

# Design Systems at Work

Optimizing design processes  
and aligning design work to company identity

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Design Systems at Work: Optimizing design processes  
and aligning design work to company identity

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# ABSTRACT

User experience design in a company setting typically involves teams comprised of individuals with diverse roles, who need to collaborate when creating products and services. Resources exist to set standards for design within such a company, guiding teams of designers and developers to create products and services with a consistent look and feel that are also in line with the company's branding. These resources include UX guidelines, UI style guides, design patterns, and design languages. The latest such resource is the *design system*.

This thesis explores the term *design system* in terms of its definition and how it is applied by design professionals within companies. It seeks to understand how to define the term and how to create a design system to support the needs of a company's design teams, and ultimately, provide a pleasant and consistent experience for end users. Following this focus on design in practice, the literature review has a heavy emphasis on articles and blog entries by working designers explaining what design systems are to them, how they have built them, and how they use them. This is complemented by academic literature on topics related to collaborative work in digital product teams, design management, and storytelling methods to drive adoption within companies. Expert interviews were also conducted with design professionals who have led design system teams in organizations. The literature review and expert interviews revealed a definition for *design system* that is not standardized, yet fairly consistent from speaker to speaker. Design systems broadly encompass the early types of standardizations for design. They include design languages, guidelines, and style guides. They go even further by not only establishing standards for how designs should look and lead to interactions. Design systems also provide the philosophy behind the design decisions that were made, relating them to the company's mission and branding.

This thesis also contains a case study with the global engineering company ABB, tracing the beginning of its central design team and transition from a UI style guide to a design system. Designers and developers throughout the company were surveyed and interviewed to hear their needs and expectations. Service design approaches were used to conduct participatory research with stakeholders within the company, with the aim of engaging them in the process of creating a design system.

Implications on a company level, industry level, and academic level are discussed. This thesis on design systems supports the case company ABB in creating its design system, and on a broader scale, connects academic and industry discussions on collaborative work in design teams to explain how design systems can be built and used.

**Keywords:** design system, UX guidelines, UI style guide, design management, branding, storytelling, service design

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# Background

# CHAPTER 1



# 1.1 INTRODUCTION

A strong brand identity can be an invaluable tool for companies to attract and retain customers. By offering products and services which provide a unified brand experience, companies create a sense of familiarity and consistency for their customers. In order to ensure this consistency, product teams within the company need to collaborate to align their work along a singular set of design standards (Wood, 2016). Large multinational companies face the particular challenge of creating and spreading these standards, such that employees with various job roles and cultural backgrounds are able and willing to follow them. *Design systems* are one such type of design standards.

## 1.1.1 Thesis structure

This thesis has two main parts: 1) defining the term *design system* and exploring its rising popularity and 2) examining the case study of ABB's design system. The overall structure of this thesis is the following:

**Introduction:** presents the study topic, introduces key concepts, and lays out the structure of the thesis.

**Objectives:** outlines the general objectives and precise research questions driving this study. The relevance of the study findings is also discussed on the academic, ABB-wide, and design industry-wide scales.

**Methods:** describes the research methods used in each part of the study and explains how they were each selected.

### Chapter 1 What Is a Design System?:

combines literature review, expert interviews, and a sample of existing examples to examine the current landscape of design systems in software-producing companies. The roles of design management and brand identity within product teams are also discussed.

### Chapter 2 A Design System Case Study –

**ABB:** details the case study of ABB's design system. A survey, interviews, and co-design workshop were conducted to collect the views and needs of internal product teams.

**Conclusions & Discussion:** combines the findings from the two main chapters to create a deeper understanding of design systems and how they can be implemented in practice.

## 1.1.2 Design... Guidelines? Language? Patterns? Style Guide? System?

Documents gathering principles for design appear under many names. Throughout this thesis, the distinctions between these terms and the importance of differentiating them is evaluated. As a group, they will be referred to as *standardizations for design*. The terms discussed include design guidelines, style guide, design language, design patterns, and design system. (The definitions of these terms are discussed further in the Literature Review and Data & Results sections below.) These terms all designate different means for companies to establish design practices, thus shaping the user experience of all individuals who interact with the company's products and services. This thesis particularly examines the term *design system*, which is defined here as *a platform that gathers a continuously evolving set of reusable design and development elements of user interfaces, that are in line with a company's brand identity and UX design principles*. The elements are organized systematically and presented along with explanations of how each design choice was made. (The construction of this definition is outlined in the Definitions of standardizing design section of Chapter 2). This study explores the rise of the *design system*, both as a broad industry trend and specifically within the context of a case study in the multinational corporation ABB.

## 1.1.3 Company case study: ABB

To complement the discussions of design systems, a case study was undertaken to further explore the concept. Case studies are a way to investigate an emerging or little understood concept by taking a deep dive into one occurrence of it (Muratovski, 2016: 106). The case company selected for this thesis is ABB, a global engineering company

active in over 100 countries with 147 000 employees and highly diversified operations classified in four divisions: Power Grids, Electrification Products, Industrial Automation, and Robotics and Motion (Our businesses 2018). These divisions are further segmented into a total of twenty-one business units. For a company of ABB's scale, the degree of complexity is incredibly high: with each business unit comes different sets of hardware and software products and services, with only some functions that overlap. The product teams creating these offerings are also widely spread out geographically. These conditions have led to initiatives within the company to set unifying standards, with the aim of achieving a unified and consistent look and feel, a positive user experience, and a strong brand identity. Such standards include among others the company vision, mission, and brand identity. These act as tools for leaders within the company to align its operations under a unified internal culture and external image, by explicitly setting out a course for employees to follow.

Within ABB, some organizational bodies operate on a group-level, conducting activities that span the company as a whole. One such structure is the new Digital organization, which includes a group-level UX Design team, established in January 2018. This central design team is responsible for developing, harmonizing, maintaining, and monitoring standards for the user experience design of ABB customer-facing interfaces. The case study will focus on the work of the central design team at ABB and their work creating a design system for the company. The topics explored are how a design system can be packaged and enhanced to meet the needs of designers and developers on a global scale, to enable them to follow the company's standards while still independently making decisions to meet the specific needs of their products and context.

*Note: Throughout this thesis, the term UI Style Guide is used to refer to the existing website at ABB, while design system is the future platform that will be built upon it. The style guide was tested during the research. The research results are contributing to the transition from style guide to design system.*

#### 1.1.4 Key terms

**Designer:** one who creates and often executes plans for a project or structure (designer, n.d.). In this thesis, designers are specifically UX designers, meaning that their work is focused

on creating products and services that provide a good user experience.

**Design system:** a platform that gathers a continuously evolving set of reusable design and development elements of user interfaces that are in line with a company's brand identity and UX design principles. The elements are organized systematically and presented along with explanations of how each design choice was made.

**Developer:** a person or company that develops computer software (developer, n.d.). In this thesis, the term developer also describes individuals who identify as software engineers.

**Frontend:** a software interface (such as a graphical user interface) designed to enable user-friendly interaction with a computer (frontend n.d.)

**Product:** throughout this thesis, the term product (e.g. in "product teams") is used to refer to software products. Hardware products are not addressed in the text.

**Service design:** service design addresses services from the perspective of clients. It aims to ensure that service interfaces are useful, usable and desirable from the client's point of view and effective, efficient and distinctive from the supplier's point of view [...] This process applies explorative, generative, and evaluative design approaches (Mager qtd. in Miettinen and Koivisto 2009: 15)

**Standardization for design:** used in this thesis to designate the totality of the resources used for standardizing design, including design guidelines, style guide, design language, design patterns, and design system. These have the aim ensuring consistency over the different design outcomes carried out by multiple designers and developers within the same company.

**User experience:** a person's perceptions and responses resulting from the use and/or anticipated use of a product, system, or service (International Organization for Standardization 2016).

## 1.2 OBJECTIVES

The research conducted under this thesis has the following aims, both for software-producing generally and specifically for the case company:

- To explore the definition of the term *design system* and how it does or does not differ from other types of standardizations for design
- To propose best practices for a design process for product teams that incorporates use of a design system and interactions with a central design team (which is tasked with overseeing the user experience of customer-facing interfaces throughout the company)
- Specifically for the case company, to test the usability of the current standardization for design (UI Style guide), from the perspective of its users
- And to identify resources (i.e. digital products and services) which could be improved, to support the work of all ABB employees responsible for the creation of customer-facing interfaces, regardless of their job role, product category, and location

In addition to the above, the following topics were considered as secondary areas of interest while conducting research at the case company. They were not the main focus but were taken into account to narrow the focus of the study:

- **Cross-cultural relevance:** ABB's product teams are spread out all over the world. While part of the same company, ABB product teams differ widely in terms of location and corresponding cultural context. Efforts were made to account for these varied viewpoints with diverse recruitment for the research phases of the study, soliciting input from ABB employees on a global scale.
- **Naming policy:** in the transition from the current UI Style Guide to the wider scoped design system, several names were considered. The different terminologies are discussed in the Literature Review.
- **Differentiation from other ABB standardizations for design:** this thesis

covers the UI Style Guide for ABB customer-facing software products. Design guidelines for other ABB assets (e.g. promotional materials, hardware products) exist. Differentiations and overlaps with the Branding Guidelines in particular are mentioned throughout this thesis.

### 1.2.1 Research questions

In order to establish a more focused approach for achieving the aims outlined above, the following research questions were defined:

- Q1:** What are the key elements of a design system and how is it different from other types of standardizations for design?
- Q2:** What are the needs of designers and developers, and how can design systems best meet those needs?
- Q3:** Which resources (human, services, products) are essential to support design systems in practice?

### 1.2.2 Relevance

This thesis operates at the intersection of academia and industry. As such, it bears relevance on multiple levels:

**ABB central design team:** the outcomes of this thesis provide immediately implementable and long-term recommendations for the team in terms of how to frame and structure the upcoming ABB Design System and its associated resources.

**ABB:** the findings will reinforce the nascent connections between the disparate ABB product teams, to create a more united design community. They will also advance the interest of design and design-oriented operations throughout the company, in part by empowering software product specialists to share their views and participate in change. By streamlining product development, a design system and instructions for implementing it will additionally lead to very considerable cost

and time saving throughout the company, significantly impacting profits.

**Academia:** this thesis explores concepts previously explored in academic research, such as organizational change and multidisciplinary teams, and extends the academic discourse with further discussion of these topics, with a particular focus on design operations within a global engineering corporation.

**Design field:** design is a field that evolves quickly and is thus susceptible to passing trends. The field and its practitioners can benefit from an academic exploration of a rising topic that is rooted in a true case study in industry. This thesis adds to the conversation about the definition of *design system* and how one should be created and implemented within a company.

## 1.3 METHODS

A variety of research methods were combined to define the term *design system* and its uses in the first chapter, both reviewing existing literature and speaking with relevant actors in the field of design. In the second chapter, qualitative research methods were used to evaluate the usability of the current ABB UI Style guide as assessed by a diverse selection of employees. The methods in the second chapter were selected in order to get both a broad overview of user responses to the platform as well as detailed feedback. Recruiting was ensured with support from the central design team as well as personal interest and involvement from employees throughout the company whose job role revolves around the creation of customer-facing interfaces.

### 1.3.1 Literature review (Chapter 2)

The literature review in this thesis goes beyond background information regarding the study topic. It also serves as a sort of meta-analysis of the existing discussions of design systems by practicing designers and of related terms in both industry and academia. In Chapter 2, the literature review, benchmarking, and expert interviews are combined for a richer understanding of these topics. This research provided insights for research questions Q1, Q2, and Q3.

#### Aims

A combination of academic literature, blog entries, design books, and design conference materials were reviewed for this section. The texts and media sources were identified using search terms related to design management, branding, and design systems. Because of the short history of *design system* as a design term, other keywords such as *design guidelines* and *style guide* were also used. While such terms have a longer history, they were also not found to be extensively covered in the academic literature. In addition, while this thesis is an academic document, it mostly describes phenomena from industry. As a result, the literature review combines academic texts with informal writings published by working designers. Sources

addressing the following topics were selected:

- Exploring the meaning of *design system* and other terms designating standardizations for design.
- Establishing the importance of standardizations for design.
- The tools product teams use to collaborate.
- How to create the tools and environment to foster this collaboration.

### 1.3.2 Expert interviews (Chapter 2)

Three industry experts with experience in creating design systems were interviewed. Sessions lasted from half an hour to one hour. All interviews were conducted by the thesis worker, either in person or remotely over Skype. This research provided insights for research questions Q1, Q2, and Q3.

#### Aims

The expert interviews were conducted to hear perspectives about design systems and how they could be applied from experts in diverse organizations. The general topics discussed were the same as the topics targeted in the literature review (see above section).

### 1.3.3 Benchmarking (Chapter 2)

While the documents consulted for the literature review offered a perspective on how designers write about design systems, benchmarking (in the Examples section of Chapter 2) reveals how designers are actually creating them in practice. Design systems for companies in a range of industries and of varying sizes were consulted. This research provided insights for research questions Q1, Q2, and Q3.

#### Aims

Benchmarking was used to gain an understanding of design systems in action and explore the following:

- How are existing design systems structured?
- Which job roles are explicitly designated as users of the design systems?
- Which resources for design, development, etc. (e.g. downloadable components) are included in the guidelines?
- What tones of voice and narrative structures are used in design systems?

### 1.3.4 Survey (Chapter 3)

For the first phase of user research in April, an online survey was designed and sent out using the online platform SurveyPal (SurveyPal). Before deploying the survey, it was tested internally with members of the central design team for clarity and relevance of content. The survey was sent out directly to digital team leaders to share with their teams. It remained open for two weeks, in order to reach as many designers and developers at ABB as possible who are currently designing and developing for customer-facing interfaces. A link to the survey was also posted to the “ABB UI style guide” Yammer group and added to the UI Style Guide website as a ribbon and news item. SurveyPal was also used to collect responses, which were then sorted and analyzed using Excel and Airtable (Airtable).

Quantitative research methods including surveys are “concerned primarily with measuring attitudes, behaviours, and perceptions based on a systematic observation, or by collection of numerical data. Gathered data is then used to prove or disprove ideas or assumptions” (Muratovski, 2016: 106). Such data can be used to get an understanding of a group’s opinions about a particular issue at a specific point in time. As they are conducted without direct interaction with respondents, it is not possible to ask for elaboration from the participants about any of their responses. However, surveys make it possible to obtain feedback from a large group of individuals at one time, for a generalized overview of user needs and attitudes. As such, this was the selected method to initially map out the needs and contexts of the UI Style Guide users. This research provided insights for research question Q2.

#### Aims

The approach for this study is qualitative. As such, the survey was not used to generate complex quantitative data and analysis. Rather, it was used to gain a broad overview of the current situation and to identify participants and topics of focus for later stages of the study. The data was analyzed to identify any patterns in the responses regarding the use of the UI Style Guide and the needs of its users. The survey questions centered on the following topics:

- What is the value and impact of the UI Style Guide for the usability of ABB software products?
- What is the value and impact of the UI Style Guide for the design and development processes of ABB software products?
- How satisfied are users of the style guide with its content, understandability, and tone of voice?
- Are there any specific cultural or localization needs that could enhance the style guide?

#### Structure

The survey was comprised of a combination of multiple choice, Likert scale, and open-ended questions, organized in the sections outlined below. No questions were obligatory, in order to maximize the response rates and to accommodate respondents for whom some questions were not applicable (e.g. most developers skipped the “design phase” section of the survey):

**Demographics** (4 multiple-choice questions): introduction section with general questions about the participants’ job title and role, nationality, and business unit within ABB.

**General impressions** (2 multiple-choice questions): questions regarding the structure of the style guide, ease of navigation, general usability, and purpose of the style guide itself.

**Style guide content** (23 Likert scale, 2 multiple-choice, and one open answer): questions regarding the usefulness and clarity of the content, with a particular focus on interface examples, icons, and localization and language needs.

**Design phase** (4 multiple-choice questions): questions regarding participants' preferred tools in the designing process and the resources they would like to be made available along with the style guide.

**Development phase** (6 multiple-choice questions): questions regarding participants' preferred tools in the development process and the resources they would like to be made available along with the style guide.

**Wrap-up** (2 open answer and 2 rating scales): final section inquiring about overall satisfaction, overall feedback about the style guide, and net promoter score. This section in particular can be reused in future studies as an abridged survey, to track the satisfaction of users over time and over multiple versions of the style guide and upcoming design system.

### 1.3.5 Usability testing & Interviews (Chapter 3)

Fourteen participants were selected for a series of combined semi-structured interviews and usability testing. Participants were ABB employees chosen based on their responses to the survey in order to achieve a representative mix across job roles, gender, location, and rate of use of the style guide. The sessions lasted approximately 60 minutes.

