in nature or had the label “ux” added to them were considered to contribute to UX debt (f). This definition was acknowledged to not be comprehensive, but it was a start. The exact amount of UX debt may not be disclosed in this public thesis.

There were several existing alternatives identified for the style guide. There were style guides drafted by a consultancy agency, but they had fallen out of date a long time ago. Their format was not optimal for keeping up-to-date: they existed on a network drive in a document format.

The current UX guide which functioned as a style guide of sorts had littered with too specific information. It was laborious to maintain. The last existing alternative was the UX team – this was not a viable option, since it instantly introduces more risks to project in the cases of changes to staffing of lack of documentation.

In parallel with defining the problem, it was essential to analyze who were having the problems the style guide was set out to solve.

5.1.2 Target audience

The presumed users of the style guide were developers, UX designers, SMs, POs, testers and the management. The primary user group was assumed to be the developers. There were three different kinds of developers identified. It should be noted that everyone in the target audience were native Finnish speakers.

The first archetype of the developer was the enthusiast. This kind of developer would actively consult the style guide and possibly promote its existence. It was hypothesized that this kind of developers would hold following the process in high regard and have high aspirations of their career.

The second type of developer was the impartial. The attitude towards the style guide would be neutral – it would just be another document in the process. They might use the style guide if it was truly worth it.

The third type was the resistant. They would not see the benefit of the style guide nor understand why it is needed. The resistant would not outright leave the style guide unused, but would avoid using it as long as possible.

In order to maximize the probability of the style guide getting used appropriately it should deliver value to the primary user groups.

5.1.3 Value propositions

The added value of the style guide was thought to be multiple things. First, it would provide a reference that would be unambiguous and meaningful. Second, it would be easily available and easily maintained. Third, it would enable for quicker development. Fourth, less time would be spent on consulting basic things UX designers and POs. Fifth, it would enable developers to collaborate better in the design process. Sixth, the style guide could provide access points between the code repositories and UX principles.

The value was treated conceptually similar to the Goals of the Google HEART framework in the Goals–Signals–Metrics process [47].

The next step after defining the problem, the audience and the value the product (style guide) would deliver it was time to come up with more concrete features and attributes the solution would include.

5.1.4 Solution

To solve the problems, and to achieve the value propositions, the solution (the style guide) should have certain features and attributes. The most important aspects the solution should address to achieve the value were:

- Documentation of look and feel
- Each major UI component documented
- UX and interaction practices and principles documented
- Engaging content
- Meaningful content
- Accessible
- Easy to use
- Easy to find
- Easy to search.

Through documentation of look and feel, each major UI components and UX and interaction practices and principles the design process could be made faster and more lightweight. It would make the design principles more transparent and open and enable improving and refining them.

By making the content engaging, meaningful and accessible, the changes of the style guide getting used would be improved. This would naturally require the style guide to be easy to use.

To determine if the style guide addressed the correct aspects, the solution should be measured with appropriate metrics.

5.1.5 Key metrics

In order to determine if the direction of the style guide development was the right one, appropriate and actionable metrics were required. Considering the problem, solution and value framing, the appropriate metrics were chosen in compliance with the HEART framework. Metrics were chosen from three categories: Happiness, Engagement and Task Success.

HEART's Happiness is used to categorize usability related issues, such as satisfaction and ease of use [47]. Typical metrics for this are the System Usability Scale (SUS) and Net Promoter Score (NPS) which have been found to correlate rather well [52]. Since both are rather straight forward and easy to measure, both NPS and SUS were chosen to measure the overall ease-of-use and satisfaction.

NPS divides respondents into three groups: the promoters, passives and detractors. The NPS questionnaire includes one question only. Promoters are those who respond with a 9 or 10. Passives respond with a 7 or 8, and anything below that is considered a detractor. [53] The individual score is called likelihood to recommend (LTR).

NPS results in a total score that ranges from -100 to 100. It is calculated by subtracting the detractor percentage value from the promoter percentage value. The passives have no effect on the score.

SUS is a tried tool for measuring overall usability of a software system. The SUS questionnaire includes 10 questions and results in a single combined score. The score ranges from 0 to 100. The resulting score can be described with an adjective:

- Best imaginable: 90,9
- Excellent: 85,5
- Good: 71,4
- OK: 50,9
- Poor: 35,7
- Awful: 20,3
- Worst imaginable: 12,5.

The scores listed are the lower bounds for each adjective. [54]

Each SUS question uses a Likert scale from one to five. One means "Strongly disagree", five means "Strongly agree". Odd questions are positive statements, and even questions are negative statements. The questions of the SUS questionnaire and the questions' individual weights are presented in **Table 1** below [55, 56].

Table 1. *SUS score calculation.*

Question	Score calculation
1. I think that I would like to use this product frequently	$answer - 1$
2. I found the product unnecessarily complex	$5 - answer$
3. I thought the product was easy to use	$answer - 1$
4. I think that I would need the support of a technical person to be able to use this product	$5 - answer$
5. I found that the various functions in this product were well integrated	$answer - 1$
6. I thought that there was too much inconsistency in this product	$5 - answer$
7. I would imagine that most people would learn to use this product very quickly	$answer - 1$
8. I found the product very awkward to use	$5 - answer$
9. I felt very confident using the product	$answer - 1$
10. I needed to learn a lot of things before I could get going with this product	$5 - answer$

Each SUS questionnaire item is calculated by subtracting one for odd questions and subtracting the question answer from five for even questions. The scores are then summed together and multiplied by 2,5 for the final SUS score. [56]

Lewis and Sauro have found a positive correlation with SUS and the LTR of NPS. They suggest that a promoter has approximately an average SUS score of 81 and that detractors have an average score of 52,5. A person who gives a rating over 81 can be considered a promoter with fair certainty, and a person giving a rating below the 52,5 can be considered a detractor. [52, 57]

Lewis and Sauro present a simple rule of thumb for a rough estimate of a LTR score with a SUS score: [57]

$$LTR = \frac{SUS}{10}.$$

Engagement is used to categorize metrics that illustrate the level of user involvement. Typically, this is measured through visits to a website and generally the number of user actions within the product. Since the style guide would be published in the community-wiki, observing page metrics would be a viable and cost-effective option.

Task Success category is for traditional UX related metrics, such as completion rate, time-on-task and so on. For the style guide, a relevant Task Success metric would be the amount of UX debt tracked in JIRA. This is clearly a longer-term metric than the others, and the UX debt can even go momentarily up as a result of the beginning to comply with the style guide.

During test sessions, traditional usability metrics such as time on task or errors in completion were observed for Task Success. These would give more instant feedback in contrast to the UX debt.

To summarize, the metrics chosen were:

- SUS and NPS for Happiness: general usability and satisfaction
- Page views for Engagement
- UX debt for long term Task success
- Time on task and errors in completion for short term Task Success.

In parallel with determining the appropriate metrics and the solution definition, it was crucial to analyze the distribution of the style guide.

5.1.6 Channels

The development process imposes restrictions through the context. One aspect of these restrictions is a technological one, and the technological context should be considered when determining the right channels for making the style guide known.

Since JIRA and Confluence were familiar to everyone involved in the development processes, they were a natural selection for being the primary channels of communication. They both enable two-way communication.

JIRA can be used to observe the UX debt. The UX team can decide the necessary actions based on the direction of the UX debt: whether it is increasing or reducing. Confluence enables a more direct feedback loop through comments on the pages of the style guide, for example.

In addition to the primary channels, three other means were identified: word-of-mouth (WOM), internal chat and email. WOM can be casual daily discussion, or e.g. a presentation. Internal chat can be used to communicate immediate matters. Email is used by everyone in the organization on a day-to-day basis so it can be used to distribute information most widely in a relatively short-term time period.

Another aspect to consider with the distribution and applying of the style guide are the stakeholders related to the style guide.

5.1.7 Stakeholders

Most of the identified stakeholders for the style guide were assumed to have a positive impact upon the style guide. Only two stakeholder groups might have an impeding impact upon the development process of the style guide or its adoption.

The positive and supporting force behind the style guide would be the Scrum Masters, Product Owners and the other management section of Insta Response. The SMs and POs would make the style guide known to all the development teams. Management was generally supportive of the effort, and wanted to make style guide an official part of the development process.

The impeding factors would be the "resistants" described earlier. This could include SMs, as well. The other stakeholders that might impede the development could originate within the UX team, if they considered the style guide somehow a threat to their practice (see the "lonely hero designer" antipattern).

5.1.8 Hypotheses and risks

Each part of the canvas is built upon hypotheses. Each hypothesis includes a risk. In this section, three of the riskiest assumptions are identified, and their initial risk is examined.

The riskiest assumption is that the developers will actually use the style guide. The risk here naturally is that the style guide will go unused. In this case, the development of the style guide has contributed to waste in the form of wasted time. Signs of this risk manifesting are that the style guide does not get any views or the developers are unaware of it or find it unusable or useless.

The second most risky assumption is that the style guide will help reduce UX debt. In the worst case, it will only generate more UX debt which is never fulfilled. Another sign of this assumption being wrong is that the style guide will have no effect on resolving the UX debt. Naturally, reducing the UX debt requires a process to resolve it in addition to the style guide.

A third hypothesis is that the style guide will help and improve the UX design process. The style guide could also be a disruptive factor. If there is too big gap between the style guide and status quo, it might be confusing or detrimental to the development process to adopt the style guide.

In this section, the aspects potentially leading to the failure of the project were examined. Next, the things signaling for potential success are described.

5.1.9 Signs of success

In order to determine if the style guide fulfilled its hypothesized purpose, limits for the metrics were established. To set the initial limits, a baseline for the metrics should be determined. This was executed by running a smoke test with NPS (see the next subsection for details).

For Happiness, the initial goal for SUS score lower limit was set to be 72 (Good). This corresponds roughly to NPS score of seven [52].

The other tangible signal of success would be the reduction of UX debt, which would contribute to the Task Success of the style guide. UX debt would go down only on a long-term (several sprints) time window, and in short-term it might even increase.

Recurring page views is another success signal. This would mean that the content is engaging and interesting enough for stakeholders to keep an eye for it.

Another sign of success would be reduced need for UX- and UI-consultancy. This would mean that the style guide is understandable enough so that less support from UX team would be needed. This is harder to measure than the previous signals, since it is mostly based on the feelings of the consultancy frequency of the UX team. There existed no recorded benchmark on the consultancy need of the UX team.

5.2 NPS smoke test

To give the Style Guide a Go/No-Go decision a smoke test was carried out. The baseline for the metrics of the style guide was formed with the Net Promoter Score (NPS) System. The NPS questionnaire was distributed via email to all project participants. The respondents were given two weeks to answer the questionnaire.

In the sense of Lean philosophy, the NPS Smoke test can be viewed as representing the Minimum Viable Product (see e.g. “The Video Minimum Viable Product” in Ries’ book, The Lean Startup) [30]. By asking the respondents to answer if they would recommend using a hypothetical style guide, they first need to imagine such a guide.

The test would divide the respondents into three groups: promoters, passives and detractors. This corresponds to the user segmentation into the enthusiast, the impartial and the resistant, respectively. The promoters were thought to represent the possible early adopters for the style guide.

It was very light weight to carry out both for the administrators of the test as well as for the respondents. The results for the smoke test are discussed in chapter 6.

To gain insight into why someone was a detractor or a promoter, follow-up questions were distributed. The detractors were sent the follow-up question: “How could we make the style guide in a way that you could consider promoting it?”. The promoters received the follow-up question: “What, in your opinion, would make the style guide so relevant?”.

After receiving and analyzing the surprisingly positive responses from the NPS smoke test, the next step was to build a testable subset of the style guide, i.e., the next iteration of the MVP. This was done during the second cycle of the BML loop.

5.3 MVP: first iteration of the Style Guide

The first iteration of the style guide was drafted after the principles described in chapter 2 and according to the solution features, values and target audience listed in subsection 5.1 earlier in this chapter. The style guide was created into the Confluence site of the UX team, and it was written in English.

The implementation of the style guide began with outlining the overall contents of the style guide. The style guide was divided into three main categories: Design, Components and Practices.

The design section included all the high-level design specifications, such as the color palette, layout templates, typography and metaphors for the GUI. The Components section included all the major UI elements like buttons, menus and dialogs. The Practices section included processes and patterns for interaction, usability and overall UX.

The color palettes, typography and tone of voice were derived from the brand book of Insta, as well as partly from the existing GUI implementation. This was done in order to direct the GUI to adhere to the brand of Insta Group in addition to defining the brand of Insta Response.

In most countries, blue color is associated with high quality and trustworthiness. In western countries such as USA, dark grey often connotates a valuable high technology product. The Insta Response color palette is mainly constructed from different shades of blue and grey. [58] These color selections are aligned with the value propositions of the Insta brand (see Chapter 2).

To meet the findability criterion of the style guide, a search functionality was embedded to the page. The Confluence site of the style guide was also optimized for Finnish search words through metadata.

In order to potentially improve the engagement with the style guide, a few novel features were added in. These included animations and video clips of the current GUI and interactive elements embedded within the style guide.

In the first iteration of the style guide, the primary focus was on documenting the current elements within the Components section. Each of the documented components sections were added practical examples of both good and bad implementations [6, 11]. **Figure 8** below demonstrates one example presenting bad implementation.

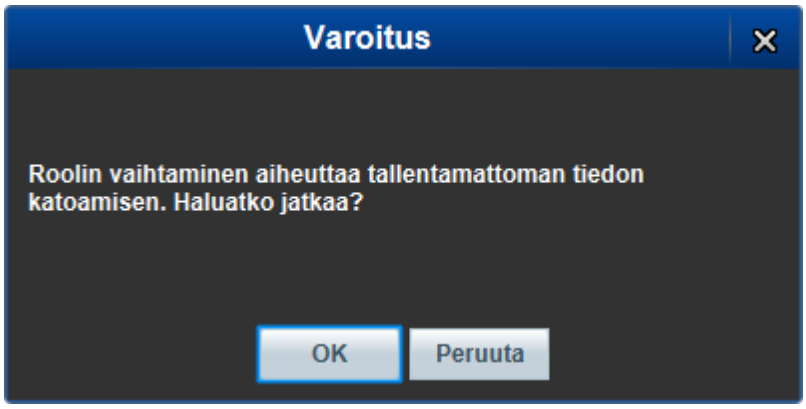


Figure 8. *An example of a GUI dialog implementation that does not adhere to the Style Guide.*

The above example did not fully adhere to the Style Guide. The dialog (**Figure 8**) did not follow the platform conventions which would be aligning the buttons to the right-hand side. It centered the dialog header, although the Style Guide advises aligning them to the left. The dialog also used incorrectly styled buttons with poor descriptions for their actions.

During the development of the next iteration of the MVP, informal collaboration was exercised with the developers to gain feedback on the implementation on-the-go and to constantly validate the direction of the style guide. The next iteration of the MVP was then tested with a traditional usability study.

5.4 Running an experiment: Style Guide pilot testing

To further validate the Style Guide user tests were carried out. The Style Guide was planned to be pilot tested with five developers, five being the recommended sample size for gathering insights [59, 60]. Before the actual and more formally defined pilot testing, informal collaborative design sessions and user tests were carried out.

A test plan was drafted for the pilot tests (see Appendix B for details). The test included three brief tasks for the participants to perform on the style guide. In the first task the participants were to find the style guide. In the second task the participants were asked to design a GUI against a user story. In the third task the participants were asked to evaluate faulty GUI implementation with the style guide.

During the test, three metrics were observed. The first addressed the accessibility and findability goal of the style guide. The second metric determined the preliminary task success of the style guide through simple design tasks. The third metric measured the overall usability of the style guide with SUS.

Each of the five test sessions was reserved a one hour slot. The participants were chosen based on their response to the NPS questionnaire. The pilot test focused on testing the early adopters, or the “enthusiast” profile.

The first task for the participants was to locate the style guide in Confluence. This was seen as important first step to validate, since the wiki of Insta Response is very rich with different kind of information. Additional challenge might be the language choice for the style guide, since English is not the native language for the Insta Response developers.

The following two tasks were simple GUI design and evaluation tasks in the Insta Response context. The goal was to determine if the information included in the style guide would help solve this kind of problems. The metric was based on the perceived deviations in the output of the tasks. Each decision step the participants took was assigned a deviation factor from zero to four, zero meaning “no deviation”, one “minor deviation”, two “moderate deviation”, three “major deviation” and four “critical deviation”. These are presented in **Table 2**.