The usability testing focused on the current UI Style Guide website. The interview questions covered topics related to the website and its contexts of use as well as the participants' design process and needs for design and development resources. This research provided insights for research question Q2.

#### Aims

The method of usability testing was selected to assess the usability of the UI Style Guide website by asking its users to evaluate:

- The purpose and relevance of the style guide's content
- The logic and ease of wayfinding and navigation

Furthermore, the interviews were meant to uncover information about the style guide users' particular work context and individual needs by exploring the following areas:

- Use cases for using the UI Style Guide

- The style guide users' needs
- The structure of different users' work process
- How information about the style guide should be shared and presented

#### Structure

A discussion guide was created ahead of the interview, outlining the topics for discussion and the general structure of the usability testing and interview. Early questions focused on the participants' general job role and work context, in order to better direct the rest of the sessions. Based on their answers, more or less time was spent on each of the next topics. Throughout the usability testing and various tasks, participants were asked to think out loud, in order to provide information about their decision-making process, impressions, habits, and any other relevant information.

**Background and position:** a discussion about the participants' job role, team structure, typical projects, and the resources they use to support their work.

**UI style guide:** questions regarding frequency of use of the style guide, when participants first became aware of them, what they perceive the purpose of the guidelines to be, and their opinion of various design terms (e.g. UI style guides, UX guidelines, design system, etc.).

**Website task:** based on their reported work process, participants were asked to simulate a work task that would require them to locate information on the style guide website, explaining their thought process along the way.

**Card sorting:** card sorting is a tool that "that helps [to] understand the people" for whom something is being designed, by giving people a set of cards and asking them to group and organize the cards in a way that makes sense to them (Spencer 2009: 4). Participants were asked to describe their de-sign/work process, and to indicate points in the process where they may need to consult the style guide and when direct contributions from the central design team would be beneficial.

**Wrap-up:** to end the session, participants were asked once more to give their overall impressions and comments about the style

guide, design community, and central design team.

### 1.3.6 Codesign workshop (Chapter 3)

Participatory research methods include users “in the research and design process to make findings from the context of use more realistic and actionable” (Jaffari et al. 2011: 100). Co-design workshops are such a participatory method, as they enable “creative cooperation during design processes” involving users (Steen et al. 2011: 53). As the users of the UI Style Guide, ABB designers and developers were invited to participate in a co-design workshop, to help shape the style guide to fit their needs and to gain a sense of ownership of the platform.

The co-design workshop took place in June in one of ABB’s Helsinki offices over a period of two and a half hours. Designers and developers from two business units and from the central design team were invited to join. The workshop engaged participants to discuss the issues raised in the previous survey and interviews in more depth and to ideate about possible solutions. The thesis worker acted as facilitator and documenter of the workshop. This research provided insights for research questions Q2 and Q3.

#### Aims

As the final phase of research, the aim of the workshop was to consolidate and deepen understanding of the product teams’ needs. The focus was not only on understanding their current design process using the existing current UI Style Guide, but also to start to elaborate a purpose and structure for the upcoming Design System by asking the participants to:

- Articulate the design/work process from planning to implementation
- Understand the unique needs of designers and developers throughout the process
- Explore at what touchpoints the central design team and Design System could support the process and with what resources
- Gather designers and developers in one place to activate their feeling of ownership of the style guide and of belonging to a design community

#### Participants

Participants of different profiles were split into three teams, with the goal of ensuring diversity of perspectives within each team.

#### Activities

The workshop was divided into a series of individual and group tasks over three phases. Participants were asked to think about an issue on their own, then discuss with their teams, and devise a solution together as a final step. At the end of the workshop, the three teams presented their findings and commented on each other’s work.

There were three main activities in the workshop. For the two first activities, the participants initially completed individual tasks and then discussed and combined their ideas with their group members. The third activity was entirely a group effort.

**Narrate & Create** (tasks 1-5) – listing the series of steps in the participants’ current design process and creating an ideal design process

**Ideate & Condense** (tasks 1-3) – defining at which points along the design process the central design team and style guide should be consulted

**Contextualize** (tasks 1-3) – prioritizing solutions and presenting to other teams



# What Is a Design System?

## CHAPTER 2

## 2.1 LITERATURE REVIEW: Academic and industry views on design

*This section explores the existing literature, both academic and informal, that addresses the topic of design systems, other types of design guidelines, and the structures within a company to support them.*

### 2.1.1 Definitions of standardizing design

*There is no dictionary or otherwise standardized definition for design system, or adjacent terms such as design pattern, and UX guidelines. Designers are left to create their own definitions for these terms and to select a naming policy for whichever documents they use to communicate*

*with their colleagues regarding principles of design. In an effort to define what these terms mean and to determine the differentiating characteristics of a design system, they are broken down and their components defined below.*

Designers and developers use a variety of tools and concepts to organize information and communicate with each other. Though some of these terms are at times used interchangeably, their names imply different meanings. Along with *design system*, some of the terms often used include *style guide*, *UX/UI/design guidelines*, *design language*, *pattern library*, and *design patterns*.

**Design:** “to create, fashion, execute, or construct according to plan” (design, n.d.). In the context of this thesis, all the products and services that are created, executed, and constructed are digital.

**User experience (UX):** “a person’s perceptions and responses resulting from the use and/or anticipated use of a product, system, or service” (International Organization for Standardization, 2016)

**User interface (UI):** all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system (International Organization for Standardization, 2016)

**Style:** “a particular manner or technique by which something is done, created, or performed; a convention with respect to spelling, punctuation, capitalization, and typographic arrangement and display followed in writing or printing; an organized or established procedure” (style, n.d.)

**Guide:** “something that provides a person with guiding information; one that leads or directs another’s way” (guide, n.d.)

**Guideline:** “an indication or outline of policy or conduct” (guideline, n.d.)

**Language:** “a systematic means of communicating ideas or feelings by the use of conventionalized signs, sounds, gestures, or marks having understood meanings” (language, n.d.)

**Library:** a place in which literary, musical, artistic, or reference materials (such as books, manuscripts, recordings, or films) are kept for use but not for sale; a collection of such materials (library, n.d.)

**Pattern:** “something designed or used as a model for making things, a discernible coherent system based on the intended interrelationship of component parts” (pattern, n.d.)

**System:** “an organized set of doctrines, ideas, or principles usually intended to explain the arrangement or working of a systematic whole” (system, n.d.)

## What is a Design System?

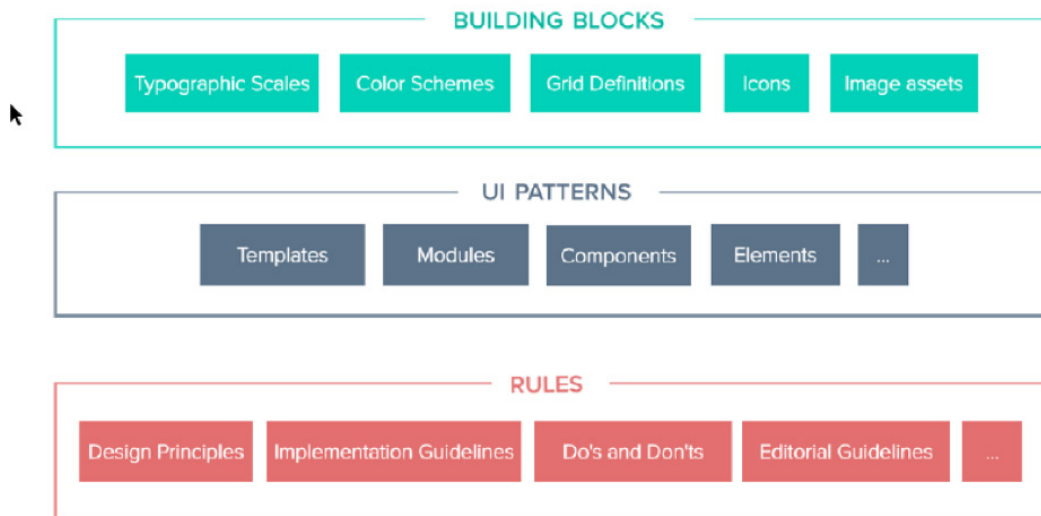


Figure 1: Design systems are an often-covered topic on the blog of the online prototyping platform UX Pin. The company has consolidated these concepts into an online book, which explains design systems and how to introduce them to product teams. This diagram offers a description of design system based on what it contains (Treder and Cao 2017: 9).

The term *style guide* has a focus on giving instruction and direction specific to the visual attributes of a design. It “directs” how a design should look. *Language*, *library*, and *pattern* meanwhile emphasize how information should be structured and presented. As such, the terms *design language*, *design pattern*, and *pattern library* designate resources that offer information organized in a precise way, such that it is identifiable, retrievable, and replicable by several individuals who are following them.

Based on dictionary definitions, a *design system* would include all of the design resources above, along with the “principles” to justify the choices that have been made to establish the standards for design. As such, a *design system* could be described as the most comprehensive of these concepts. A *design system* includes resources and components for design, organized in a clear, logical, and consistent way for its users to locate with ease. In addition, a design system should provide justifications to support the design principles that it outlines. The following definition for *design system* in this thesis is derived from the dictionary definitions of its parts and its usage in practice as: *a platform that gathers a continuously evolving set of reusable design and development elements of user interfaces that are in line with a company’s brand identity and UX design principles. The elements are organized systematically*

*and presented along with explanations of how each design choice was made.* Throughout this thesis, any use of the term design system will correspond to the definition proposed here. *Design guidelines* meanwhile seems to be a much broader descriptive term which describes all of the above, rather than being a category of its own. Indeed, the company Salesforce categorizes its design system Lightning as design guidelines (Design Guidelines, 2018).

Despite the lack of standardized definitions for the design terms outlined above, efforts have been made within design communities to define them. On the blog of digital agency Wiredcraft, Gu describes *UI guidelines* as “a visual language communicating the design goals to the team” (2015) while the Interaction Design Foundation defines *design guidelines* as “sets of recommendations towards good practice in design” (Interaction Design Foundation, n.d.). These definitions are not standardized, but rather tentatively proposed by working designers seeking to share their thoughts within their community.

An important aspect to note about all of these design tools and the terms that describe them, is that they do not incorporate a preemptive understanding of user needs. Rather, they focus on minimizing the amount of manual work involved in design and development to execute designs that are aimed at meeting user needs and

consistent with company branding. Dutton makes the distinction that *design patterns* represent the company's needs, while the users' needs still need to be discovered with each project (2018). She warns that relying solely on design patterns established by a company can actually be harmful if they are not balanced with an investigation and understanding of users. And even when using any type of guidelines, designers and developers still need to make decisions in their interpretations. Dutton notes that while such resources "do help teams hesitate less and build things in shorter amounts of time, it is how and why a group of patterns and components are stitched together that results in great design." As such, these design resources should be built such that the product teams using them can interpret them successfully, and those individuals should also possess the skills and creativity to lean on these guidelines to create great design. To achieve this, Dutton suggests that product teams rather think of themselves as service teams. This change in focus would ensure that the software development would not only rely on building products that work, but rather on understanding the services

that users need and how to build them out at every touchpoint.

The definitions of these design terms given by different individuals and organizations do not completely match, making it all the more difficult to distinguish what the differences are between the terms. While it is possible to uncover distinctions by distilling the terms' dictionary definitions, differentiating them is quite complex in practice. Dutton traces a sort of timeline of these design terms, from *style guides* to the evolving *design patterns* "initially, design patterns were small pieces of a user interface, like buttons and error messages. Design patterns go beyond the scope and function of a style guide, which deals more with documenting how something should look, feel, or work. More recently, the scope of design patterns has expanded [...] to create reusable components of a larger scope" (2018). She describes *design system* as "the final evolution" of other types of standardizations for design, that includes "a comprehensive set of design standards, documentation, and principles."

*Over the past couple of years, definitions of the term design system have been articulated by many design professionals in blogs, conferences, and other forums of open discussion. Here is the definition of design system proposed by this thesis, followed by some other definitions written by other designers:*

"A collection of reusable components, guided by clear standards, that can be assembled together to build any number of applications."

– **Will Fanguy** in the inVision blog (2017)

"A set of interconnected patterns and shared practices coherently organized to serve the purpose of a digital product. Patterns are the repeating elements that we combine to create an interface: things like user flows, interactions, buttons, text fields, icons, colors, typography, microcopy. Practices are how we choose to create, capture, share and use those patterns, particularly when working in a team.

– **Alla Kholmatova** (2017: 25)

"A library of visual style, components, and other concerns documented and released by an individual, team or community as code and design tools so that adopting products can be more efficient and cohesive."

– **Nathan Curtis** (2017)

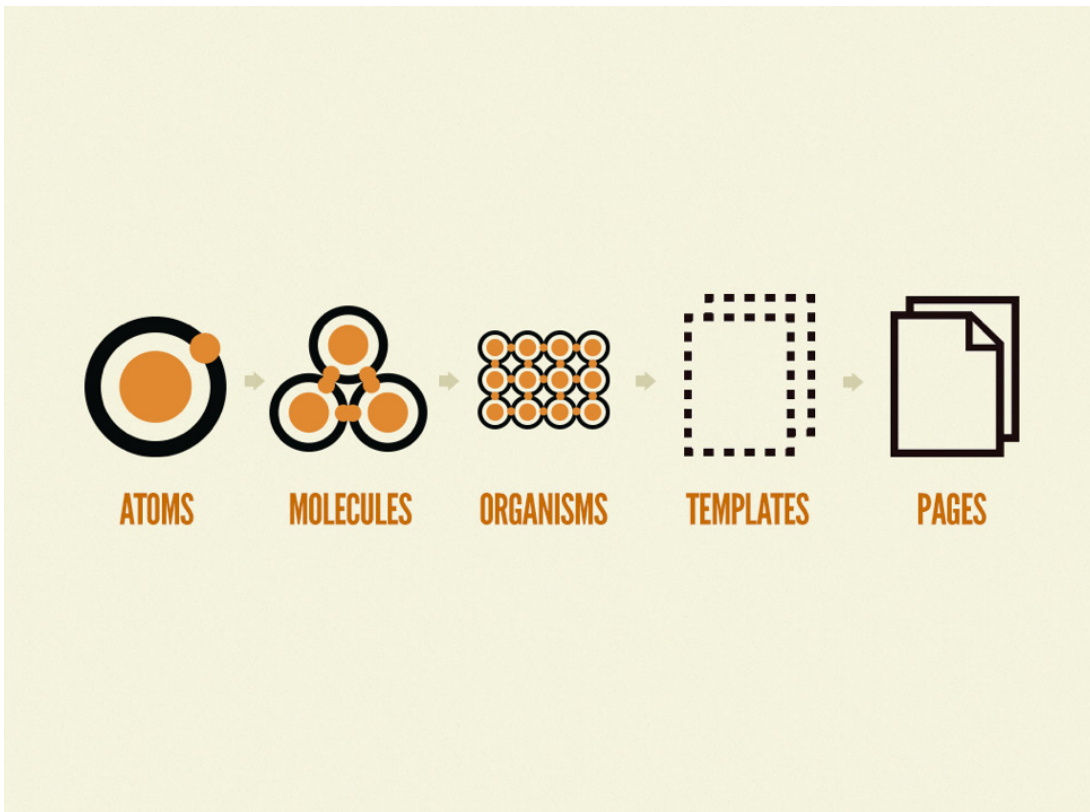


Figure 2: Atomic design approach to design systems: Frost proposes an approach to design systems called “atomic design” in which atoms are “foundational building blocks that comprise all our user interfaces, [...] molecules are relatively simple groups of UI elements functioning together as a unit, [...] organisms are relatively complex UI components composed of groups of molecules and/or atoms and/or other organisms, [...] templates are page-level objects that place components into a layout and articulate the design’s underlying content structure, [...] and] Pages are specific instances of templates that show what a UI looks like with real representative content in place” (2016).

Spies attempts to define and contrast *style guides* and *UX guidelines* in the following way: “While a style guide mainly describes the visual identity of a product and is usually aimed primarily at marketing and editorial staff, UX guidelines focus on the UX and interaction design, and so are aimed more at designers and developers who build or develop the product” (2015: 270). Spies says that while the definitions of the documents can be differentiated, a document that is truly comprehensive will fit under several definitions. Thibodeau rather describes a *style guide* as the “map of [a] design system” (2018). In this interpretation, a *style guide* is not a part of a *design system*, or a separate, less complete document. Rather, it is a tool to articulate the structure of the *design system*. Rutherford similarly outlines a hierarchy with *design system* as the most encompassing concept, though the specifics differ (2018). He defines a *design system* as “the complete set of design standards, documentation, and principles along with the toolkit (UI patterns and code components) to achieve those standards,” a *pattern library* as “a subclass in the design system, this is the set of design patterns for use across a company,” and a *style guide* as “another subclass in the design system, this static documentation describes the design system itself: how products should look and feel, use cases for UI patterns, correct typographic scales, etc.” Between

Dutton, Spies, Thibodeau, and Rutherford, there is significant overlap between the interpretations of these terms. *Design system* is largely recognized as a macro term, encompassing all the components needed for design and the justifications needed to support them. *Style guide* however is alternatively referred to as a reference point for visual characteristics of a design, and as a blueprint of a design system. As design is not a field that operates with a set of rigid standards, these definitions are likely to remain loose. The general agreement about the scope of a *design system* however suggests that it is the most suitable term to describe a comprehensive document for the standardization for design within a company. It goes beyond a list of components by additionally explaining the philosophy behind their selection. As Marco Suarez explains in conversation with Fanguy, “understanding not only the what, but the why, behind the design of a system is critical to creating an exceptional user experience” (2017). It is precisely that “why” that differentiates *design system* from the other concepts.