Table 2. *Deviation severity factors.*

Severity	Meaning
4	Critical deviation
3	Major deviation
2	Moderate deviation
1	Minor deviation
0	No deviation

The evaluation of the deviation severity of the outputs was based on the expert review of the UX team. The deviation indicator would be calculated like this:

$$D = \frac{4 \cdot D_{Cr} + 3 \cdot D_{Ma} + 2 \cdot D_{Mo} + 1 \cdot D_{Mi} + 0 \cdot D_{No}}{4},$$

where D is an overall deviation indicator, ranging from 0 to 1. D_{Cr} is the ratio of critical deviations with all the counted steps taken, D_{Ma} is the ratio of major deviations, D_{Mo} is the ratio of moderate deviations, D_{Mi} is the ratio of minor deviations and D_{No} is the ration for steps that had no deviation result on the outcome. This is adaptation of the “Severity Impact” of Morten Hertzum. [61]

Enough tasks were planned so that there would not be idle time during the tests sessions. It was assumed that there would be enough time to run one or two design tasks.

Finally, the participants were asked to evaluate the style guide using a standard SUS questionnaire. This would indicate the direction the style guide has progressed against the baseline established with the NPS smoke test.

5.5 Style Guide release

The style guide was planned to be released through multiple channels. Email and WOM were the most prominent ones. Confluence was also seen as a probable source of attraction, since the activity of the UX team on the style guide was open for everyone to see.

With the management, it was decided that a brief event should be arranged to promote the style guide. This would be the point where the style guide would become an official part of the development process.

The official release would raise the profile of the style guide and make the developers more aware of it. Releasing the style guide marked the begin of the third BML loop.

5.6 Maintaining the style guide

For the style guide to stay relevant, it should be current and updated regularly. The updates should push the style guide into a more complete direction, based on the vision of the UX team and the feedback of the audience of the style guide.

The Lean UX book [3] claims that there are essentially two strategies in approaching a style guide: the “big bang” and “slow drip”. In big bang, the style guide is reserved a prioritized and fixed time slot to implement it. The style guide gets fully implemented during this time. In slow drip, elements are added to the style guide when they get changed. [3]

Since the UX team had other priority tasks in addition to implementing the style guide, the slow drip approach was adopted. The approach has the obvious disadvantage of the style guide not being complete as opposed to the big bang strategy [3]. Since the style guide was implemented with the Lean UX philosophy, however, this was seen mostly appropriate: the style guide would have to be tested and validated regularly, and each iteration of the style guide could be considered the next MVP.

Another NPS questionnaire was planned to be distributed, but this did not happen in time to fit in this thesis.

6. RECEPTION OF THE STYLEGUIDE

In this chapter, the results from NPS Smoke test, Style Guide Pilot Test and Style Guide launch are reported, respectively.

6.1 NPS smoke test results

The initial attitude towards the Style Guide was very positive. The response rate could have been higher, but was still satisfactory: 63,2 % response rate. The survey resulted in a preliminary NPS score of 58,1. With the regression formula presented in chapter 5.1.5, this would correspond to roughly a SUS score of 90 – this would be described with the adjective *excellent*.

The raw data for the survey results can be seen in Appendix A. The survey was distributed to 68 individuals within the organization, out of which 43 responded. The standard deviation for the survey was $\sigma = 1{,}18$ with the mean for LTR being 8,74 on an eleven-point scale from 0 to 10. The distribution of the results can be seen in **Figure 9**.

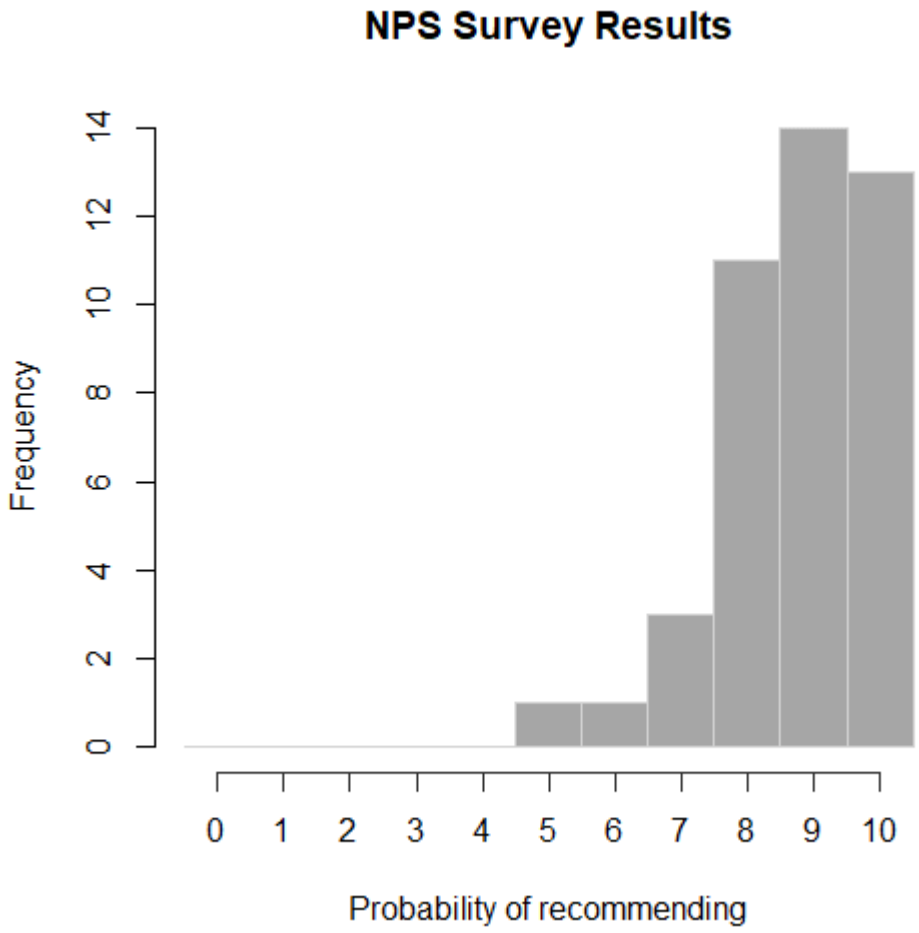


Figure 9. *Histogram of the NPS survey results.*

Of the 43 respondents, two were counted as detractors, twenty-seven as promoters and the rest fourteen as passives. The top reasons for promoting the style guide were:

- Improved consistency and uniformity of Insta Response
- Improved usability of Insta Response
- Enabling for faster development
- Documentation
- Enhancing the UI testing process.

The top reasons for opting to detract from using the style guide were:

- Unawareness of the style guide
- Doubts about the currency of the style guide (i.e. style guide not being up-to-date or its ability to stay current)

- Doubts about how realistic the style guide will be considering the current status of the GUI of Insta Response.

6.2 Style Guide pilot testing results

The pilot tests were conducted mostly according to the test plan (see Appendix B). There were changes to the schedules, and on one test session, the participant had to leave early and did not have time to fill in the SUS questionnaire or to perform all tasks. All planned five test session were executed. The facilitation of the tests was successful, and the UX team received positive feedback on the arrangement of the test session from the participants.

Overall, the style guide performed well on the planned tasks. The results are reported in detail in Appendix C and summarized in **Table 3**. All participants were able to find the style guide in the target time, which was under one minute. The design tasks went without any critical or major deviations.

Table 3. *Pilot test results, tasks 1 – 3.*

Participant No.	Task 1 (search time, seconds)	Task 2 (deviation ratio, 0 – 4)	Task 3 (deviation ratio, 0 – 4)
1	40 s	0	0
2	under 30 s	0,028	N/A
3	under 40 s	0,036	0,045
4	under 30 s	0,05	0
5	under 60 s	0	0,1

According to the SUS score, however, the style guide was not able to meet expectations set with the NPS smoke test. Average score for SUS was 75,6 (*good*) and the standard deviation for the score was $\sigma = 15{,}6$. The goal was over 86 (*excellent*). **Table 4** shows the SUS survey results in detail.

Table 4. *Pilot test SUS survey results.*
Average score 75,6 (good). Standard deviation $\sigma = 15{,}6$.

Participant No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS Score
1	4	2	3	1	2	3	4	1	4	1	**72,5**
2	-	-	-	-	-	-	-	-	-	-	**N/A**
3	5	2	4	1	5	3	5	2	4	1	**85,0**
4	4	1	4	1	5	1	4	1	4	1	**90,0**
5	3	4	3	2	4	2	4	3	3	4	**55,0**

Only one of the participants of the pilot test graded the style guide over the goal set for the SUS score. The NPS prediction for the style guide based on the SUS scores would be 25% promotion.

Each of the participants commented that there was potential for the style guide to be an excellent one. Each participant also commented that the contents of the style guide was what they expected it to be. Some of the participants found the unfinished state of the style guide more disturbing than others, however, and this probably is reflected the most in the scores.

6.3 Release and post release

The official release had a profound impact on the view count of the style guide immediately after the launch. Before the launch, the style guide was getting barely any views. The style guide was announced on 5th of April 2017 (week № 14). **Figure 10** below shows a graph of the view statistics of the first week. The view count was gathered via the Confluence's statistics view.

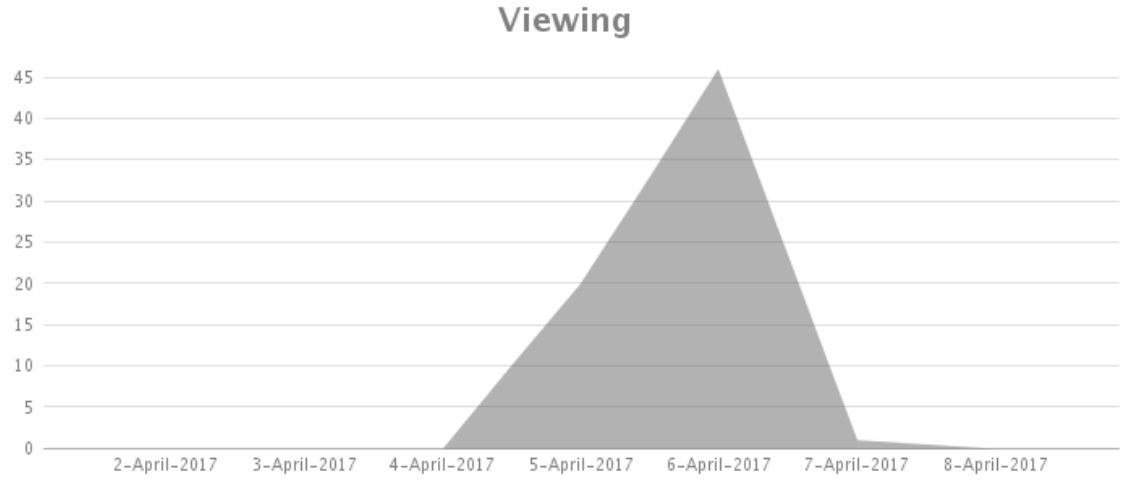


Figure 10. *Style guide release, first week: 67 views in total.*

Immediately after the launch, the style guide reached its then all-time highest view amount. During the first week, the style guide was viewed 67 times. During the promotion session of the style guide, some of the developers commented that they would rather see a "live style guide" than another wiki page. A live style guide is a piece of software that is maintained versioned together with the rest of the code base, and not a separate wiki page or site.

During the next two weeks, the project activities were quite low due to Easter holidays. This impacted on the view count of the style guide, which was 20 views. The view count for week № 15 can be seen in **Figure 11** below.

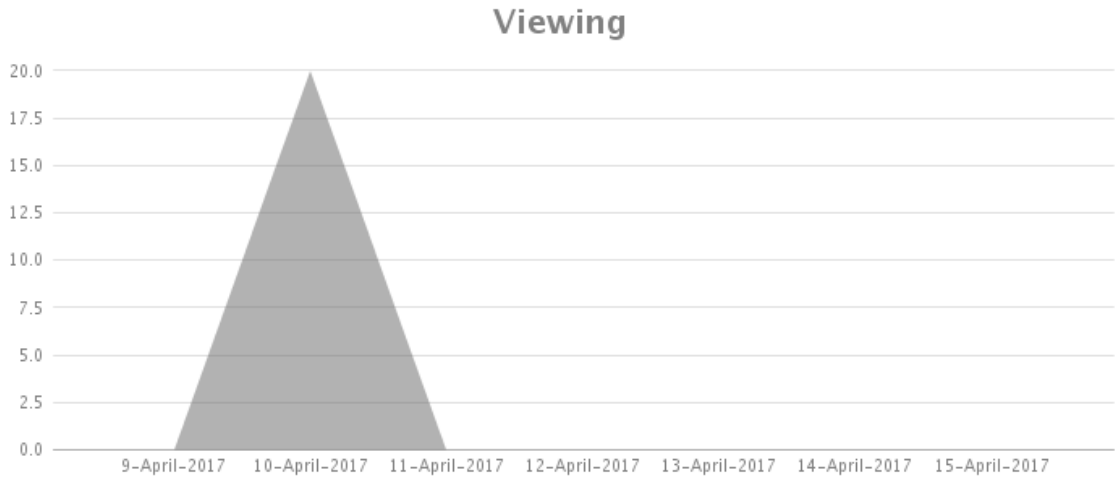


Figure 11. *Style guide release, second week: 20 views in total.*

On week № 16, the view count continued to drop. The bottom for post-announcement views was during this week: only 11 views. The view graph for week № 16 can be seen in **Figure 12** below.

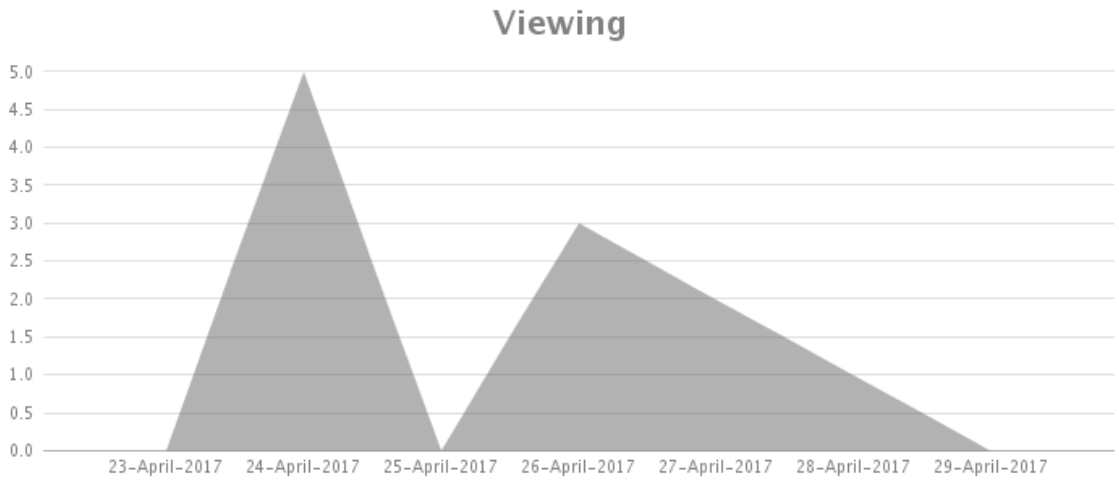


Figure 12. *Style guide release, third week: 11 views in total.*

After week № 16, the views of the style guide clearly improved. Week № 17 saw 53 views of the style guide. The graph can be found in **Figure 13**.

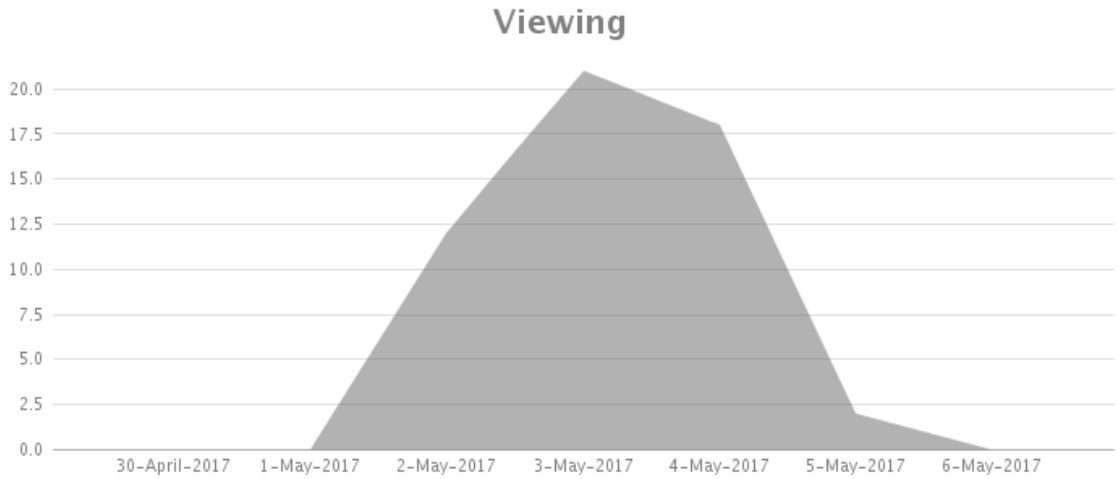


Figure 13. *Style guide release, fourth week: 53 views in total.*

During the writing of this thesis, the UX debt had started to mildly reduce. The UX debt had reduced about eight percent from the original value. However, it is unclear how much the style guide contributed to the improvement of the UX debt – there were other significant process improvements in addition to the implementation of the style guide. The role of the style guide is ambiguous at best when considering the reduction of UX debt.