### 2.1.2 Design systems – more than a trend

*While an exact definition for design system has not been established as a design industry standard, the term has been rising in popularity over the past couple of years. An increasing number of companies are launching initiatives to create an internal design system and design professionals are sharing their findings within their online communities.*

Companies first started to use the term and concept *design system* approximately in the early 2010s (Fanguy 2018). According to a search on the Algolia internet history search platform, the first public online document to use the term *design system* in this sense only dates back to December 2013, in an article describing the beginnings of Salesforce’s design system, which is now recognized as one of the first and has since been named Polaris (Search Hacker News). This was followed by one online mention of the term in 2014 and six in 2015, all related to Salesforce. 2016 had the same number of mentions, regarding not only Salesforce, but also Airbnb and an online UI toolkit named Fabricator. The number of mentions increased to nearly 50 during 2017. While these measures can be taken as approximate as they may not capture all online mentions and cannot reveal any internal confidential documents, they clearly show a sharp increase in the use of the term *design system* within the past year alone. Design system has now reached such a level of mainstream conspicuity that satirical twitter accounts named *Design System Jesus* and *Design System Satan* have been created, producing design systems-related tweets and memes (Twitter).

The rapid rise of the term *design system* designates it as a current trend, though likely not a passing one. Over the past decade, terms such as innovation and digital have risen and fallen in popularity within the field of design (Search Hacker News). One could broadly connect the dots and postulate that in the late 2000s, innovation was widely regarded as the goal for design while digital was the platform to achieve it and in the meantime, there has been a shift towards placing users (or humans) and their experiences at the center of design (Lewis, 2016). As a result, the focus is no longer to create something new and digital, but to create the best solutions for people, even when that means optimizing an existing

analog service rather than creating a digital product. One could equally wonder about the longevity of the term *design system’s* relevance within the field of design. There is however evidence that design systems will continue to exist.

Mainly, what points to the staying power of design systems is their proved capability to improve efficiency and reduce workload, which in turn means a reduction of financial expenditures. Thibodeau explains that the Polaris Design System product teams are using at Shopify provides “building blocks” so that they do not need to constantly rebuild components that commonly appear in their interfaces (2017). Rather than redoing the same work multiple times and in multiple teams, the designers and developers can instead leverage the work that has already been done to create the design system to streamline their own day-to-day work. They are able to work faster because the reusable components they are provided eliminate extra work, and also because the design system facilitates decision making, by making the information familiar and easy to locate. That leaves them time to focus on the more complex and unique aspects of the products they need to build. This dedicated attention to interfaces’ more specialized elements and users’ more specialized needs is what allows product teams to create superior user experiences. The totality of the design and development work is not eliminated, only the rote tasks. This means that if the design system is conceived properly, it still allows designers and developers to retain creativity (Suarez et al. 2018).

In terms of financial gains, the software consultancy Projekt202 writes in a recent report that through the use of design systems, they have found that “just by eliminating code redundancy, more than 20% of a developer’s time can be regained. For a team of 100 developers, this means around \$2 million per year” (Projekt202). This is a significant saving in both time and money, which is instantly profitable for the company.

If *design systems* are eventually replaced, it will not be by a different set of values but rather by an evolution of the concept. As outlined in the previous section, the current writings by designers discussing the topic typically refer to a transition to *design systems* from some other method of standardizing design, highlighting how

## Step by step guide to creating a design system

*Treder writes a checklist of eleven steps for creating a design system within a company (2017: 9 – 39). Here they are listed and summarized.*

1. **The Inventory:** the first step to building a design system is to “understand the current state of [thecompany’s] design and development ecosystem” (9). This involves making an inventory of all the visual elements and interactions that currently appear in the company’s designs, which may be inconsistent.
2. **Get the support of the organization:** a design system needs to be allocated human and financial resources from company executives. It should also be built with participation from its users, who should then be enthusiastic to use it. To achieve this, it should be explained to stakeholders how a design system will benefit their work.
3. **Build a multidisciplinary systems team:** the design system should be built and supported by designers and developers who will be able to represent the users of the design system, as well as by individuals with organizational skills, such as project managers, to ensure smooth operations.
4. **Make key decisions and establish key rules and principles:** a single set of consistent components must be selected. Design software and coding languages must also be selected and required for consistency. KPI (key performance indicators) should be selected to test the design system over time.
5. **Build the color palette:** colors play a big role in creating user experience and brand identity. Colors should be chosen carefully and considered on several levels: palettes, CSS specifications for development, contrasts, and harmony of the interfaces.
6. **Build the typographic scale:** typography should be selected as well as rules for the scaling of the typography in different contexts of use. In this step as well as the rest of the design system building process, diverse designers and developers who are not on the design system team should be solicited for testing and feedback.
7. **Implement icons library:** icons are also an important visual element of interfaces with strong potential to communicate information. A definitive icon library should be created, along with a process to manage the library, metaphors, and instructions for submitting new icons conform to the same style.
8. **Standardize other style properties:** in addition to the previous, “grid, space definition, and basic style properties” need to be unified to solve any inconsistencies found during inventory (32). Any new standards should be tested with the designers who will be using them and made available on a shared platform.
9. **Build the first design system pattern:** the architecture for combining the different components on the company’s interfaces should be established. This can be in done in “sprints,” or short and intensive periods of a specific time, usually one to two weeks, when the team works on one particular section of the design system.
10. **Run a sprint retrospective:** this is an occasion for the designers and developers involved in the making of the design system to reflect upon the process, what went well, and what could be improved. It’s also the first opportunity to analyze KPIs, which can be tracked over time.
11. **Keep working on it:** by this point, the design system is operational. However, it stays in constant flux, as new patterns may be tested, adjusted, added, or removed for improvements. Contributions from the users play a big part in this ongoing process.

*design systems* are a more comprehensive approach to what is currently existing. If this tendency continues, any future concepts that would overtake design systems would include them and be an evolution of the concept, perhaps built to include new stakeholders and variables that are not yet established in design processes, such as for instance artificial intelligence.

### 2.1.3 Consistent brand identity, its meaning, its purpose/importance

*At the heart of a Design System, is the imperative to create products and services that follow a unified and consistent brand identity. A Design System is contingent upon the clear definition of a brand identity for the company, which sets a standard for the look and feel of the company's designs. Accordingly, in order to understand how to establish a design system, branding efforts must be clear and focused, and in constant exchange with design efforts.*

A company's branding is linked to its offerings' ability to give users "meaningful and delightful experiences" (Roto et al. 2015: 2278). For digital products, this potential is not only contained in the elements of the interface. The experience that users get from interacting with a particular product depends on the product itself as well as their perceptions of the brand and how well their expectations of the brand are met. Roto et al. give the example of Apple and its strong brand identity, meaning that Apple users have strong expectations for their experiences with Apple products based on their view of the Apple brand overall. They posit that when there is a mismatch between expected and actual experience of a branded product, the experience suffers. Thus, "consistent experience is important to strengthen the brand and to fulfill users' (and customers') expectations."

Brand identity and users' expectations can be quite different for B2B organizations. Roto et al. describe a case study involving a metals and engineering firm and explain that for such companies, the brand experience does not tend to be as strong "since long-term, personal relationships with customers do not require strong brand advertising." As a result, there is an admittedly lesser need to establish a strong brand identity. Nonetheless, Roto et al. predict that increasing competition is leading to a need for companies to differentiate themselves

from their counterparts, and the creation of "brand value" may be one method.

The brand image of a company is reinforced by consistent user experience across all its platforms and touchpoints. Roto et al. explain that these touchpoints should thus all be created according to a set of "company-wide experience goals" that are meant to define a company's values. In their case study, Roto et al. source input from a small group of employees to formulate those goals, and later organize a co-design workshop for the employees themselves to generate ideas for how to embody these goals in the company's products and services (2280). One outcome of the workshop is the expansion of the goals to include two parts: "an experience goal for design followed by the intended experience result."

Brand identity is meaningful for a company's customers as well as its employees. According to Baker, key measures of employee satisfaction such as "employee engagement and alignment are critical [to an] organization's strategic plans" (2014: 25). Companies should aim to create a strong brand identity, in which the employees see themselves reflected and that "resonates in their hearts and minds." When employees feel that their own values are in line with the company's brand identity, they "see [the company's] strategic vision and branding positioning" and are thus understand how their own role contributes to strengthening the company's strategy. It follows that setting the brand identity should involve employees at multiple levels of the company. Roto et al. write that "brand experience design is no longer a sole territory for marketing people, but today, the whole organization is building the brand" (2015: 2281).

Accordingly, branding teams are now being built in a multidisciplinary way to reflect this need to include the views of employees at all levels of a company. Establishing the ideal size for such a group needs to strike a delicate balance between hearing the needs of all, and the drive to make concise decisions (Wheeler, 2012: 110). While social sciences have shown that people making decisions in groups tend to be more conservative and less innovative, organizational sciences have shown that leveraging the knowledge of many leads to stronger solutions. Wheeler suggests as best practices an approach that involves a small and select group of individuals



tasked with decision-making to define the brand. Part of that team’s work should be to consult employees throughout the company about their thoughts and needs. Similarly to an indirect democracy, the masses of employees are not directly responsible for defining the brand, but they are in direct contact with a smaller team that is. Such a team collects these views and filters and synthesizes them with other information, to create the company’s brand identity. The group is not so large that creativity is impaired, yet still considers the concerns of a larger pool of employees.

## 2.1.4. Design management

*The introduction of a design system into a corporation requires an understanding of how to manage design – how to set objectives for design, obtain stakeholder buy-in, spread initiatives throughout the company, create the measures needed to support design projects, and build a team to oversee the entire process.*

A highly motivated designer working on his or her own could make a great effort at creating a design system... which would never be used by anyone else (Stamas 2017). A design system should be the result of a collaboration between employees with different job roles and needs. In her description of her work creating the Polaris Design System for Shopify, Thobideau discusses the

need to include non-UX employees (i.e. non-designers) in the creation of a design system (2018). Developers, product managers, project managers, marketing professionals and more also have the company’s offerings at the center of their work. As such, they have valuable and diverse perspectives about the type of content that should be included in the design system and how it should be framed. Knight warns against the effects of a homogenous team when establishing best practices, which may get stuck on industry standards and well-known trends rather than exploring other methods (2016). He explains that “when someone has little to no idea of what the industry standard is, they’ll help steer you away from it by introducing their own view of the problem that has nothing to do with how things are always done and everything to do with the best solution for this unique problem.” In addition to providing valuable content, diverse stakeholders are more likely to be motivated to actually use the design system once it’s launched if they feel ownership and responsibility for its success, which can be achieved by including them in the building process (Roto et al. 2015: 2278). They will also understand better how the design system works and the “logic behind design decisions,” which will equip them to “build better experiences” (Thibodeau 2017). A competent design system team is able to engage different stakeholders and leverage their knowledge to create a more

Internal design department drives company priorities and brand vision, and leads development of brand standards. Brand standards are regularly updated and audited for usability. Brand adherence is measured.

Internal design team collaborates with external agency in brand development, and serves as primary counsel to executive team and clients in developing branding initiatives. Team includes dedicated brand ambassador role.

External agency develops brand standards. Internal design department helps set company priorities and leads efforts based on brand knowledge. Creative directors monitor brand adherence.

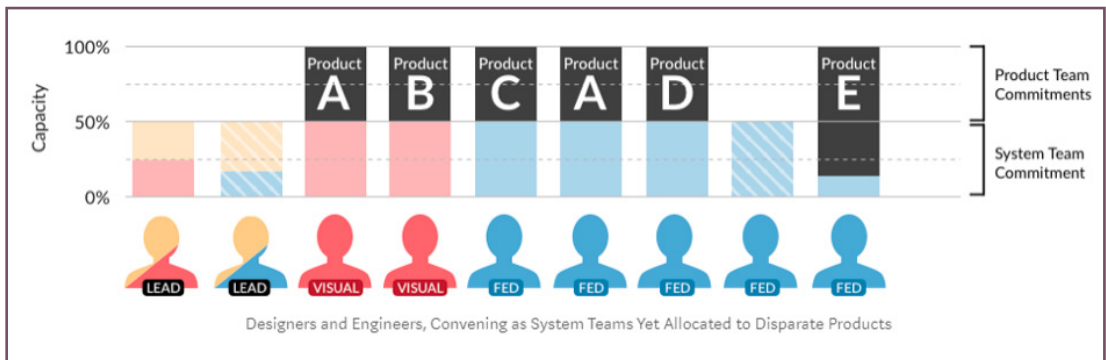
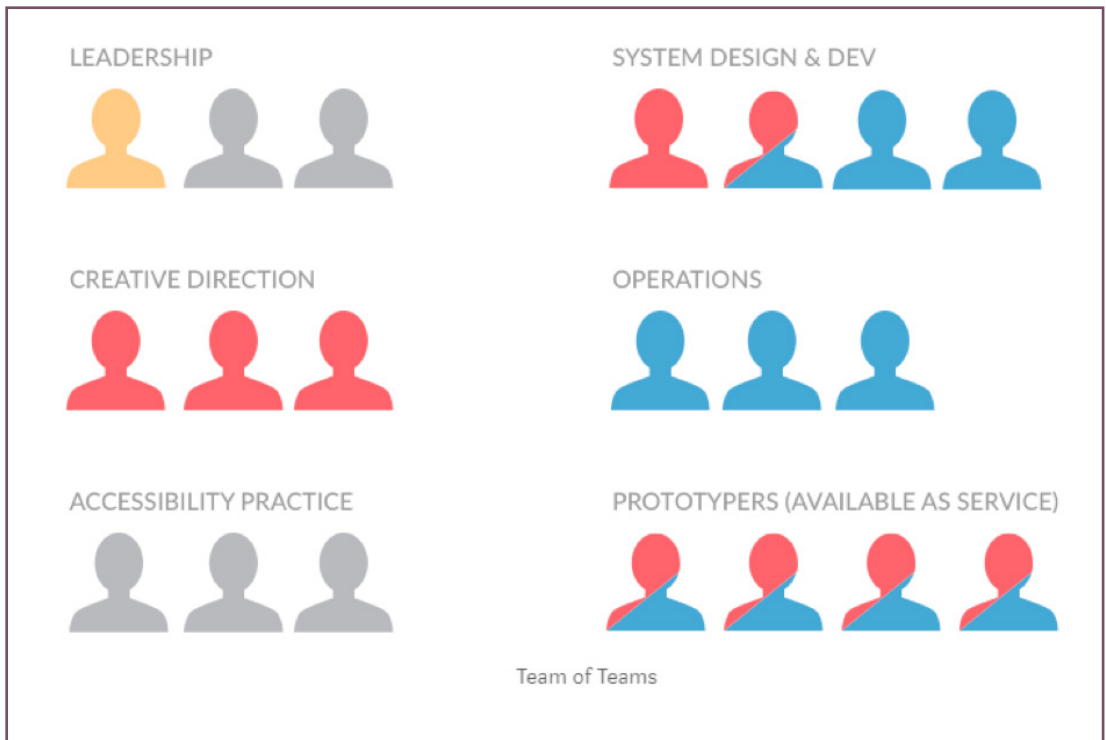
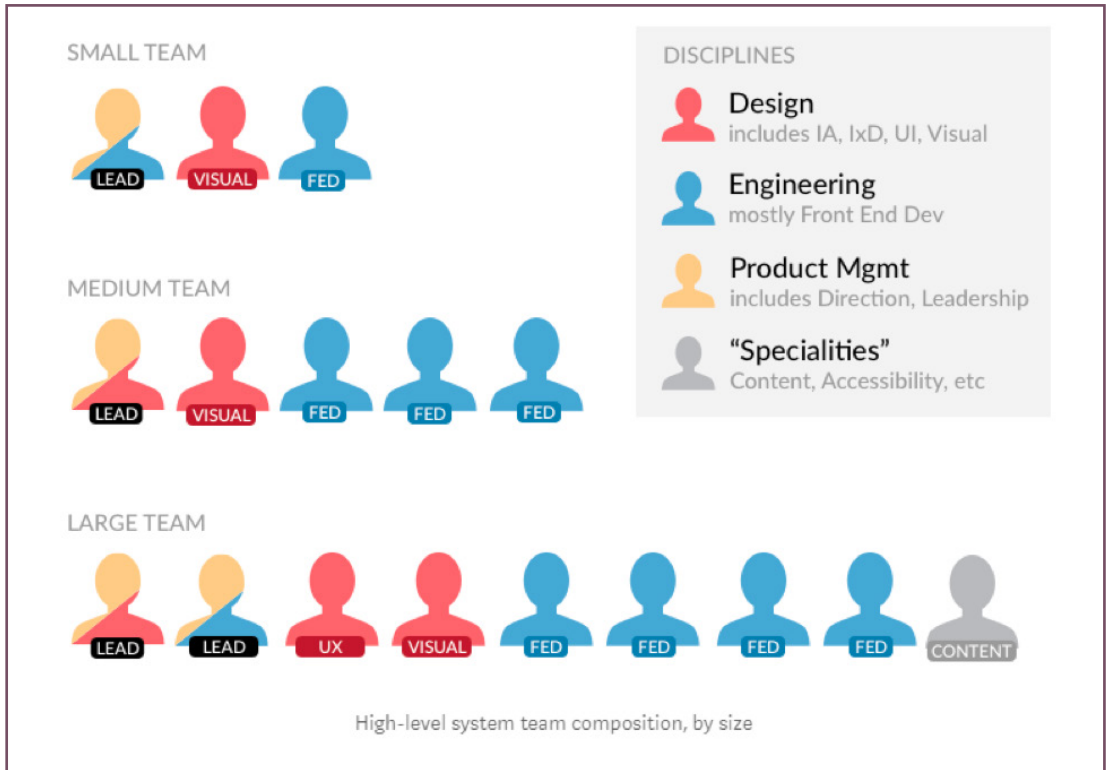
Internal design department designs and executes against brand standards, measures effectiveness, and adds value through best practices.