7. DISCUSSION

In this chapter, the results presented in chapter 6 are discussed. The first sub chapter discusses the results from the initial NPS smoke test. Second sub chapter interprets the results from the style guide pilot tests. The third chapter goes through the implications of the metrics observed after the release. The final chapter evaluates the work done during this thesis.

7.1 The meaning of NPS smoke test: the first MVP

Using the NPS survey as a smoke test was seen as a clever application of the minimum waste -principle of lean philosophy, as well as the Lean UX paradigm of early validation. This allowed the UX team to validate the idea and possible utility of a style guide and its need among the developers and other stakeholders.

What did the score actually measure? The UX team argues that the NPS survey measured the attitude towards an imaginary style guide. A simple survey was enough to evoke a surprisingly strong and positive mental image of the style guide. It can further be argued that this would set the baseline for the expectations for the style guide.

The NPS smoke test survey can be held as a successful step in the Lean UX implementation process of the style guide. It was lightweight enough to carry out and to spark a considerable response rate, and actionable enough to provide insights into how to proceed with the development of the style guide. In lean terms, the NPS smoke test was a true MVP and the first iteration through the BML loop [30].

7.2 Scaling up with the second MVP and style guide pilot test

The second iteration of the MVP was not as successful as the first MVP: even though the style guide was able to perform well with the tasks carried out in the pilot test, it underwent a drop with the predicted NPS score (68% original; 25% predicted). This drop can be regarded only indicative, however, and not by any means conclusive. The prediction is based on the ratings of four participants, with two being likely promoters and one being a likely detractor. As for the task success, the style guide could meet the goals set to it.

On the other hand, managing to turn one of the promoters into a probable detractor is not a good sign of the direction of the style guide. This can mean essentially two things: either the style guide failed in its current format to meet expectations or it failed to meet expectations due to its unfinished state.

This might imply that more developers would expect to see the style guide as not being a wiki page in the Confluence, but rather a live style guide that would live within the code repositories, and version with the rest of the code base. To obtain a more concrete view of the direction of the style guide the NPS survey should be distributed again. The results should be compared with the baseline formed during the NPS smoke test to determine the real trend for the happiness of the style guide.

7.3 The profile and awareness of the style guide raised

While the ultimate impact of the style guide on the product development process remains to be seen, it can safely be stated that the awareness of the style guide improved significantly. Clearly, the official announcement had the most impact upon the views of the style guide during the writing of this thesis. Still, as the graph in **Figure 13** from week № 16 shows, the style guide was getting steady page views.

Overall, the view count bodes well for the engagement with the style guide. Evidently, the stakeholders of the style guide are keeping an eye on it. The impact upon the UX debt remains to be seen, but the direction seems encouraging.

7.4 Review of the process

Implementation of the style guide was challenging, since it was difficult to prioritize and allocate time for its development amidst other UX team tasks. The limited resources of the UX team added up to the challenge.

The aim of lean is to release the right product as fast as possible with as little effort as possible. Lean UX provided a framework that directed into a critical and analytical approach. Using Lean UX as a framework provided a solid base in delivering the right solution with no or minimal effort wasted.

The style guide could have been implemented in a faster schedule if the resources and prioritization would have allowed to do so. Still, the resources were efficiently utilized and a good base for further development of the style guide was formed.

Lean UX was good complementary process alongside the regular Scrum process of the product development. Lean UX allows approaching design work pragmatically and efficiently, solving some of the problems imposed when using Scrum and more traditional approaches to design. As a result, Lean UX is to be adopted more widely to the UX work in general.

8. CONCLUSIONS

This thesis was more about applying a novel framework in practice than implementing a style guide. The role of the style guide was to be the subject matter for applying the Lean UX philosophy and framework, not to be the focus of the thesis. Examples of style guides and their benefits abound, it was more interesting to focus on taking the Lean UX framework to a concrete level. This is reflected in the main research question for the thesis.

In this chapter, the research questions are revisited in the first section. Finally, the future of the style guide is discussed.

8.1 RQ: How can Lean UX be applied to developing a style guide?

This thesis shows that Lean UX as a framework is applicable in developing internal products such as the style guide with limited resources in a large-scale software project. Lean approach in large-scale development of software products is encouraged in addition to agile methodology in the researched literature as well. Lean UX was selected as the framework because of its novelty and its synergetic principles with the philosophy of the UX team.

It should be noted that all the frameworks in software development described in this thesis share much traits. They all share almost the same steps be it waterfall, IID, ISO 9001, design thinking, agile or lean when examined through coarse enough lens: inception, building, verifying and learning. They all try to achieve the same principal goal, which is to deliver a solution to a problem – only their emphasis differs. This is, in essence, a scientific method.

Thus, at the heart of the Lean UX framework lies a scientific method, with the focus on delivering the right product to the right audience with as little waste as possible. Lean UX makes it transparent that it builds upon assumptions – or hypotheses, which must be rigorously validated.

Lean UX, as a framework, promotes deeply the collaborative aspect of design. Since the UX team was very limited in human resources, the collaboration might have suffered in comparison to what it could have been if there was a better ground for team collaboration.

RQ1: Why is the Style Guide needed in the first place?

As the results of the NPS survey indicate, the style guide is considered a needed addition to the product development of Insta Response. The style guide is needed for the following reasons, among others:

- Improved consistency and uniformity of Insta Response
- Improved usability of Insta Response
- Enabling for faster development
- Documentation
- Enhancing the UI testing process.

These aspects will hopefully address the problems outlined in 5.1.1. Namely, enhance collaboration, improve the design process and reduce UX debt.

Lean UX helped to validate the hypothesis of the style guide being a needed addition to the product development. The framework also guided in steering the course of the development of the style guide to include features that the target audience would need.

RQ2: How to get the project stakeholders to use and be aware of the Style Guide?

In the context of this thesis, it cannot be concluded how to get the project stakeholders to use the style guide. The pilot test results indicate that the style guide *can* be used by its intended audience. As for the awareness of the style guide, the post release results are a positive indication.

The Lean UX framework combined with a canvas approach of the UX Canvas helped to come up with a viable strategy that took into consideration the various stakeholders and distribution channels for the style guide. The UX team believes that this was key in managing to raise the profile and awareness of the style guide.

RQ3: How to measure the success and utility of the Style Guide?

The utility of the style guide can be observed through NPS and SUS, which measure the overall Happiness towards the style guide. Task success metrics can be utilized as well, such as time on task and error counts.

The Lean UX framework requires validation through meaningful metrics. It does not dictate how to proceed with the measuring, however. For this purpose, the HEART framework was applied in harmony with the Lean UX framework.

The overall success of the style guide, however, can only be observed through a combination of metrics. Good indicators are that the style guide gets regular views (i.e. the audience is engaged to it) and that the style guide performs well with the Happiness and Task success metrics. If these metrics give positive indication, and the UX debt starts to drop as well, then the style guide can be regarded truly successful.

8.2 Summary and prospects

In this thesis, Lean UX was applied as a novel framework in implementing a style guide. The thesis combines multiple UX practices concretely with the Lean UX principles and philosophy.

Lean UX provides a framework that steers its adopter into thinking the development activities critically and methodologically. At the heart of Lean UX is the scientific method, in which its actors transparently declare hypotheses which are subject to rigorous testing.

It should be noted that Lean UX as framework does not dictate its adopter to do anything very specific. By refusing a dogmatic application, prior knowledge of the best practices and tools are assumed – or at least beneficial in getting started with Lean UX. On the other hand, the framework encourages the adopter to try new approaches while regarding them as hypotheses that should be validated. This, in turn, promotes adopting the approach that is *sensible* or smart instead of blindly following a cook book of methods.

The results from the pilot test leave the style guide in a position of mild uncertainty. While some indicators give positive signals, the current implementation calls for further validation. A viable pivot might be to shift towards the live style guide.

In the big picture, the UX team is shifting towards adopting the Lean UX framework to its daily activities. Producing the style guide was the first concrete step in a wider adoption of Lean UX to the practices of the UX team of Insta Response.

REFERENCES

[1] J. Edwards, The great oxymoron: B2B UX, Journal of Direct, Data and Digital Marketing Practice, Vol. 16, Iss. 4, 2015, pp. 266-269.

[2] D. Norman, J. Nielsen, The Definition of User Experience (UX), Nielsen Norman Group. 2017. Available: https://www.nngroup.com/articles/definition-user-experience/.

[3] J. Gothelf, J. Seiden, Lean UX, 1. ed. ed. O'Reilly, Sebastopol, CA [u.a.], 2013.

[4] J.M.T. Balmer, Identity based views of the corporation, European Journal of Marketing, Vol. 42, Iss. 9/10, 2008, pp. 879-906.

[5] Values | Insta Group, Insta Group. 2017. Available: http://www.insta-group.fi/group/values/.

[6] E. Olsson, J. Gulliksen, A Corporate Style Guide That Includes Domain Knowledge, International Journal of Human-Computer Interaction, Vol. 11, Iss. 4, 1999, pp. 317-338.

[7] Product family engineering, Wikipedia. 2017. Available: https://en.wikipedia.org/w/index.php?title=Product_family_engineering&oldid=721205197.

[8] J. Jiao, T.W. Simpson, Z. Siddique, Product family design and platform-based product development: A state-of-the-art review, Journal of Intelligent Manufacturing, Vol. 18, Iss. 1, 2007, pp. 5-29.

[9] P. Kotler, K.L. Keller, Marketing management, 14th ed. ed. Pearson/Prentice Hall, Upper Saddle River, N.J, 2012.

[10] J. Perkins, C. Maloney, Today's style guide: trusted tool with added potential, IEEE Transactions on Professional Communication, Vol. 41, Iss. 1, 1998, pp. 24-32.

[11] H. Kim, Effective organization of design guidelines reflecting designer's design strategies, International Journal of Industrial Ergonomics, Vol. 40, Iss. 6, 2010, pp. 669-688.

[12] C. Larman, V. R. Basili, Iterative and incremental developments. a brief history, Computer, Vol. 36, Iss. 6, 2003, pp. 47-56.

[13] L.R. Vijayasarathy, C.W. Butler, Choice of Software Development Methodologies: Do Organizational, Project, and Team Characteristics Matter? IEEE Software, Vol. 33, Iss. 5, 2016, pp. 86-94.

[14] W. Royce, Managing the Development of Large Software Systems, Proceedings of IEEE WESCON, 1970, http://www.cs.umd.edu/class/spring2003/cmsc838p/Process/waterfall.pdf.

[15] K. Beck, Embracing change with extreme programming, Computer, Vol. 32, Iss. 10, 1999, pp. 70-77.

[16] Definition of INCREMENT, Merriam-Webster. 2017. Available: https://www.merriam-webster.com/dictionary/increment.

[17] Quality management systems. Requirements (ISO 9001:2015), Suomen Standardisoimisliitto SFS ry, Helsinki, 2015.

[18] Insta DefSec - Johtavaa suomalaista puolustus- ja turvallisuusteknologiaa, Insta Group. 2017. Available: http://www.insta.fi/defsec/.

[19] J. Nielsen, Usability ROI Declining, But Still Strong, Nielsen Norman Group. 2017. Available: https://www.nngroup.com/articles/usability-roi-declining-but-still-strong/.

[20] Benefits of User-Centered Design, Department of Health and Human Services, Harvard Business Review. 2017. Available: https://www.usability.gov/what-and-why/benefits-of-ucd.html.

[21] J. Rae, Design Can Drive Exceptional Returns for Shareholders, https://hbr.org/2014/04/design-can-drive-exceptional-returns-for-shareholders.

[22] SFS-EN ISO 9241-210, in: Ergonomics of Human-System Interaction. Part 210: Human-Centred Design For Interactive Systems (ISO 9241-210:2010), SFS Online, WWW, 2010.

[23] J. Pernstål, R. Feldt, T. Gorschek, Blekinge Tekniska Högskola, Sektionen för datavetenskap och kommunikation, The lean gap: A review of lean approaches to large-scale software systems development, Journal of Systems and Software, Vol. 86, Iss. 11, 2013, pp. 2797-2821.

[24] R.E. Kraut, L.A. Streeter, Coordination in Software Development, Commun. ACM, Vol. 38, Iss. 3, 1995, pp. 69–81. http://doi.acm.org/10.1145/203330.203345.

[25] Tietojärjestelmien hankinta Suomessa 2013, Tieto- ja viestintätekniikan ammattilaiset TIVIA ry, Web, 2013, Available: http://www.tivia.fi/sites/tivia.fi/files/liitteet/Tietoja%CC%88rjestelmien%20hankinta%20Suomessa%202013_0.pdf.

[26] K. Schwaber, J. Sutherland, Software in 30 Days, John Wiley & Sons Inc, US, 2012.

[27] K. Kuusinen, Improving UX work in scrum development: A three-year follow-up study in a company, Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), Vol. 8742, 2014, pp. 259-266.

[28] E.L. Law, M.K. Lárusdóttir, Whose Experience Do We Care About? Analysis of the Fitness of Scrum and Kanban to User Experience, International Journal of Human-Computer Interaction, Vol. 31, Iss. 9, 2015, pp. 584-602.

[29] M. Poppendieck, M.A. Cusumano, Lean Software Development: A Tutorial, IEEE Software, Vol. 29, Iss. 5, 2012, pp. 26-32.

[30] E. Ries, The Lean Startup, 1st ed. Crown Business, New York, USA, 2011.

[31] M.d. Rosário Cabrita, S. Duarte, H. Carvalho, V. Cruz-Machado, Integration of Lean, Agile, Resilient and Green Paradigms in a Business Model Perspective: Theoretical Foundations, IFAC-PapersOnLine, Vol. 49, Iss. 12, 2016, pp. 1306-1311.

[32] K. Dorst, The core of 'design thinking' and its application, Design Studies, Vol. 32, Iss. 6, 2011, pp. 521-532.

[33] P.A. Rodgers, E. Winton, "Design Thinking" - A critical analysis, DS 62: Proceedings of E and PDE 2010, the 12th International Conference on Engineering and Product Design Education - When Design Education and Design Research Meet, pp. 42-47.

[34] M. Holloway, How tangible is your strategy? How design thinking can turn your strategy into reality, The Journal of business strategy, Vol. 30, Iss. 2/3, pp. 50-56.

[35] J.J. Garrett, The Elements Of User Experience, 2nd ed. New Riders, USA, 2011.

[36] Alexander Osterwalder, The business model ontology, University of Lausanne, 2004.

[37] L. Liikkanen, H. Kilpiö, L. Svan, M. Hiltunen, Lean UX: the next generation of user-centered agile development? Proceedings of the 8th Nordic Conference on human-computer interaction, ACM, pp. 1095-1100.

[38] Decoding the DNA of the Toyota Production System, Harvard Business Review, Vol. 77, Iss. 5, 1999, pp. 96.

[39] M. Borseman, S. Tanev, M. Weiss, E.S. Rasmussen, Lost in the canvases: Managing uncertainty in lean global startups, ISPIM Innovation Symposium, Mar 2016, The International Society for Professional Innovation Management (ISPIM), Manchester, United Kingdom, Manchester, pp. 1-17.

[40] A. Osterwalder, Y. Pigneur, Business model generation, Wiley, Hoboken, NJ, 2010.

[41] A. Maurya, How to Document Your Business Model On 1 Page, Love the Problem. 2017. Available: https://blog.leanstack.com/how-to-document-your-business-model-on-1-page-a6c91ab73efd.

[42] A. Maurya, Lean Canvas: How I Document my Business Model, LeanStack. 2017. Available: https://leanstack.com/businessmodelcanvas/.

[43] A. Maurya, Why Lean Canvas vs Business Model Canvas? LeanStack. 2017. Available: https://leanstack.com/why-lean-canvas/.

[44] Can I use the Business Model Canvas or Value Proposition Canvas in my own teachings or public projects? – Have a question? Find the answer here. http://support.strategyzer.com/knowledgebase/articles/506842-business-model-canvas-and-value-proposition-canvas.

[45] B. Crothers, Fight the dark side of Lean UX with the Experience Canvas. 2017. Available: https://www.atlassian.com/blog/archives/fight-the-dark-side-of-lean-ux-with-the-experience-canvas.

[46] J. Gothelf, The Lean UX Canvas, Medium. 2017. Available: https://medium.com/@jboogie/the-lean-ux-canvas-d4da53263c40#.csjbyg1hy.

[47] K. Rodden, H. Hutchinson, X. Fu, Measuring the User Experience on a Large Scale: User-centered Metrics for Web Applications, Atlanta, Georgia, USA, ACM, New York, NY, USA, pp. 2395-2398.

[48] K. Rodden, How to choose the right UX metrics for your product — GV Library, GV Library, WWW, https://library.gv.com/how-to-choose-the-right-ux-metrics-for-your-product-5f46359ab5be.