Internal design department executes brand vision at request of business and against available brand standards. Standards are often outdated or lacking and adherence is informal.



Figure 3: Wheeler refers to the Maturity model for design management devised by Cohen Miller Consulting as a guide for companies to gauge the current strength of their design management efforts and to set goals for the future (Wheeler 2013: 115).

Figure 4: Curtis proposes several structures for building a design system team. All proposed teams have a leader and include core specialists in design, engineering, and project management roles. Some teams also include "specialties (content, accessibility, etc.)" roles. The choice of a particular team format is dependent on the goals of the organization and the size of its team and resources (Curtis 2017b).



comprehensive resource that meets their needs and speaks their language.

A design system should also be supported by a designated team. Saarinen writes that once the need for a design system at Airbnb was identified, a team of designers and developers was formed, which settled in a separate studio to work on creating what would become the new “Design Language System” (2016). Thibodeau warns that building a design system should not be viewed as a “side project” or approached as a “hackathon,” which would imply intensive but short-term effort (2018). Beyond their creation, design systems need to be maintained, updated, and promoted (Treder 2017: 18). A specially allocated team should be responsible for these efforts and support the work of the product teams who are using the design system.

Design management is not, or should not, only be about managing down towards employees of a lower rank. It is also about managing upwards to appeal to company executives about the importance of design activities. In order to build design systems,

design and development teams need to receive an allocation of human and financial resources from decision-making stakeholders, which requires communicating with them about the advantages of using a design system (Reichenberg 2017). In startups, there tends to be a flat hierarchy and easier exchange between advocates of a design system inside product teams and the company executives who allocate resources while in large corporations, product teams have to overcome more organizational barriers to reach members of management (Termini and Martin 2018). And yet, large corporations are precisely the context in which design systems are the most beneficial, due to the volume of products and complexity. Designers need to appeal to executives by expressing how a design system can solve current company problems and thus create value (see Figure 3 and “Design systems – more than a trend section”). Without obtaining the financial and organizational resources from executives to support the creation and implementation of a design system, it likely will not happen.

PROBLEM	SOLUTION	VALUE
Defining components over and over, without clear design and coding rules	A central repository of reusable components, principles, and rules	Time-to-market reduction
Having inconsistent user interfaces across our product portfolio	All the products now have a clear design and coding direction	Design consistency
Product design and development teams working in silos	Design and development teams building together the design system	Alignment of teams
Short-term design and coding approach leading to low quality and bugs	Every component added to the design system is carefully tested	Less maintenance work
Products designed and developed in silos leading to incompatibilities	All components in the design system share design and coding approach	Easier integration of products

*Figure 5: Termini and Martin recommends engaging company executives for design system buy-in by outlining problems the company is facing, explaining which solutions a design system would provide, and describing the value these solutions would bring to the company (2018).*

### 2.1.5 Designers and developers – collaboration in the design process

*Designers and developers are both integral parts of a software development team. However, these two job roles come with different mindsets and skillsets. A design system should provide tools for both groups to do their work effectively and provide a platform for them to communicate and interact.*

When software development first emerged as an important activity in the 1970s and 1980s, the focus was on creating software products that functioned (Maudet et al. 2017: 1). As technology advanced in the 1990s to allow for the creation of highly graphical interfaces, designers became an integral part of software development teams, creating the visuals and interactions for software. Designers use imaging software and “communicate visually” about the appearance and interactions of a planned software. Meanwhile, developers use “text editors and Integrated Development Environments (IDEs) to create functional systems.” The current work processes are not always exact and not always co-occurring. The typical pattern is that designers create some kind of plan for a design by drawing it and describing the interactions that should occur. They are responsible for representing the needs of the users as well. Developers are then meant to execute those plans based on the materials provided by designers. The transition of materials and execution of plans is of course not always smooth. There is a “collaboration gap” between designers and developers who are working with different tools whose technologies have evolved at a different pace and that support cooperation at different scales (Schleifer 2016). Myers et al. outline the difficulties that designers have communicating about interactions in particular, when sharing prototypes with developers (2008: 1). In their survey of 259 designers, “86% reported that the behavior [interaction] is more difficult to prototype than the appearance. Over the past decade, tools have been created to allow designers to produce interactive clickable prototypes, which they can use to combine their visuals with the planned interactions (Creative Bloq 2018). While this eases some of the tensions in the transfer of information from designer to developer, issues still remain.

The fields of design and development are dominated by work styles that differ

significantly from one another (Salah et al. 2014). While not in use in all development contexts, agile development – a lightweight development process – is popular amongst development teams. The agile development method favors working quickly. Meanwhile, a user-centered approach is fundamental for many designers. User-centered design considers users’ needs as the main guide for design. Discovering those needs typically requires time-consuming research. While the approaches chosen by designers and developers who are collaborating can be complementary, they can also be at odds if developers are focused on a fast process while designers are afraid that increased speed may lead to a poor understanding of user needs. This can make collaboration between the two groups difficult. Furthermore, some product teams lack a documentation process, which would serve to tie the two processes together. There are thus three factors that have the potential to maximize the success of collaborative work between designers and developers: “sharing an understanding of users, sharing an understanding of design visions, and synchronizing efforts of UCD practitioners and developers” (5,6). This sharing is possible through the use of physical co-presence during planning meetings as well as through the use of particular documents, including “wikis, documenting via webpages, use cases, scenarios, personas, sketches, wire frames, prototypes, design patterns, information radiators, and tool support” (7). The sharing of these resources allows members of these teams to communicate effectively about the specification of the product being designed and the needs of its users.

In software development contexts in which developers and designers collaborate, individuals on each side tend to construct a specific “interactional identity” for themselves, which directs their interactions with others (Brown et al. 2012: 1381). These identities are shaped by “an individual’s background, their perception of the project situation, and their understanding of the group’s desired outcome” and allow the individuals to make sense to themselves about their own roles within the broader context of the team. The designers and developers also use “design artefacts (e.g. sketches, lists, documents, and so on)” as points of reference to communicate, interact, and collaborate with each other. These artefacts are a way for individuals to externalize their ideas to share with the

team, and simultaneously to internalize the agreed-upon ideas outlined through the arte-fact (1389). Brown et al. thus recommend that teams work with artefacts that match and encourage particular transactional identities, such that the artefacts serve the needs of the designers and developers involved and facilitate their collaboration (1390).

### 2.1.6 Telling stories of change

*Design systems should act as a platform for content-creating teams within a company to agree upon, standardize, and learn about a unified look and feel. Users of a design system should thus be able to grasp a coherent branding identity for the company and how they can contribute to support it. Storytelling is the key medium to communicating what the design system aims to achieve.*

Brand identity allows organizations to project a particular image of their company values to their customers and internally to their employees (Mazzoleni 2013: 55). When making branding choices such as visual style, companies are telling stories about themselves and what they stand for. The power of storytelling comes from people's instinctive ability to "learn better and remember longer when information is integrated into a story" (Mazzoleni 2013: 56). Mazzoleni interviews designers Kit Hinrichs and Alina Wheeler to understand how to tell such stories successfully, and the stakes in doing so. Hinrichs says that when designers understand a company's story clearly, the story gives them direction in creating their designs to communicate that story to customers. The story is then reflected in the choices of "color, style and other elements" (56). Through these elements, customers as well as the company's employees gain a clearer sense of the company's values (Baker 2014: 25). When those values resonate with their own, they feel a stronger connection to the company.

The process of creating a company's story crystallizes its "theories and principles [and] strategic planning efforts" into a format that can be easily understood and discussed. For employees in particular, an understanding of the organization's values may already exist implicitly, weaved into their work (Bhardwaj and Monin 2006:72-73). The creation of stories makes these values

tacit and thus transferable knowledge from person to person. In an article addressed to business leaders in which he advocates for the importance of storytelling, Baker gives four guidelines for companies to leverage the power of storytelling: "1. Present your strategic planning work in the memorable language of stories: not in corporate speak. [...] 2. Invite employees to contribute stories to your planning efforts while they are still being crafted. [...] 3. Give your employees the means to share and showcase stories consistent with your strategic vision and brand positioning. [...] 4. Develop story champions within your organization and encourage your top leaders to become "storytellers in chief" (Baker 2014: 26, 27). This type of approach engages employees in the process of storytelling by leveraging the implicit knowledge they have about the company's identity into something concrete. Once integrated into the employees, storytelling can also be a potent tool to drive organizational change by communicating clearly to employees about new work processes and the significance of adopting them.

## 2.2 EXPERTS SAY...

*Three working designers with experience in building design systems were interviewed for this study. They were asked to describe their experiences creating and implementing design systems as well as their views on the concept. All opinions reflected below are from the experts.*

*Nathan Curtis is a speaker, writer, consultant, and co-owner of the UX firm Eightshapes, based in the Washington DC area. He specializes in design systems and is a frequent speaker at design conferences. He regularly blogs about design systems and has published the book Modular Web Design: Creating Reusable Components for User Experience Design and Documentation.*

*Mikael Leppä is the Head of User Experience Design at Wärtsilä, a Finnish corporation with activities worldwide in the marine and energy industries. Wärtsilä has an existing set of design guidelines, periodically updated by the design team. Leppä oversees user experience design and service design projects throughout the company and is now leading the efforts to create a Wärtsilä Design System in the Helsinki offices.*

*Marjukka Mäkelä is the head of User Experience design at ABB, the case company. She leads the central design team with both designers and developers with the goal of providing the ABB Design System.*

### 2.2.1 Defining design systems

As implementers of design systems, all three experts have a conception of the term design system in mind, which guides their work and how they communicate with others. Leppä defines a *design system* as “any collection of artifacts and guidance that makes designing easier and the communication easier with other designers and with developers.” To Leppä, a design system is primarily aimed at designers, and secondarily at developers. Mäkelä contrasts design system to other standardizations of design, saying that “it’s more than a UI style guide with pixel-perfect visuals, colors, and layouts. It includes reusable

components and design principles, touching on interaction as well.” She aims to serve both designers and developers, while acknowledging their different needs. She considers design principles to be the foundation of a design system, and the background understanding that designers typically want to grasp before starting their designs. While also important for developers, this may be “too abstract” so they need to see concrete components that they can implement.

The importance of using the term *design system* remains ambiguous. Leppä for instance states that he “wouldn’t put a strict line between design guidelines and design systems, which are both there to make work easier.” As their purpose is the same, the distinctions between the two are not so clear. Mäkelä meanwhile emphasizes that “there is meaning in words, which give the message of the scope [we’re] trying to cover.” Ultimately, design system represents the type of platform she and her team are trying to build. One thing that all three experts agree upon is the importance of having one common terminology. Curtis explains that when teams “share the same vocabulary,” they are better able to communicate and work together. Accordingly, it is important that terms such as design system and pattern library for instance are not used interchangeably, or that developers and designers do not use different terms for the same thing. Leppä echoes that sentiment, adding that this can be a bit difficult when some terms are not equally well-known. The fact that *design system* is becoming a more popular term makes the concept easier to introduce to various teams, as they are more likely to have heard the term and understand what it means, making it “easier to explain to them why a design system is important.” Mäkelä agrees, explaining that design system has become popular and discussed enough that by conducting a short internet search, people can easily find information about the term that is relatively consistent from source to source. She makes a comparison to the term *design thinking*, which was new about a decade ago but is now widely known and easily researched. However, she does not expect that stakeholders other than UX

professionals are likely to be knowledgeable about the term. As such, she sees it as designers' responsibility to introduce the term and define it to others – namely that it contains “design principles and process descriptions, reusable design assets like toolkits and software component libraries available through an online site” so they understand how it will integrate with their work. Overall, the concept of design system is more valuable than the term. Some of that value is lost if the stakeholders do not have a common understanding of what it is, how to use it, and what it can add to their work.

“

***When teams share a vocabulary, they are better able to communicate and work together.***

Currently, the term design system is gaining visibility, being increasingly featured in design and tech blogs and even used as the theme of design conferences. However, some still don't actually know what it means. Leppä explains that there have been trends over the past decade or so that focus on accelerating work processes. Like Salah et al., he mentions the concept of agile development, which outlines a structure in which content is created and iterated as quickly as possible. Some influence of this emphasis on quick iteration in development can be seen in design with design sprints, a methodology that outlines step for creating working design within five days. Leppä warns that designers have to be cautious when considering what it means to work efficiently. There is no shortcut to user research and understanding users' needs. The importance of taking one's time when designing becomes life or death for companies such as Wärtsilä and ABB which manufacture heavy machinery. Because design systems provide a set of reusable components that eliminates parts of designers' and developers' work, some may see it as a way to accelerate their overall work process when rather, it is supposed to

shift time away from the tedious component creation to more meaningful tasks. Leppä explains that “it's not drawing the button that takes time, it's whether the button should be there. And figuring that out takes time.” The drawn button is provided by the design system, leaving more time for designers and developers to focus on strategic decision-making. Mäkelä sees a design system as an opportunity to outline best practices that focus on how to build good user experiences from the perspective of all job roles. This means not only providing the reusable components, but also indicating how they should be used in which parts of the work process and encouraging a heavier emphasis on high-level strategic decisions. Curtis further states that the value of a design system is higher when it includes a discussion of which decisions need to be made and simplifies the decision process as much as possible.

The experts do believe that there exists a difference between design systems and the tools for standardizing design. Similarly to Dutton, they see design systems as a progression of the others. Mäkelä for instance does not see the creation of a design system for ABB as a departure or the start of something new. Rather, it's a continuation of the current “UI Style Guide”, adding more elements to it. The progression reflects the needs of product teams and the resources they have available to meet those needs. Curtis and Leppä explain that there have been many changes over the past few years, which affect how product teams work. Curtis says that “these ideas [related to design systems] have been around for a long time,” but it's the level of attention and resources that has changed. He references the advent of design thinking and a growing concern for design operations in companies. As executives are increasingly placing a high priority on design, the resources needed to support design efforts are gaining more attention and more support. Meanwhile, designers themselves have understood the need for this type of resource for several years. Leppä discusses the increased awareness within companies of the need to connect designers and developers and the advent of better tools to do so. Similarly to Schleiffer and Myers et al., he mentions that the two groups have traditionally been working with different tools. However, new technologies have made it possible for the two to collaborate. Amongst designers, there are also more ways to share reusable components than before. A few years ago,

design guidelines were circulated inside companies as static PDFs. It is now possible to create interactive websites and share files for working components in various formats. These changes have driven a push towards more standardization.

### 2.2.2 Building design system teams

There are different approaches to building teams in charge of creating a design system. Leppä has seen the role of design grow within his past six years at Wärtsilä. During that time, he has been appointed in charge of user experience design and built a team comprised of UX, visual, and service designers. Their work on the company design system is done side by side with design projects for customer-facing interfaces. As such, the creators of the design system are also its users. They fully understand the contexts of use, which shapes the way that they approach the document.

Over the last ten years she has spent at ABB, Mäkelä has also witnessed changes in the way design is approached at the company. UX design was initially an activity contained to individual business units, until Mäkelä was asked to help build the central design team, whose responsibility is to focus on company-wide efforts to support UX design functions. She shares that it was challenging to find candidates who had experience in building design systems as the main focus of their work. She selected two UX designers, one visual designer, and one frontend developer to launch the team in January 2018. She has since also worked with external consultants, internal collaborators, and trainees. To create a strong foundation for the team, her focus is on senior-level UX designers with broad-ranging expertise (e.g. in interaction design, motion, and visual design) who can assist in gradually building out the team.

Curtis meanwhile acts solely as an external. As a consultant, he works with multiple companies, often two to three at a time. He joins internal teams to help them to build a design system that fits the company's specific needs. While he may not have complete knowledge of a particular company's context at any point in time, he intervenes as an expert in design systems. In a sort of hybrid approach, Mäkelä and her central design team at ABB are a kind of internal consultation team dedicated to the design system and other standardizing

efforts. They do not work within product teams to design interfaces themselves. Like Curtis, the team is primarily dedicated to creating and maintaining the company design system and involves both designers and developers. Like Leppä and his team, their efforts focus on only one company.

One common aspect amongst these three approaches is the creation of an internal team which works on creating a design system within a company. Whether that team works on other projects in parallel, or whether that team works with external consultants, the company needs to allocate resources to create a team that can create a design system and oversee its maintenance. Such a team is also in charge of collecting comments, insights, and completed components from other employees to contribute to the design system. Mäkelä describes how the need to build such a central team at ABB came about after the hiring of a CDO (Chief Digital Officer) at ABB and the establishment of a group-wide Digital organization that enables business units to accelerate digital transformation on a corporate level. The central design team is part of this Digital organization. Curtis also explains that companies that hire him have already understood the need to create a design system and at least have the willingness to invest in the project.

### 2.2.3 Connecting with collaborators

As mentioned in the previous section, design systems thrive when the teams responsible for them receive contributions from its users as well as resources from company executives. This requires a certain buy-in from both groups. Accordingly, design system teams need to adopt certain strategies to obtain it. Curtis explains that when he intervenes as a consultant, part of his work is to "model who [in the company] needs to be involved in the process and how to integrate them." For Mäkelä, the decision to create the central team actually came from executives in ABB Digital. Yet, the weight to prove that they are improving UX design processes is evident. They need to maintain this buy-in from executives as it is what will secure them continued support.

For Leppä's team, the Wärstilä design system is one project amongst others that his team handles. Through these projects, they are occasionally in positions to meet with executives during co-design





the tools most product teams are currently using. Mäkelä states that the switching costs may be high for some, but on the other hand standardization across the company makes things easier. For example, sharing knowledge and lowering the cost of licenses can be achieved when common software tools are adopted across the board.

#### 2.2.4 Monitoring design discourse

Leppä and Mäkelä lead design teams in organizations where developers outnumber designers. The opportunities for exchange are limited, particularly regarding upcoming trends such as design systems. As a result, they are both very engaged with the local and global designer community and avidly read design blogs covering topics relevant to their work. Leppä follows blogs and social media, where “brands such as Google and Airbnb” are very active in sharing about their design systems. These companies are however operating in industries very different from his own. He mentions that his interactions with Mäkelä have been very insightful, as they are both leading teams in engineering companies and working to create design systems. He maintains similar relationships with design leaders at other Finnish firms. Mäkelä sees this sharing culture as a staple of the design industry. Particularly within engineering companies, “designers are always pushing for change” and connecting with one another offers peer support they may not find in their engineering-focused organizations. She makes the distinction that designers do not share actual content with one another. Rather they share about their non-confidential experiences related to how to organize their teams, how to gain buy-in from stakeholders, and the challenges they face along the way.

Leppä credits externals who temporarily join product teams for bringing “new ways of working” along with them. Curtis operates on this “external” side and as a consultant, has the goal of imparting such new ways of working to his clients. In addition, he leads workshops, speaks at conferences, writes books, and is active in online design communities. He currently publishes “twelve to eighteen articles per year” on his blog. Having consulted for many different companies, he sees patterns and insights over time that he wants to share with the wider design community.

Curtis addressed the openness that some companies show when sharing their full design systems, making them accessible online with no restrictions. He explains that rather than “a true open-source mentality,” companies are typically motivated by the following: “1) people can reverse engineer their frontends anyways, so it’s not obscure or confidential, 2) they want to ease access to standards so other collaborators can access them more quickly – to eliminate blockers of efficiency, 3) they want to be perceived as having a more rigorous and high-quality culture, or 4) they want to have higher visibility for marketing and recruiting reasons.”

“

*Exchanging with designers from other firms and collaborating with externals brings new ways of working to the company.*

#### 2.2.5 Future directions for Design Systems

Following Dutton’s assertion that design systems are the latest evolution of standardizations for design, the experts were asked what they thought could be the next evolution and whether design systems would eventually become obsolete. Curtis does not believe terms will change, describing design systems as “an aspect of digital product development that is here to stay, and will stay a necessary part of things.” Rather, he predicts differences in the ways that design systems are used. Currently, they are largely confined to large companies. He foresees that they will become increasingly accessible for smaller companies, which typically do not have many resources to allocate to standardizing tasks, to incorporate them. The simplification of HTML will help to drive

this change. He also posits that “it’s unclear what the roof [limits] of product libraries should be and people will start to converge on what that ceiling is.” There is thus potential to expand the concept of design systems without moving on to something else entirely.

Leppä expects that technology will continue to develop no matter what, so he rather places his hopes for change on stakeholders. He hopes that the next step in the evolution of design systems will be for technology and business sides of companies to “see that design systems add value. Of course, it’s up to designers to keep promoting and explaining.”

Mäkelä does not think that design systems will disappear either as standardizations for design with varied scope will be needed also in future. Considering the trends over the past ten to fifteen years, “people might come up with a different name, but we are talking about the same thing the whole time.” The idea of standardizing design will remain but the exact tools to do so may change. However, she does think that developers and designers working so closely is a new phenomenon. She expects that evolving technology will enhance these collaborations by creating new ways for these roles to visualize and communicate about what they are building.

“

***People might come up with a different name, but we are talking about the same thing the whole time.***

## 2.3 EXAMPLES: Design systems in action

Over the past couple of years, an increasing number of companies have been adopting design systems, some of which are made available to wide audiences. Benchmarking was conducted on the following websites: Bulb's Solar Design System, Google's Material Design, Hudl's Uniform, and IBM's Carbon.



Styles  
Colors  
Iconography  
Interactive States  
Layout  
Microcopy  
Spacing  
Typography

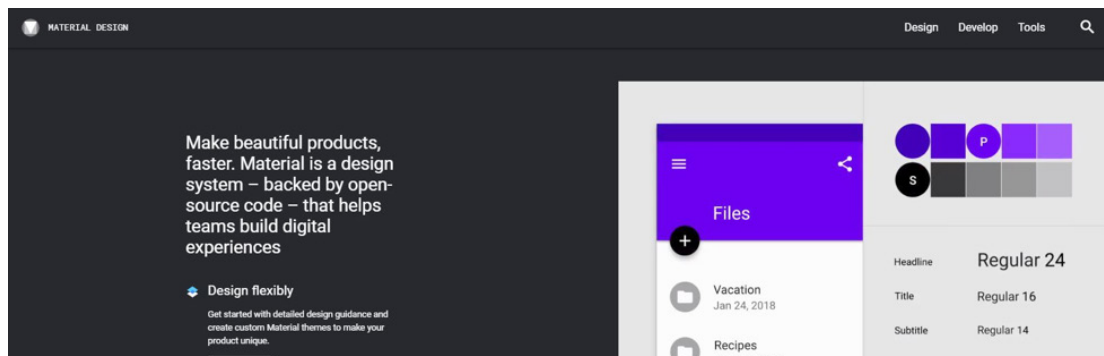
Modules  
Buttons and Links  
Checkbox  
Dropdown

### Colours

#### Main palette

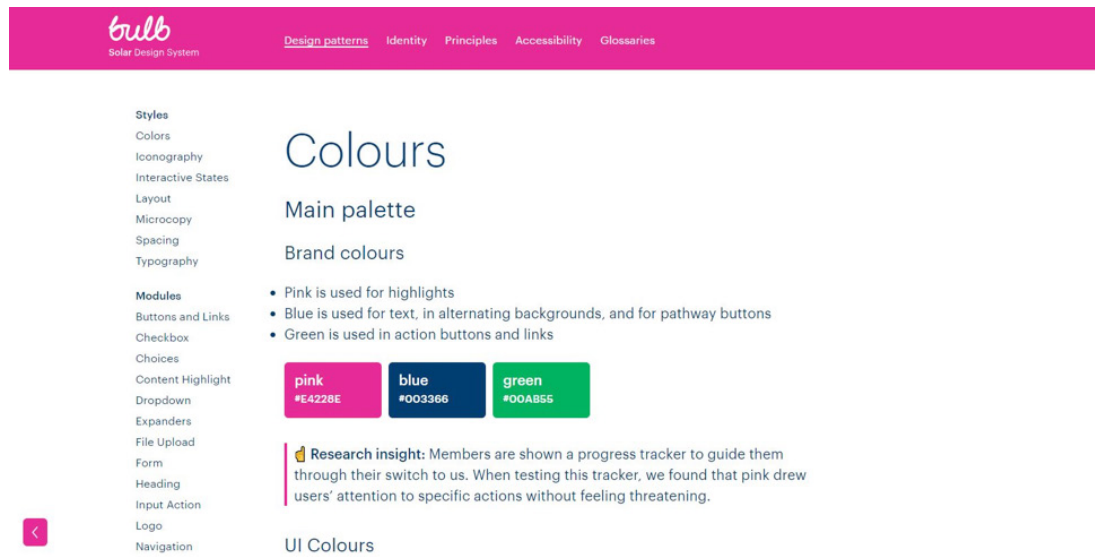
#### Brand colours

- Pink is used for highlights
- Blue is used for text, in alternating backgrounds, and for pathway buttons
- Green is used in action buttons and links



## 2.3.1 Bulb's Solar Design System

*"Our design system is a collection of shared design patterns and practices that allow our team to build quality consistent interfaces."*



**Job role specific?** N – visual guidelines and code are presented together

**Search function?** N

**Use of 1st and 2nd person?** Y, "We have three types of page layouts." "Title allows you to insert invisible text for assistive software like screen readers."

### Summary

Bulb, a renewable electricity provider, is a small and young company compared to the other examples on this list, with only three years of existence and about 100 employees which include fewer than ten designers. The company nonetheless prioritized the creation of a design system as a tool for coordinating design and development efforts. This can serve as an example for how a relatively small and new design team can create a design system.

### Structure

**Design patterns:** with no homepage, Solar starts directly in the design patterns section. Here are listed the elements of style and the components. Next to the visual examples, there is a link to open an expander with lines of code.

**Identity:** introduces elements of the Bulb brand identity, such as the logo and colors, and how to use them in design.

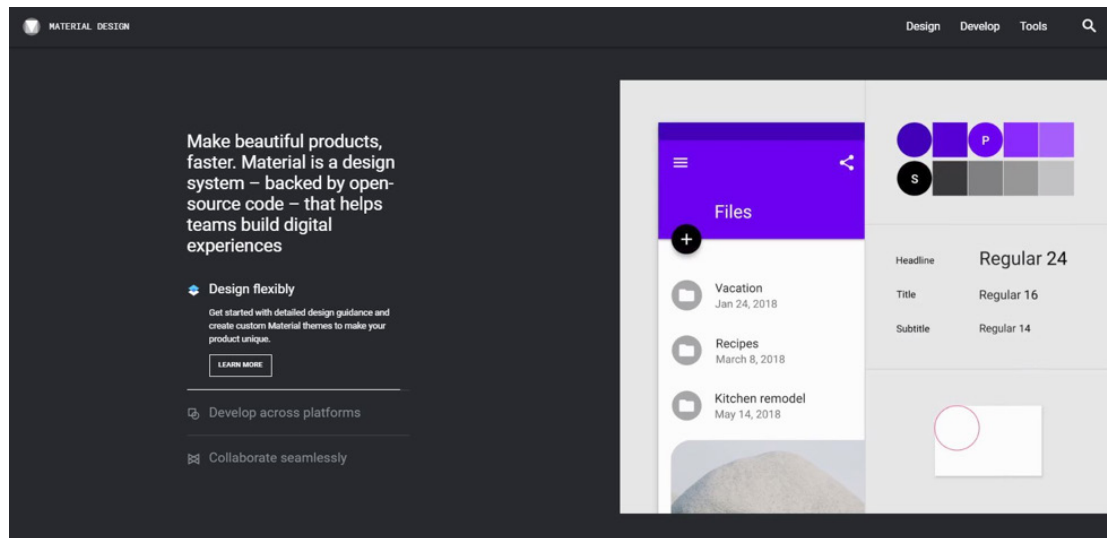
**Principles:** outlines the Bulb company culture and connects its values to the design principles and tone of voice to use in company designs. The principles are simple, robust, and personal.

**Accessibility:** provides a set of standardized accessibility guidelines and checklists for ensuring accessibility of products.

**Glossaries:** defines key terms related to the company (e.g. "member" is the term used to refer to customers), and to design and development.

### 2.3.2 Google's Material Design

*"Material design is an adaptable system—backed by open-source code—guiding you in the principles and best practices of contemporary UI. Material helps teams streamline the designer-developer collaboration, reduce complexity, and enable fidelity through reusable components, patterns, and code libraries. All while adapting easily to your brand, platform, and users' needs."*



**Job role specific?** Y – separate designer and developer sections

**Search function?** Y

Use of 1st and 2nd person? Y, "You can set this style on your BottomNavigationView if you'd like a bottom navigation bar with the old behavior. However, we recommend you use the updated Material style where possible."

#### Why selected

Google Material Design is one of the most often cited examples by designers who write about design systems. Curtis for instance often refers to it in his blog entries. The ABB branding site also refers to the site as an "industry standard." The material on the site is completely open and the content is broad and varied enough to be adapted to different styles and needs. As such, designers and developers can use it as the basis for digital products of their own that are completed unrelated to Google. Material Design is not used by Google employees to make the company's own products, but sets studies standards that others can follow.

#### Structure

Homepage: provides an overview of the website's content

Design: introduces Material Design, and provides components and design principles. Links to reusable components hosted on the version control platform GitHub are provided.

Develop: reusable code is provided for the different components as well as links to GitHub code repositories and tutorials.

Tools: a series of guides and resources to simplify workflow are listed for topics such as icons, colors, and responsive design.

## 2.3.3 Hudl's Uniform

"Uniform is Hudl's design system. It exists to unify Hudl's products through design (👁) and code (🔗) implementation."



**Job role specific?** Y, there is a toggle button allowing site visitors to switch from "design" mode to "code" mode. The design pages have a white background and the code pages a black background.

**Search function?** N

Use of 1st and 2nd person? 2nd person, "For icon-only, make sure the action is clearly implied."

### Why selected

Uniform is the design system for Hudl, a tool for athletes and coaches to review footage. This site was selected as it is one of the best examples open to the public of a straightforward and easy to navigate design system. It has very clear sections categorized by job roles and a detailed yet clear version history.

### Structure

Landing page: prominently displays link to the design side of the site, the coding side of the site, and version history.

Visual guidelines: explains how information – namely color, typography, and use of space – should be organized and displayed in Hudl designs. On the coding side, reusable code is provided for use on multiple platforms.

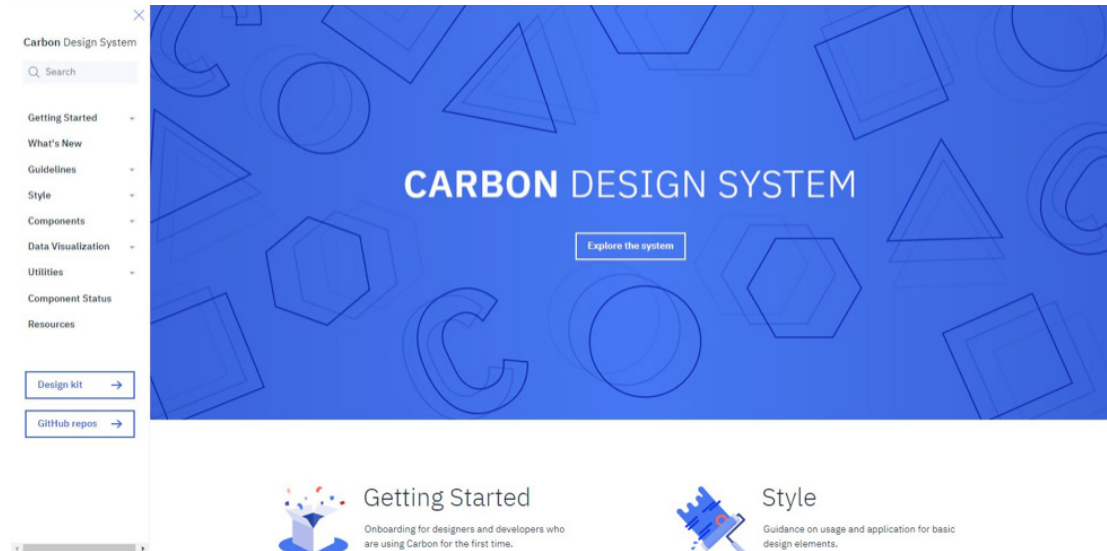
Components: components are listed and shown individually and in context. Code is provided.