[49] How to Choose the Right UX Metrics for Your Product, Digital Telepathy. 2017. Available: http://www.dtelepathy.com/ux-metrics/.

[50] K. Talke, E.J. Hultink, Managing Diffusion Barriers When Launching New Products, Journal of Product Innovation Management, Vol. 27, Iss. 4, 2010, pp. 537-553.

[51] Affairs, Assistant Secretary for Public Wireframing, Department of Health and Human Services, https://www.usability.gov/how-to-and-tools/methods/wireframing.html.

[52] MeasuringU: Predicting Net Promoter Scores from System Usability Scale Scores, MeasuringU. 2017. Available: https://measuringu.com/nps-sus/.

[53] D.B. Grisaffe, QUESTIONS ABOUT THE ULTIMATE QUESTION: CONCEPTUAL CONSIDERATIONS IN EVALUATING REICHHELD'S NET PROMOTER SCORE (NPS), Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior, Vol. 20, 2007, pp. 36.

[54] A. Bangor, P. Kortum, J. Miller, Determining What Individual SUS Scores Mean: Adding an Adjective Rating Scale, J. Usability Studies, Vol. 4, Iss. 3, 2009, pp. 114–123. http://dl.acm.org/citation.cfm?id=2835587.2835589.

[55] A. Bangor, P.T. Kortum, J.T. Miller, An Empirical Evaluation of the System Usability Scale, International Journal of Human-Computer Interaction, Vol. 24, Iss. 6, 2008, pp. 574-594.

[56] T. Tullis, B. Albert, Chapter 6 - Self-Reported Metrics, in: T. Tullis, , B. Albert (ed.), Measuring the User Experience (Second Edition), Morgan Kaufmann, Boston, 2013, pp. 121-161.

[57] J. Sauro, J.R. Lewis, Quantifying the User Experience: Practical Statistics for User Research, 2nd; 2; 2nd ed. Morgan Kaufmann Publishers Inc, US, 2016.

[58] M.M. Aslam, Are You Selling the Right Colour? A Cross-cultural Review of Colour as a Marketing Cue, Journal of Marketing Communications, Vol. 12, Iss. 1, 2006, pp. 15-30. http://www.tandfonline.com/doi/abs/10.1080/13527260500247827.

[59] J. Nielsen, How Many Test Users in a Usability Study?, Nielsen Norman Group. 2017. Available: https://www.nngroup.com/articles/how-many-test-users/.

[60] J. Nielsen, T.K. Landauer, A Mathematical Model of the Finding of Usability Problems, Proceedings of the INTERACT '93 and CHI '93 Conference on Human Factors in Computing Systems, ACM, New York, NY, USA, pp. 206–213.

[61] M. Hertzum, Problem Prioritization in Usability Evaluation: From Severity Assessments Toward Impact on Design, International Journal of Human-Computer Interaction, Vol. 21, Iss. 2, 2006, pp. 125-146.

APPENDIX A: NPS SMOKE TEST RESULTS

Participant No.	Response (0 – 10)
1	8
2	10
3	6
4	10
5	9
6	8
7	9
8	9
9	10
10	10
11	9
12	9
13	7
14	10
15	9
16	7
17	9
18	5
19	8
20	9
21	10
22	8
23	9
24	7
25	8
26	10
27	8
28	10
29	10
30	9
31	8
32	9
33	8
34	9
35	9
36	10
37	9
38	10
39	8
40	10
41	8
42	10
43	8

$N = 43, \qquad \sigma = 1{,}18$

Detractors: 2, Promoters: 27, Passives: 14.

APPENDIX B: STYLE GUIDE PILOT TEST PLAN

INTRODUCTION

This document describes the test plan for Insta Response Style Guide.

Insta Response is a product family of mission critical emergency call center applications. To assure the quality of the product family's interfaces, a style guide has been devised. This test plan aims to verify the current implementation of the style guide.

The purpose of the style guide is to enhance and speed up the design process by offering ready solutions to the most common problems. As an outcome of the release of the style guide, the UX Debt of the project should be reduced on a long-term schedule.

STUDY GOALS

The primary goals of the study are as follows:

1. The style guide can be found easily
2. The pieces of the style guide can be used to complete a simple design task without heavy wire-framing
    a. The content is understandable
    b. The content is efficiently structured.

LOGISTICS

The tests will be carried out in three parts.

TIME	DATE	PARTICIPANT
10.00	Tue 2017/04/04	PEJO
12.00	Tue 2017/04/04	YLJU
10.15	Wed 2017/04/05	TAES
12.00	Wed 2017/04/05	KATO
10.00	Thu 2017/04/06	*On reserve*
12.00	Thu 2017/04/06	KOAN

The study will be in usability test lab format, with moderated test cases.

All studies will be carried out in the Puisto conference room.

PARTICIPANT PROFILES

The participant profiles include developers mostly. The participants were screened and selected based on their answers on the Net Promoter Score Smoke Test distributed earlier on. All selected participants replied 9 or 10 and thus were segmented to the “Promoter” class.

Each participant was selected from a different development team.

TASKS

1 LOCATE THE STYLE GUIDE

How would you access the Style Guide? Where is it?

2 SIMPLE DESIGN TASK(S)

With the aid of Style Guide and UX staff, determine a preliminary specification/implementation for the feature A and/or B.

FEATURE A

As an operator, I want to be able to examine all equipment a unit has, so that I can determine if it has the necessary resources to complete a task.

Appropriate components:

- Information Card (Unit Information Card)
- List (Unit List)
- Buttons: Unit Button

FEATURE B

As an operator, I want to be able to join a phone call, so that I can aid with handling a call with other operators.

Appropriate components:

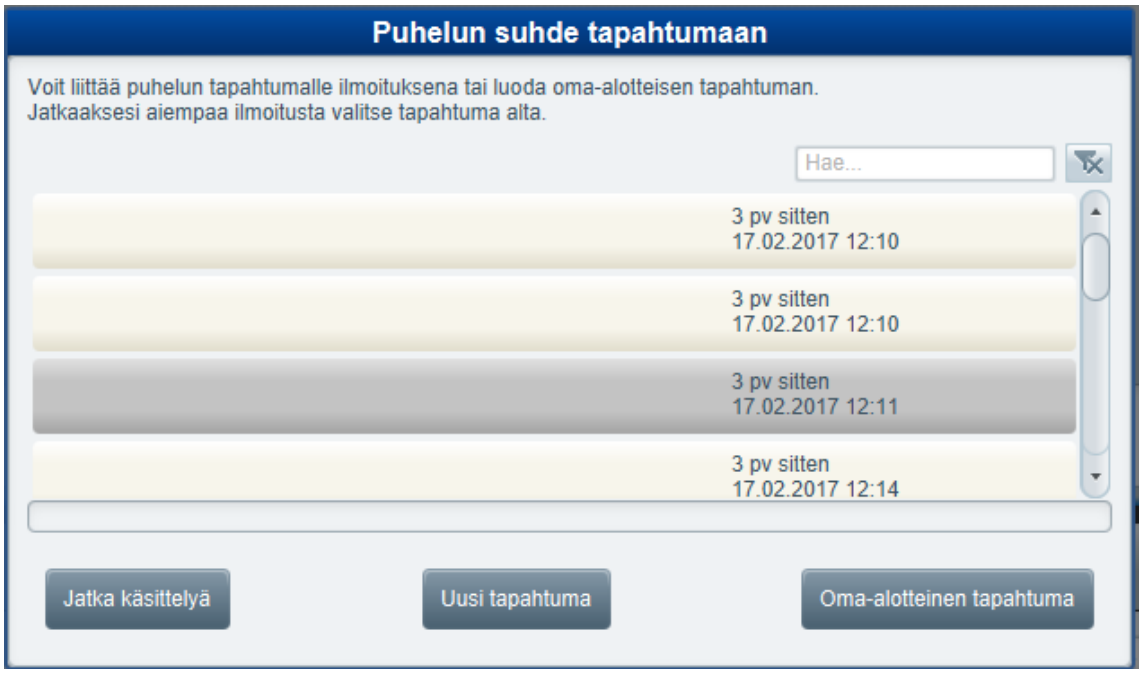
- Dialogs
- Compositions: Communication Tool
- Buttons

3 USER INTERFACE EVALUATION

With the aid of the Style Guide, evaluate designs for feature X, Y and Z.