Words: this section regarding the copy and tone of voice of Hudl materials exists on the design side of the site only.

Resources: links to libraries of reusable parts for both designers and developers.

### 2.3.4 IBM's Carbon

*"Carbon is the design system for IBM Cloud products. It is a series of individual styles, components, and guidelines used for creating unified UI."*



**Job role specific?** Not throughout – there are separate sections for designers and developers under the “Getting started” menu. For the rest of the site, some pages have no division of content while others provide different tabs for different roles, e.g. the grid page has “design” and “code” tabs while the components pages have “code,” “usage,” and “style” tabs.

**Search function?** Y

**Use of 1st and 2nd person?** Y, “We recommend using two sizes for body copy.” “Use the larger tokens to increase the amount of white space and to disassociate sections.”

#### Why selected

Carbon was also mentioned during the expert interviews. It is particularly relevant to the case company as IBM also has a background in industrial products and has undertaken similar initiatives in design, such as creating a custom font.

#### Structure (descriptions are taken from website, except for homepage)

Homepage: links to the different sections of the website as well as to design toolkits and code repositories hosted on GitHub.

Getting started: onboarding for designers and developers who are using Carbon for the first time.

Style: guidance on usage and application for basic design elements.

Components: a library of all Carbon components, comprised of code, usage and style guidelines.

Resources: a helpful list of tools, links and downloads that will improve a Carbon user’s workflow.



# **A Design System Case Study: ABB**

## **CHAPTER 3**

## 3.1 CURRENT SITUATION

Information regarding the current ABB design resources was collected by reviewing company websites, including internal platforms only accessible to ABB employees. Some of the information was gathered informally and over time as the thesis work was conducted. Such information is not attributed to any source as it is common knowledge within the company.

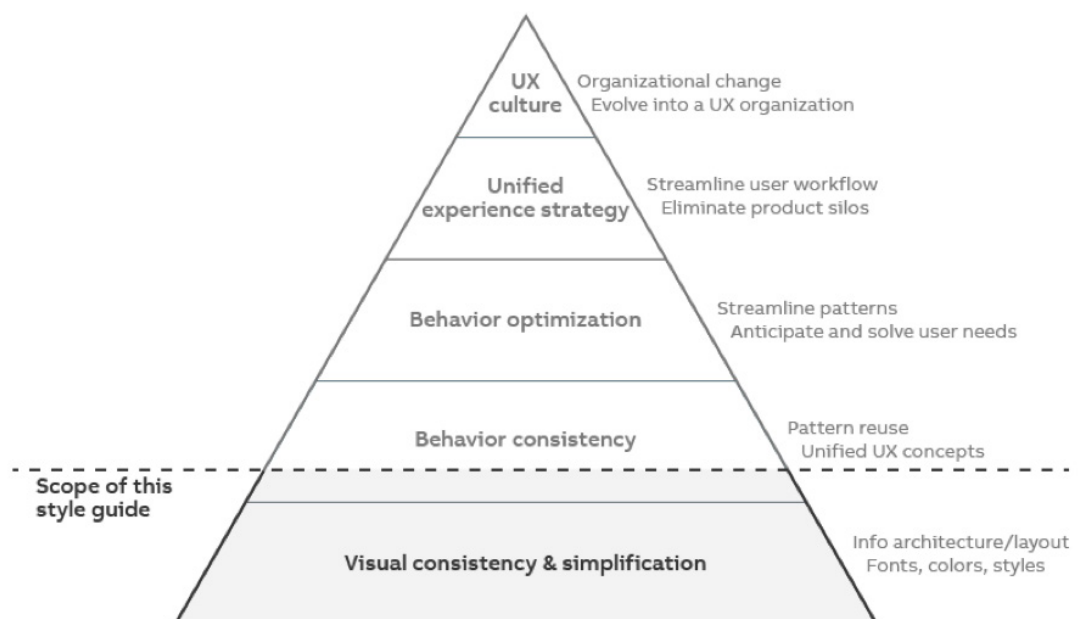
### 3.1.1 The ABB central design team and ABB Design System

ABB's central design team was established in January 2018, in an effort to provide an overseeing body to standardize UX design principles for the entire company and to provide support for following them.

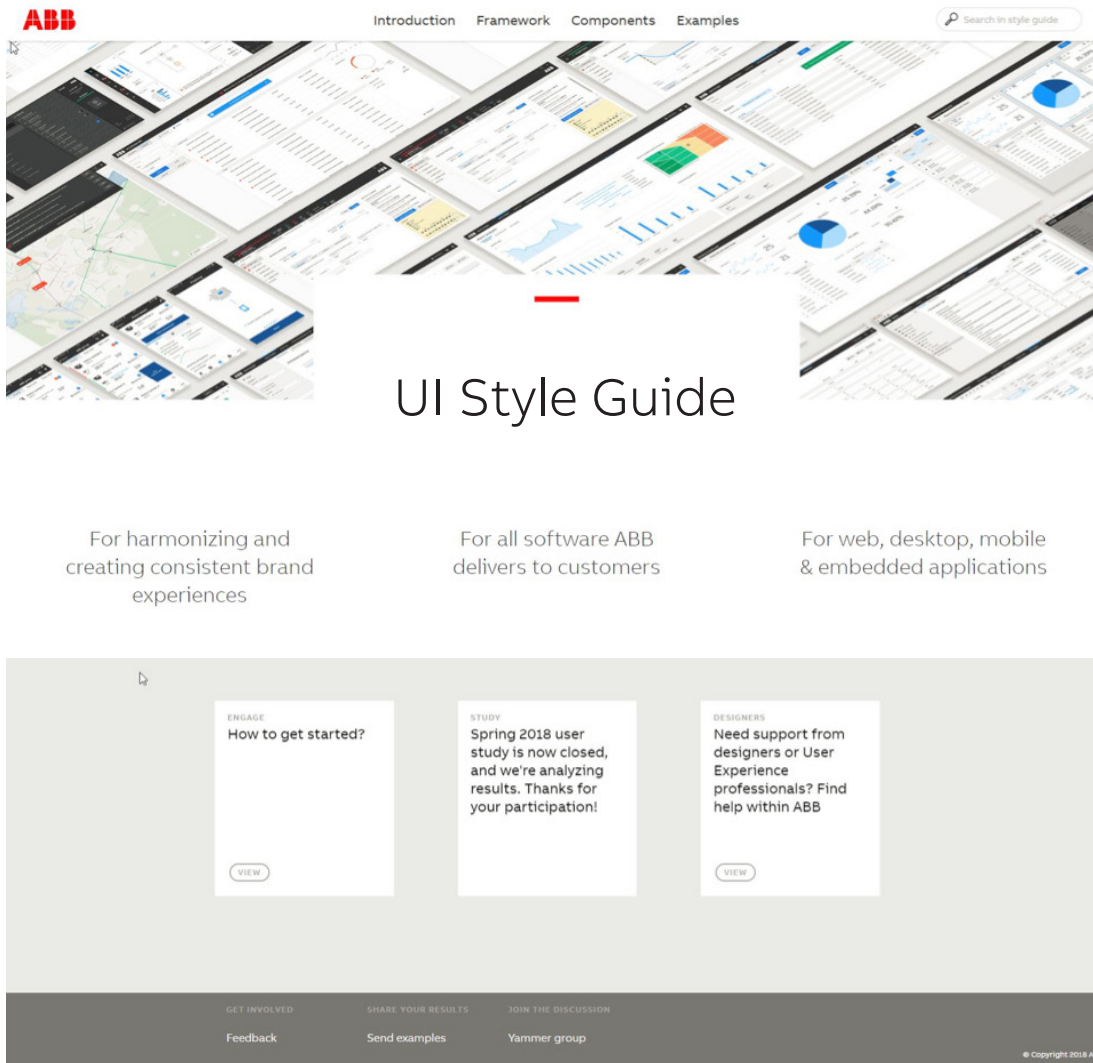
The team inherited the "UI Style Guide" website, which had first been created as part of a design project at ABB. Previously, ABB-wide design guides had only been available as a PDF. Furthermore, some individual business units had been documenting their own sets of standardizations for design over the years. The central design team set out to build upon the existing UI Style Guide and create an ABB Design System, to be released in autumn 2018. As the primary

touchpoint between the central design team and product teams throughout all of ABB, the platform should have a name that clearly indicates its intended use. The name change from *style guide* to *design system* indicates that a fuller set of resources will be made available to ABB product teams through the online platform, such as more detailed principles, reusable components and explanations of the design choices. The central design team will provide this platform as a service to the product teams, enabling them to create great user experiences with a unified look and feel.

Figure 7: Based on Stefan Klocek's "hierarchy of effort to fix a broken user experience," the current UI Style Guide is described as having a scope mainly on the first level: enabling visual consistency and simplification, and slightly extending to behavior consistency. The upcoming design system should then elevate the scope from "behavior consistency" to the "unified experience strategy" level (Klocek 2012).



### 3.1.2 UI Style Guide



The current UI Style Guide is available as a website. The website is divided into four main sections: Introduction, Framework, Components, and Examples. These are further divided into subsections.

**Introduction:** provides an outline of user experience principles, how to interpret the guidelines, and the use cases in which they should be used.

**Framework:** focuses on the ABB company identity and the unified look and feel that all ABB products are aimed to achieve. Key features of ABB products, such as the ABB bar – a dark grey bar that “typically includes product identity, main navigation, global functions and critical information” – and the basic layout, are broken out separately from the Components section.

**Components:** lays out the standards for visual and interaction components. Styling properties for developers to use are included for some entries. Illustrated examples, some of them interactive, are provided.

**Examples:** provides full-page examples of ABB applications on desktop, web, and mobile platforms.

### 3.1.3 ABB brand identity

ABB has a branding team responsible for brand experience, largely focusing on external communication such as print materials, events, and interiors of ABB facilities. Broadly, the branding team's role is to "maintain consistency across all ABB-branded materials and initiatives" (ABB Branding n.d.). Accordingly, the branding team sets standards for platforms and settings as varied as promotional posters, pamphlets, signage, and more. In addition, the branding team has outlined a set of standards for web applications in its Branding Guidelines (ABB Branding 2018b). The branding website defines the ABB cornerstone as "clarity, accessibility, precision, agility – with a human touch" and the company purpose as "together, we drive progress" (ABB Branding 2018a).

The branding team and the central design team have been continuously exchanging information about their work since the launch of the central design team.

### 3.1.4 Diversity in roles and geography

The UI Style Guide has a diverse audience. The content was compiled primarily by designers, and a few developers. The users of the style guide are primarily designers, though they are outnumbered by developers in ABB product teams. The boundaries between job roles can be ambiguous however, as some developers may work as designers, and many engineers throughout the company hold roles unrelated to software development, so reports about the number of ABB engineers do not reveal the number of developers. The style guide provides a "designer toolkit" with some reusable components, but lacks a counterpart for developers. While some code is provided, the amount of reusable content is much lower than what is available to designers, creating the need for developers to create a lot of content from scratch.

In addition to designers and developers, users of the style guide include project managers, product managers, product owners, and digital leaders. Most of these roles are filled by ABB employees, while others belong to consultants and other externals. Externals in particular have differing amounts of familiarity with the

ABB brand identity. ABB also has broad geographical and cultural diversity amongst its employees. The central design team is one of few bodies within ABB with the sole aim of standardizing processes in this highly disparate climate.

### 3.1.5 Communication

One focus of the central design team is to optimize communication with product teams throughout ABB. Primarily, the team needs to communicate about the existence of a company design system so the relevant stakeholders are aware of it. The team also needs to be easily reachable to answer any questions, offer materials and resources not available in the style guide (e.g. icons, consultant recommendations), and to provide reviews of proposed designs. The central design team can be reached in the following ways with any comments or questions:

**Designated mailbox:** the team maintains an email mailbox for any feedback regarding the style guide. The email address is listed on the Style guide website, and is also accessible by clicking on links on the website footer labeled "Feedback" and "Send examples." The mailbox allows users to send detailed questions with examples attached. In some cases, users send examples of their own work for evaluation against the style guide and approval. The mailbox is also used to schedule conference calls to discuss for further discussions.

**Yammer group:** ABB uses Yammer as its internal social media platform. There, ABB employees can subscribe to different groups focusing on particular topics, both work-related and non-work related. The "ABB UI style guide" Yammer is dedicated to discussions regarding the style guide and UX design at ABB. Members typically use the group to ask for recommendations and materials for the interfaces they are creating. As this is an open platform for all ABB employees, members may respond to each other's questions. This allows for open peer-to-peer communication, though the information circulated may not always be in line with the actual ABB design standards.

## 3.2 DATA & RESULTS

*The following section outlines the key results of the research conducted at the case company. There were three phases of research: survey, user interview & usability testing, and co-design workshop. The participants in the research were responding based on the existing UI Style Guide website. The next iteration of the website will be released as the CommonUX Design System in autumn 2018. Findings from the research are contributing to that effort. Some insights, research prompts, and business recommendations have been redacted from this thesis for confidentiality reasons, but were delivered to the case company in separate reports.*

### 3.2.1 Exploring the context (Survey)

Responses were collected over a period of two weeks from 91 participants of 16 nationalities. Out of the participants who listed their nationality, the top six represented countries were the United States, Poland, India, Finland, Norway, and Sweden. These numbers can be attributed to the large size of the United States and Indian markets. Poland, like Finland, houses a digital hub which includes design teams. Meanwhile, Finland is the location of the central design team which maintains strong ties to domestic product teams and to designers throughout the Nordic region. The range of nationalities across all the respondents indicates that the survey had a reach in many offices within ABB.

A variety of job roles within product teams were represented, with about half of respondents identifying as designers. 50 participants identified as only one job role, while the remaining 41 identified as two or more. The most common combinations were frontend developer and backend developer (8 respondents) and UX designer and frontend developer (6 respondents).

Overall, members of ABB product teams were familiar with the UI Style Guide and satisfied with its content and structure. Respondents appreciated that the online platform even exists, one writing that she “love[s] the transition from pdf guidelines into a website.” The website itself was

described “clear, simple and common for everyone” and “a wealth of knowledge to fall back on at any time in the design process.” The design of the website itself and the copy were appreciated and described as “minimalistic, clean, modern in look and feel.”

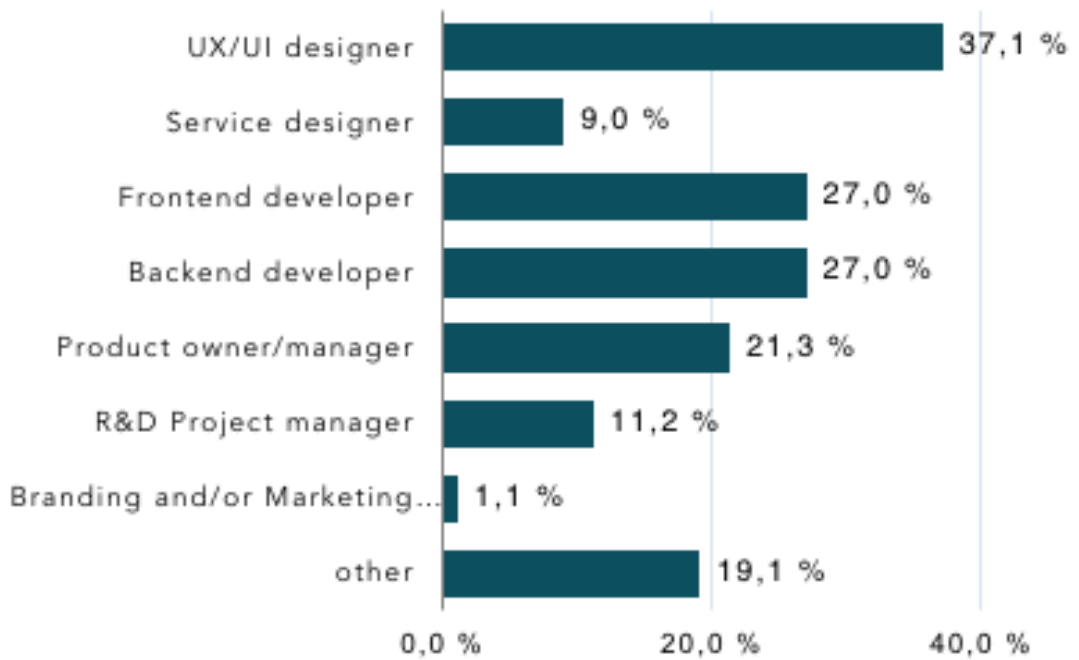
The survey respondents also outlined areas for improvement. Overall, they wanted to have more context for the examples and for the style guide itself and more comprehensive resources for developers. Some asked for “more interactive examples of different components” to understand how to create those interactions themselves. They wanted to see examples presented in context, explaining for instance how the examples were tested and if they are currently in use. An often cited concern was the need for reusable components to be used in development. “Implementations! Bootstrap, CSS, JavaScript, etc.!” wrote one respondent. They wanted to have access to code in multiple coding languages and for multiple platforms.

Next is a selection of charts representing key survey data.

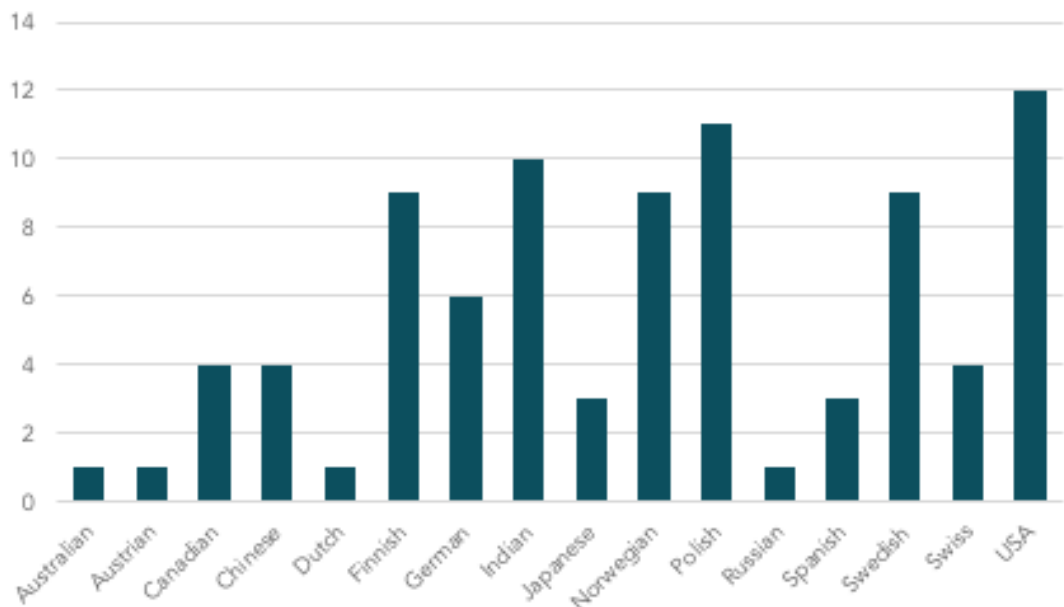
*(Note: a full report of the survey results was delivered to the case company.)*

Note: The job roles listed under "other" were for positions in design and development with more specific titles than the question options (e.g. "UX lead," "Technical architect," "technology manager").

**Job role**



**Nationalities**



**Overall satisfaction**



### 3.2.2 Hearing voices (Usability testing & Interviews)

The participants' feedback about the existing UI Style Guide and their comments about their work process was analyzed qualitatively. Four main discussion topics were identified: website usability, central design team contributions, terminology, and design process. (Note: a full report was delivered to the case company.)

#### Website usability

The website met users' basic needs to locate specifications and examples to guide them in their creation of interfaces. The language was clear and easy to understand. Users were mostly non-judgmental as they realized that the website is a work in progress.

The way content is structured on the site was sometimes confusing as some entries were in unexpected places. Users also wanted to see some information further categorized into submenus. Background information about the team behind the UI Style Guide, their mission, and best practices was missing or insufficient.

#### What works

Users see the UI Style Guide as a great initiative to set standards for ABB design and to ensure a consistent look and feel for all ABB digital products.

They see it as a communication tool within their teams – including designers, developers, project managers, product owners, and externals – about what ABB products should look like.

In addition, they believe that the style guide has potential to break silos by creating a bridge between different business units and offices.

They understand that the online style guide is relatively new and a work in progress. They were all forgiving about any shortcomings.

The language of the style guide is clear and easy to understand.

#### What could be improved

Users had comments about how to improve the style guide in the following ways:

The website currently contains most of the needed resources for designers, who seem to be the principal users of the guidelines, although they are largely outnumbered by developers at ABB. Developers need more templates and *reusable code*.

The UI Style Guide needs to be more easily *visible and accessible from employee platforms*. The CommonUX Design team should also work to spread awareness about the site.

The landing page should provide some crucial information to help users orient themselves, such as the purpose of the UI Style Guide, the mission and general information about the central design team, and recent updates to the UI style guide. The purpose of the Introduction and Framework sections needs to be clarified and the content should follow.

Users of the site spend most of their time in the Components and Examples sections. Information there should be presented *in context* and with *reusable templates* whenever possible, to enable quick and accurate implementation.

Information should also be *categorized* as much as possible, so it can be located easily. This could be facilitated by an improved *menu format*.

*Training and best practices* should be provided so users understand how best to navigate and use the style guide.

#### Central design team contributions

Users wished for varying levels of involvement and support from the central design team. Some wanted training, best practices, and design reviews to be provided. Others preferred to work independently according to their own expertise, using the style guide as inspiration for their work. The central design team should provide resources that support employees at all levels of need.

The central design team was officially launched in January 2018, only three months before the interviews. Accordingly, detailed knowledge about the central design team and their work on the style guide was limited, though all respondents were at least aware of the existence of the team.

Respondents would have liked more information about the central design team

provided on the website, and imagined that the team could contribute to their work in the following ways:

- Resources
- Review
- Design community & Promotion

#### **Resources**

Users of the style guide would like the central design team to provide them with the material, informational, and human resources they need to do their work in order to lighten their workload. These resources should include:

**Training for using the style guide** as well as principles of human-centered design. Currently, users of the style guide have to complete this learning on their own. In some cases, designers are giving ad hoc training to developers and product managers for using the style guide, which is time-consuming.

**Reusable components and templates for both designers and developers**, so they do need to start over with each new project, and can be confident that their products match the ABB branding standards. Currently, developers in particular are lacking the reusable components they would like to see.

**Provide best practices for design process and use of the style guide.** Designers are missing some recommendations for how best to conduct design projects from planning to launch. The central design team could *provide suggestions for a design process, which would also indicate where in the process the guidelines and intervention from the central design team should happen.* These best practices should address all relevant job roles (i.e. designer, developer, project manager, product manager, product owner, digital team leader).

“

*How to get the style guide in our processes needs to be also communicated in the guidelines, so people understand their importance and how to utilize them in ABB's product development processes, if it's a gate model or... guidance for managers or the people who are making the decisions.*

- Design Team Leader

“

*Training would be necessary, not only for external designers, but also for people who are not designers... There has been a need from project managers or product owners that they would like to have a training session for development or management team to understand our design principles or philosophy and how this design system is helping us to get consistency and a UI which can stand for the brand. Our design team has been briefing them but if there could be a video, would be nice.*

- UX/UI Designer

“

*[The style guide] should serve both designer and developer... there is a design kit and there should be the same for developers... Shareable components should be available in multiple formats.*

- Frontend Developer/UX Designer



## Review

The central design team should also provide review of the software interfaces created by design and development throughout ABB. This review process could include the following formats:

**Review designs** voluntarily sent in by designers and developers throughout ABB when they feel they need support. These designs could be at any stage from initial sketches to piloting stage before release. The central design team could **evaluate whether the designs are in line with the guidelines and provide the appropriate feedback.**

Some participants specified that in their opinion, this would only be necessary for **exceptional projects requiring contexts that are not covered in the guidelines.**

An **annual auditing** process which would require software-creating teams at ABB to send samples of their work to the central design team for review once per year. This would allow the team to **monitor periodically that different offices are following the style guide.** If not, the team could work with that entity more closely until standards are matched. Annual reviews would also allow the central design team to **stay up to date with what kinds of ABB products are being released** throughout the company and **what the style guide actually lead to in practice.**

“

*Maybe it's a periodic audit process... Maybe provide it as an optional service first, get good feedback, and then start to say that for certain types of funding, there needs to be some check of the style. For any group that doesn't seem to be following very closely, you give some extra assistance. That's something you do over years, not all at once.*

- Digital Lead

“

*The review process would be helpful on a component library, but I think reviewing all UIs we develop? No. It's better that the Common UX provide tool to educate us, the BUs, to review our own UIs as well as the ones others in our teams develop. It's not realistic [for the central design team] to review everything.*

- UX/UI Designer

“

*I had the situation once where a client wanted to develop a really custom visualization which didn't fit any category described by the style guide... I would want to contact the central design team to ask their opinion if what I did is the right way.*

- Technology Evangelist

## Design community & Promotion

Interview participants saw potential for the central design team to act as a uniting and representative force throughout ABB, acting in the following ways:

- As a coordinator of ABB's community of designers. The central design team could be the one shared touchpoint and connector between all the designers at ABB. This would require the central design team to provide (a) platform(s) to act as a communication tool between the designers and to update them about design news that could have an impact on their work (e.g. updates to the style guide, suggested changes to the style guide, achievements of other teams, etc.).
- The central design team could also potentially have more visibility than local design teams. This means it could act to spread awareness and get more buy-in to human-centered design throughout all of ABB. It could also promote the style guide to designers and developers so they are aware of them and of their potential impact to ABB software products.

“

***I like to be engaged with people, because I'm out here by myself. I don't have any other designers [on my team]. I like tools like Yammer because I can then try to engage with [other designers]...I just like to engage, review, bounce ideas off of people.***

**- UX Designer**

“

***It's great to have people to contact to bounce ideas around, how to work, and how they do stuff. So I feel the need for [a design community]... [Monthly calls] make it possible for me to get a hunch what's actually happening in other parts of ABB and get to know if there's something that's interesting for me.***

**- Software Developer/UX Designer**

“

***There needs to be a budget for it. Right now we have a hard time getting time and sponsoring for this type of thing. We would need to meet face to face, like in a hackathon format.***

**- Industrial Design Manager**

### Terminology

The interview participants were asked to discuss their views on the terms for standardizing design. Since the existing platform is called “UI Style Guide” and the central design team was preparing to launch the next version as a design system, the understanding of the terminology from the point of view of product teams throughout ABB is significant.

Like the experts, most mentioned that the name is not as meaningful as the content and function. One design lead mentioned that he is concerned that the term *design system* is too unknown for some – namely developers, project managers, and product owners, which may cause confusion. If these stakeholders do not know what it means, they will not be likely to adopt it and they may perhaps feel intimidated by it. One UX designer also said that to her, the names are quite interchangeable. She considered that what the design teams at ABB have been trying to achieve for the past few years could already have been called a *design system*. However, she did not think this would be obvious to non-designers. She worried that the name change may signal to those individuals that the platform has turned into something completely different. Both of these participants said they were unsure that it was worth changing the name from UI Style guide to Design System if a less accurate but more familiar term would be more usable.

Others welcomed the idea of the name change, as they thought that the current name is misleading. One UX designer and frontend developer said that the term *style guide* seems to be “only about colors and fonts.” She supported the idea of using *design system* as it would suggest a wider breadth of standards. Another UX designer thought that while some may not know about design systems, a quick google search would give them an answer, so he did not see it as an obstacle. He mentioned it would be more problematic if the term *style guide* stayed in use since the definitions that people would find online would be for less thorough documents than design systems. He recommended choosing a name that represents what the company wants to achieve, not what it’s doing currently. One service designer shared that on her team, developers typically turn to designers to ask for definitions of these terms. Designers, who are knowledgeable about the topic, could thus spread their knowledge to

others. She specified that the weight of this knowledge transfer should ideally be placed on the central design team.

### Design process

The respondents described a rather similar approach to their work process:

**planning > design > development (implementation) > review > release**

Depending on their particular job roles, business unit, and personal approach, they all put varying amounts of focus on each stage. They tended to view the design process as quite rigidly fixed to this structure, with each phase involving only certain job roles. They also all expressed that access to end users during their research activities is quite limited though they often wish they could do more. Information about the end users is typically obtained from project managers.

They described the UI Style Guide as playing one or several of the following roles during their process:

- A **communication tool** between designers, developers, product managers, project managers, product owners, and externals to establish what the look and feel of ABB products should be
- A **source of inspiration** for designers and developers to see examples of previous ABB products and get some ideas for the creation of new products
- A set of **mandatory regulations** for the design of ABB software products

### 3.2.3 Engaging users (Co-design workshop)

For the co-design workshop, designers and developers from two business units and the central design team were invited to participate. The three following teams were created with a mix of job roles and seniority level:

#### Blue Team

- Principal UX designer (central design team)
- Product manager & Developer (Business unit A)
- Senior UX designer (Business unit B)

- UX designer (Business unit A)

#### Red Team

- Industrial designer (Business unit A)
- Industrial designer (Business unit A)
- Service designer (Business unit B)
- Strategic design lead (central design team)

#### Yellow Team

- Industrial design manager (Business unit A)
- Design team leader (Business unit B)
- Principal frontend developer (central design team)
- Senior visual designer (central design team)

#### Design process

Workshop participants were asked to individually create a representation of their current design process, from the point of view of their own role as designer or developer. If they felt knowledgeable enough about other roles (e.g. product owner, project manager, etc.), they could also include other stakeholders in the process. Teams then discussed and created a combined design process incorporating their different viewpoints.

#### Central design team contributions

After having indicated a series of steps for the process, workshop participants were asked to individually think about the resources they would like to receive from the central design team to support their work. They discussed within their teams and created a hierarchy of the different resources identified.



Team yellow: created a design process making no distinctions between the different roles within a team (i.e. designers and developers). They designated a series of steps with 4 main parts: 1. proof of concept 2. happy customer 3. interpret & variate 4. implement. They described the process as highly circular, looping the different steps to allow for iterations at any points along the process.



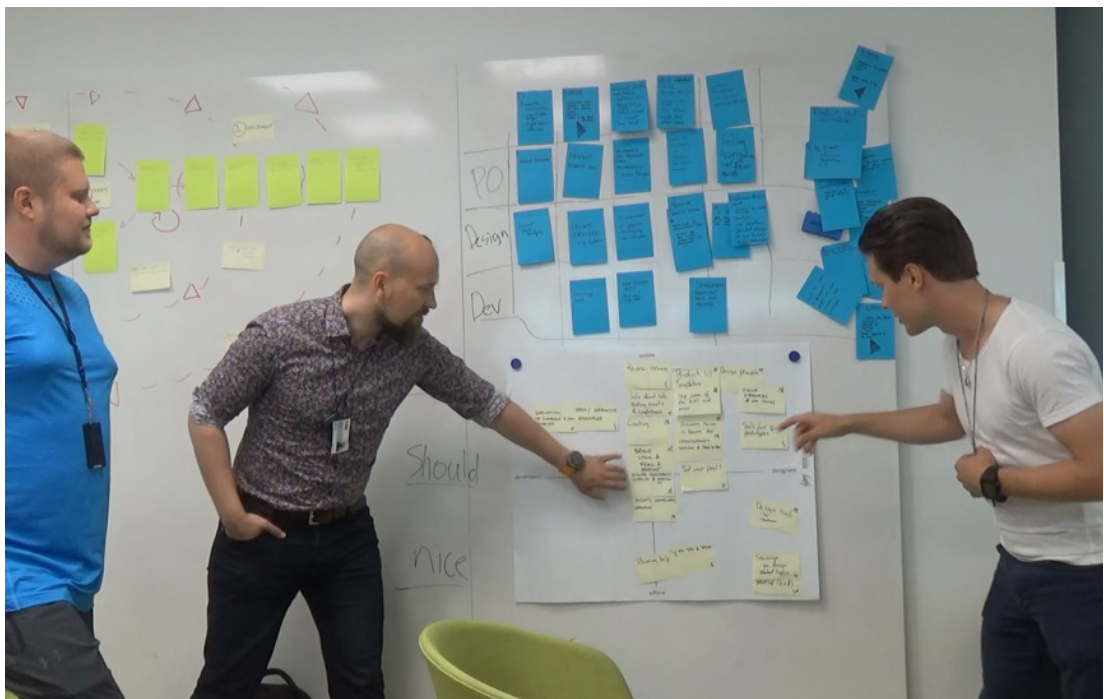
Team blue: outlined a design process in a very structured way by identifying different steps in the process, and then defining them further from the different perspectives of designers, developers, and product owners. As a result, this process highlights very clearly the specific responsibilities for individuals in each position, and by showing them in parallel, suggests how these individuals could collaborate and communicate with each other.