FEATURE X

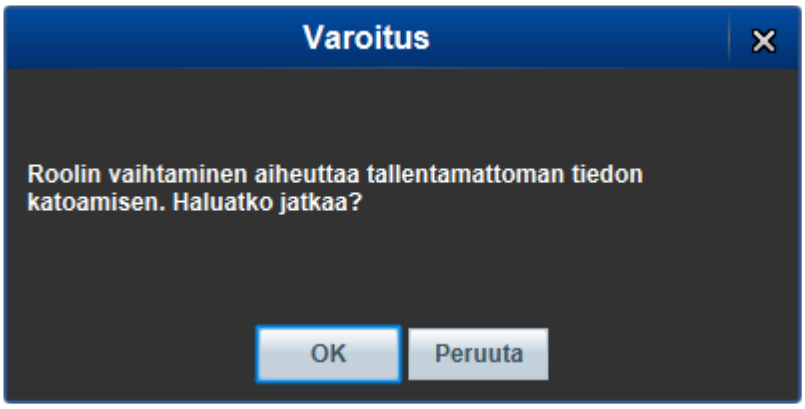
With the aid of the Style Guide, identify problems and things it does correctly related to the UI below



Make suggestions for corrections for the UI.

FEATURE Y

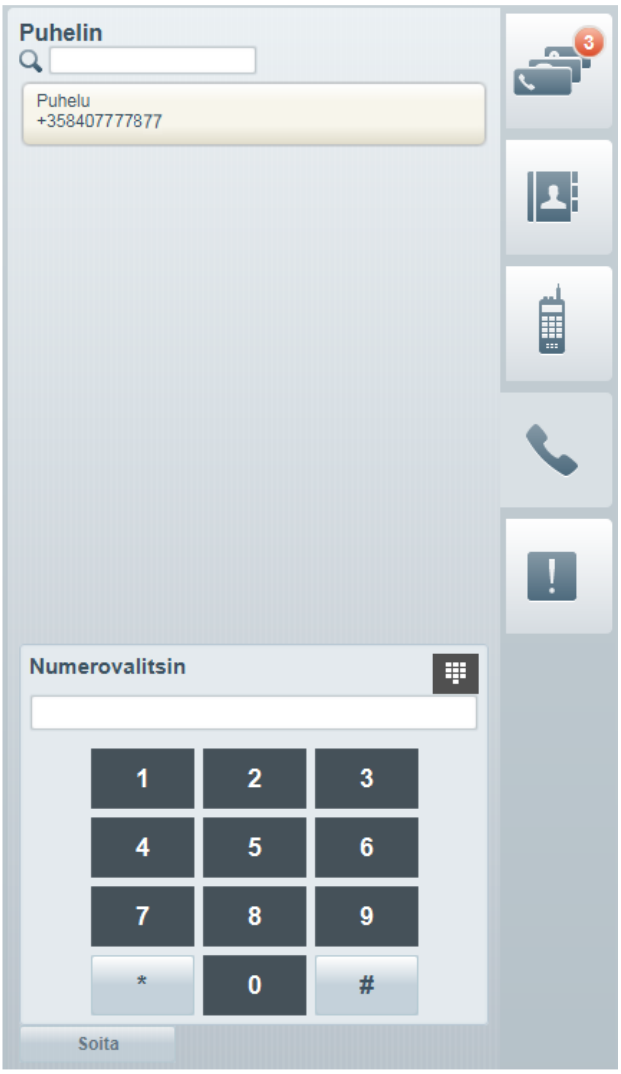
With the aid of the Style Guide, identify problems and things it does correctly related to the UI below



Make suggestions for corrections for the UI.

FEATURE Z

With the aid of the Style Guide, identify problems and things it does correctly related to the UI below



Make suggestions for corrections for the UI.

METRICS AND GOALS

The metrics and goals are chosen in compliance with the Google HEART framework. The most important metrics for the Style Guide in this study are Happiness and Task Success.

The goal of the Style Guide is to be discoverable, actionable and adoptable. This means that the style guide should be easy to find, easy to access, easy to understand and easily applied to the design process.

ATTRIBUTE	GOAL	SIGNAL	METRIC
TASK SUCCESS	The style guide can be easily found	The amount of time spent looking for the style guide	AVG. # of minutes spent searching for the style guide

	The style guide can be successfully applied during design and implementation	The number and seriousness of deviation in style	Ratio between deviation seriousness and deviation count
HAPPINESS	The style guide is easy to use	The satisfaction score from surveys	SUS, NPS

The above table provides the overall goals and metrics for the style guide study.

The deviations are assigned a severity class from 0 to 4. The resulting deviation ratio varies between 0 to 1.

SEVERITY	INTERPRETATION
4	**CRITICAL DEVIATION**
3	**MAJOR DEVIATION**
2	**MODERATE DEVIATION**
1	**MINOR DEVIATION**
0	**NO DEVIATION**

SUS stands for System Usability Scale and it results as a score from 0 to 100.

NPS stands for Net Promoter Score, which divides respondents into three groups. It results as score from -100 to 100.

Next, the concrete goals and interpretation for the metrics are listed.

THE STYLE GUIDE CAN BE FOUND WITHIN 1 MINUTE

ATTRIBUTE	VARIABLE	WORST CASE	GOAL	PLANNED	OPTIMUM	CURRENT
TASK SUCCESS	Spent time	Over 5 minutes	Under 1 minute	1 minute	30 seconds	?

THE DESIGN OUTCOMES ARE CONSISTENT

ATTRIBUTE	VARIABLE	WORST CASE	GOAL	PLANNED	OPTIMUM	CURRENT
TASK SUCCESS	Deviation ratio in style	Ratio number close to 4	Ratio under 1	Ratio under 1	Ratio number 0	?

THE STYLE GUIDE IS PERCEIVED USABLE

ATTRIBUTE	VARIABLE	WORST CASE	GOAL	PLANNED	OPTIMUM	CURRENT
HAPPINESS	NPS	-100	Over 87	Over 58	100	58
HAPPINESS	SUS	0	Over 91 (Best Imaginable)	Over 86 (Excellent)	100	?

APPENDIX C: STYLE GUIDE PILOT TEST RESULTS

PARTICIPANT #1

TASK 1

About 40 seconds.

Style guide found through weekly newsletter.

Had found the style guide previously.

TASK 2

FEATURE A

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**0**	
0	**NO DEVIATION**	**11**	

Result: 0

TASK 3

FEATURE X

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**0**	
0	**NO DEVIATION**	**10**	

Result: 0

SUS

Score: 72,5

PARTICIPANT #2

TASK 1

Under 30 seconds.

Style guide found through Confluence search.

Had not found the style guide previously.

TASK 2

FEATURE A

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**1**	
0	**NO DEVIATION**	**8**	

Result:

$$\frac{1 \cdot 1/9}{4} \approx 0{,}028$$

TASK 3

FEATURE X

No time

SUS

Score: – (no time)

PARTICIPANT #3

TASK 1

Under 40 seconds.

Style guide found with Confluence search.

Had not found the style guide previously.

TASK 2

FEATURE A

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**1**	
0	**NO DEVIATION**	**6**	

Result:

$$\frac{1 \cdot 1/7}{4} = 0{,}036$$

TASK 3

FEATURE X

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**1**	
1	**MINOR DEVIATION**	**0**	
0	**NO DEVIATION**	**10**	

Result:

$$\frac{2 \cdot 1/11}{4} = 0{,}045$$

SUS

Score: 85

PARTICIPANT #4

TASK 1

Under 30 seconds.

Style guide found through search.

Had found the style guide previously.

TASK 2

FEATURE A

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**1**	
0	**NO DEVIATION**	**4**	

Result:

$$\frac{1 \cdot 1/5}{4} = 0{,}05$$

TASK 3

FEATURE X

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**0**	
0	**NO DEVIATION**	**8**	

Result: 0

SUS

Score: 85

PARTICIPANT #5

TASK 1

Under 60 seconds.

Style guide found through weekly newsletter.

Had found the style guide previously.

TASK 2

FEATURE A

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**0**	
1	**MINOR DEVIATION**	**0**	
0	**NO DEVIATION**	**10**	

Result: 0

TASK 3

FEATURE X

Deviations by severity

SEVERITY	INTERPRETATION	COUNT	COMMENTS
4	**CRITICAL DEVIATION**	**0**	
3	**MAJOR DEVIATION**	**0**	
2	**MODERATE DEVIATION**	**1**	
1	**MINOR DEVIATION**	**2**	
0	**NO DEVIATION**	**7**	

Result: 2/9 = 0,22

$$\frac{2 \cdot 1/10 + 1 \cdot 2/10}{4} \approx 0{,}1$$

SUS

Score: 55