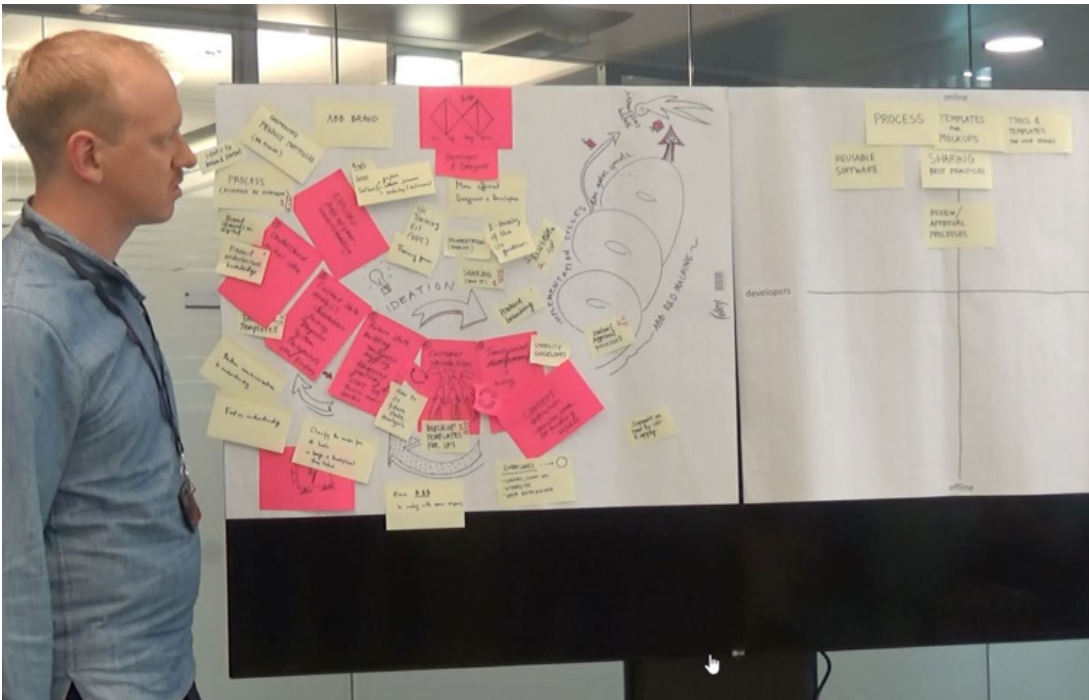
Team red: focused on understanding of the end users – specifically in terms of their current situation and wishes for a future situation. This user-centered approach aims to balance the needs of users with the resources available from stakeholders.



Team yellow wanted the central design team to provide reusable components as resources to lower the amount of repetitive work for designers and developers, so they could focus on more high-level aspects of software products and feel confident that they are in line with ABB branding.



Team blue also considered reusable components to be crucial contributions from the central design team. In addition, they mentioned the services that could be provided, such as training and design reviews.



Team red prioritized templates, training, and review. They focused on providing the tools and guidance for ABB software teams to use the style guide and follow a standardized design process.

### Outcomes

The co-design workshop had diverse outcomes, in line with the workshop goals and beyond.

**Social:** designers and developers from different business units, some of whom had never previously seen each other in person, were able to meet and connect names to faces. This meeting fortified the perception of an actual design community and of a connected design team that extends beyond individual business units.

**Informational:** the individual participants were able to discuss their team structures, projects, approaches, and opinions. Without meeting, this kind of knowledge transfer would have been difficult and the need for it may have been underestimated. At the end of the workshop, some participants had made plans to meet again to share knowledge about topics that were discussed during the session.

**Critical:** the workshop encouraged participants to think critically about the style guide and the central design team. Rather than taking these resources as they are, they were asked to think of these resources as living entities that they can

participate to improve. As heard during the interviews, there is a risk for style guides to be perceived as established structures, such that users take them as they are or discard them if they do not seem to meet their needs. The workshop gave participants a sense of ownership and signaled to them that as users of the style guide, they also have a voice and a stake in improving it.

**Generative:** in addition to these shifts in perception and increased knowledge, the workshop participants generated possible solutions and resources to include in the style guide. These proposed solutions will contribute directly to next iterations of the style guide.

### 3.2.4 Recommendations

Based on the findings from the research at the case company and from Chapter 2, the ABB Design System should:

- be approached as a full service rather than a digital product. As such, the central design team should balance the resources available with the needs of the ABB product teams. The Design System will serve as the platform for the two to meet.

↳ This means that the central design team will need to communicate consistently with the product teams to understand their needs and with executives to gain the resources needed.

- be available side by side with the UI Style Guide for an adjustment period, while the central design Team raises awareness amongst stakeholders about design systems, using storytelling approaches. Storytelling in this case doesn't have to be anecdotes of people using the style guide, but rather about explaining the brand story and why specific design choices have been made.
- be promoted to product teams as a way to make their work easier, by eliminating the labor of rote tasks such as sizing buttons and animating icons, such that they can focus instead on larger strategic points related to the design of software products and their end users' needs.
- be promoted to executives to gain further support and resources. This promotion should focus on the time savings brought on by design systems, about 20% of working time for developers. For a company of ABB's scale, these savings are huge (Projekt202).
- be optimized to accommodate the tasks performed by any user of the online platform, regardless of job role or consultant status. Designers and developers should find resources relevant to their role. Project managers and product owners who may have less knowledge about design and development as well as consultants who may have less knowledge about the company's brand should also be able to find the needed information from the site.
- include a set of best practices so any users of the design system understand how to incorporate it in their work process, no matter their role.
- these best practices should encourage a work process that does not strictly restrict each job role to each phase of the work process. Rather, the different job roles should be interacting throughout so that no information is lost during handoffs and no time is wasted preparing material that another team member will later need to adjust.
- have a focus on providing reusable components for both designers and

developers. Full pages should be available as examples and as reusable content.

- continuously engage members of the digital product teams at ABB by actively collecting their feedback and giving them opportunities to contribute content.
- act as a touchpoint for a designer community, connecting designers throughout the company to exchange ideas and experiences.



# Conclusions & Discussion

## CHAPTER 4

## 4.1 CONCLUSIONS

A design system is not meant to eliminate the development and design work altogether. Rather, it streamlines the work so that product teams don't need to reinvent the wheel each time, and in silos. Design systems provide a set of components that can be reused and clear indications for making decisions about which patterns are relevant in which contexts. It is still up to the designers to determine what the end users need, and it is essential that they do not attempt to eliminate that work with the use of a design system. Rather, design systems free up designers' time to focus on understanding users rather than designing detailed interface elements. Design and implementation of software products can go much faster, as designers and developers are not creating from scratch but rather picking solutions where the design system and user needs intersect in a coherent way. This redistributes a significant portion of work time and cognitive load from tedious tasks to high-level strategic decisions.

The issue of terminology is not straightforward. Design is a field in which terms are not often standardized. There is of course overlap between the meanings that different individuals assign to the same terms, but the definitions are very much in flux. The meanings are not such standardized as they are in constant discussion. Blogs and conferences are a way for designers and other professionals to meet and exchange ideas, while companies tend to codify their own meanings internally. In these discussions, *design system* has emerged as a term that is a continuation of other standardizations for design. It is still a way to document processes and unify designs according to one brand identity. *Design system* differs from the other terms in the following ways:

- it always includes a set of reusable components
- it is usable by both designers and developers, a new development which has been made possible by the recent advent of collaborative prototyping technologies

- it provides a design philosophy to justify the design choices that have been made

Teams at the helm of design systems should also be responsible for connecting the design teams and operations throughout the company. This can be done by creating a platform and community for designers to continuously share their insights with one another and to contribute to the improvements to the design system. Securing budget and other resources for such efforts also falls on the shoulders of the central design team, which should advocate with company executives about the importance of promoting design. Stories and numbers help here. With developers saving 20% of their working time, the cost savings would be huge (Projekt202).

## 4.2 DISCUSSION

### 4.2.1 On design systems

Design systems have the potential to act as the design artefact described by Brown et al. (2012). That is, they can serve as a resource for designers, developers, and other product team members to communicate about the aspects of a project for which they are each responsible and how to combine their work harmoniously, allowing them to create software products that are in line with company branding and a good user experience. They are also an opportunity to integrate the work flows of different job roles through suggested best practices, so they do not operate in siloes. A design system addresses these needs on a deeper level than the previously existing resources as it not only outlines the standards for design, it delivers reusable components that have been tested and approved by a dedicated team to ensure good user experience. It also provides the reasoning behind the design choices that were made. It transfers the tacit knowledge that long-time employees hold about how to design products into a written platform that others can consult to quickly understand the company context.

Design system can be considered to be an evolution of the other standardizations for design. This creates challenges when communicating about the term. As discussed by the experts, professionals tend to stay updated about new concepts in their own fields. Most designers are aware of design systems as they keep up to date with the ongoing debates. Developers and other business professionals involved in product teams may not be in the loop. However, while design systems have their roots in design, they are meant to be used by individuals in a range of positions who are active in building software products. This leads to a potential knowledge gap between designers and others. Attempting to change the term of standardizing documentation from style guide, for instance, to design system may suggest a change in approach, rather than enhancing what has previously been done with new features. Designers should be cautious when introducing design systems to a company. The experts and employees of the case company both addressed the fact that making changes in

an organization can be a disruptive and slow process. If design systems cause confusion, it may be more beneficial to retain an older name while gradually introducing changes to the features of the document.

However, names are important. Calling a platform a design system automatically sets expectations for what the document is and how it should be used. By selecting a particular naming policy, central design teams cannot ensure that their audience will consequently understand what the content includes. However, they can set goals internally about the intended purpose of the document by selecting its name. Stakeholders may not be knowledgeable initially, but once they learn what “design system” means, they would get a more complete and accurate idea of what it is about. If central design teams indeed choose to make a name change, they are responsible for educating other stakeholders about how to use the design system. Storytelling is one approach that can be used to communicate with the stakeholders about the importance of design systems to their work. It creates a context for the introduction of new material and makes the process more human and relatable. Stories could be about product teams using the design system when it comes to best practices, or about the experiences of end users to address the importance of creating a unified look and feel. There should also be a strong focus on telling a brand story that explain the design choices.

### 4.2.2 Future research

Numerical data regarding the location, timing, and frequency of use of the ABB UI Style guide website is automatically recorded with each visit and can be accessed by the website administrators. While this current study has a focus on qualitative approaches to examine usage of the style guide and the needs of its users, future studies could focus instead or in combination on this numerical data. This would serve as objective testimony of users’ navigation patterns. Quantitative analysis could also extend to analysis of the survey results.

The research phases of this study, particularly the survey, can be replicated at regular time intervals for a longitudinal study of user needs and satisfaction. Results from the current studies and future data collections could be compared and tracked over time. With the changeover from the current ABB UI Style guide to the upcoming Design System, comparative data would provide a measure of the improvements from one platform to the next. Both quantitative and qualitative data would be relevant for tracking user needs and user satisfaction over time.

Future research regarding design systems should include a deeper analysis of cultural aspects of user experience, both in terms of users of the design system (i.e. developers and designers) and of the end users of the resulting products. In the case company, organization-wide documents such as the UI Style Guide are only made available in English, English being the official corporate language. Currently, there are no plans to publish the ABB Design System in any other language, both to minimize the volume of labor required to create such documents as well as to provide a truly uniform resource of information. Any translation could easily lead to inconsistencies. However, culture has a strong impact on the way that people access, interpret, and use information (Plocher et al. 2012: 162). That can have a strong impact on how different users of a design system interpret the information it contains, as well as their expectation of how information should be organized and accessed. Even within particular job roles, cultural background makes a difference. For instance, one study “found that professional identities of software developers are influenced by ‘national myths’” (Carmel qtd. In Brown et al. 2012: 1382). This suggests that employees with the same job roles at the same company but with different cultural settings may view their professional identity and their role within the company differently. This in turn would cause them to have a different approach to resources such as a design system. The research conducted for the case study included geographically diverse respondents, ensuring that varied voices would be heard and survey results were analyzed for any significant patterns. However, sample sizes for each individual country were rather small and no specific cultural analysis was conducted to identify differences that could be attributed to culture. Further studies could adopt this focus.

Additionally, product teams in international organizations such as the case company create software and interfaces displaying information in many languages and in several alphabets. The ABB font “ABBvoice” for instance is available in the Latin alphabet as well as in Arabic, Chinese, and Korean scripts (ABB Branding n.d.). The end users of these software products also have culturally specific expectations and preferences for how to navigate applications. Such cultural considerations should be addressed in the design systems to provide guidance for successfully creating software products that are culturally relevant and appealing while also in line with the brand identity.

Naming policies are addressed in this thesis, in that design system, style guide, pattern library, and similar terms were compared. One topic that was not addressed was the name of the design system itself. The design system example companies all have a name for their design systems. Rather than IBM Design System for instance, IBM has Carbon, Microsoft has Fluent, Salesforce has Lightning, and Google has Material Library. Similarly, ABB is planning to name its design system CommonUX. The names tend to make a reference to the industry of the company. Bulb’s Solar suggests the area of renewable energy in which it operates while Uniform by Hudl, a company providing athletics-related software, is a pun referencing both athletes’ uniforms and the effort to create uniform designs. The methods for choosing such a name with an emphasis on branding could be investigated in further studies.

The ultimate goal of a design system is to ensure a consistent look and feel, quality, and a strong brand identity for a company’s software products. The current study tests the usability and opinions regarding the UI Style Guide used at case company ABB by asking its users to evaluate how well the platforms allow them to reach this goal. Another way to examine how well this goal is reached, would be to test a company’s actual software products. A review of these products for a consistent look and feel would provide insights on how well a design system is communicating the brand identity and its attributes, and how complete of resources the design system team is providing to support this effort. This could be done periodically after the launch of a design system.

The application of design systems could be adapted beyond software products in further studies. Hardware products and services are outside the scope of this thesis, and design systems indeed have a focus on standardizing specifically the components of digital interfaces. Perhaps the concept of design systems, with reusable parts that enable consistent user experiences and free up designers' and developers' time to focus on more strategic decisions, could be adapted for other types of user experiences.

One topic that was mentioned by the experts as well as the designers interviewed at the case company is that of creativity. Perhaps less of a concern for developers, creativity is important to designers who wish to maintain their authority to make design decisions, all the while adhering to a set brand identity. Additionally, some designers had the concern that they wish to continuously release products that feel new and fresh to their end users, which can seem difficult to achieve while using the exact same visuals over time. Future research should investigate how to provide guidance in a design system for designers to bring an element of creativity and newness in their designs while maintaining the consistency of the brand identity.

Finally, design systems need a proper launch and promotion campaign to support adoption throughout the company. As discussed by the experts, buy-in from various stakeholders is crucial and is only achieved when designers advocate for a design system actively. Due to its global scale and its relatively siloed operations, it will require much attention and effort to promote the design system. Future studies could examine and propose methods for building such structures and spreading awareness through them effectively.

### 4.2.3 Limitations

The thesis could have approached the topic from a different angle, if it had a stronger component of quantitative methods. With its 91 respondents, the survey could have been used to drive complex statistical analysis of user needs as indicated by survey answers. Such analysis could for instance precisely evaluate potential patterns of causation. Quantitative methods were not the focus of the current thesis however, which rather adopts a qualitative approach to assessing user needs. As mentioned in the Methods

section, the survey was therefore utilized to gain a broad overview of the situation, rather than to obtain complex quantitative analysis.

There is little existing literature on the topic of design systems. It is a relatively new term with a brief history. It is however trending in the design industry as design teams operating in business contexts have been utilizing the term, seeking to define it, and to create documents that would live up to those definitions. Over the past couple of years, design professionals have been publishing blog entries and internal documents and organizing conferences and workshops on the topic of design systems. As covered in the Literature Review, the concept of creating documents to standardize design within a company is not new, as design systems are not the first concept to be used and adopted. Guidelines, style guides, and other such terms have predated design systems and been used widely, though once again, mostly within industry. Academia has not produced nearly as much literature on the topic. As a result, the literature reviewed for this thesis relies heavily on the writings of professional designers in addition to limited academic writings on the topics.

### 4.2.4 The future of design systems

Designers have been discussing how to create design principles to match a company's brand identity for many years. The discussion itself is not new, though "design systems" seem to be the latest iteration of the concept. There are unique challenges when trying to introduce new concepts in large corporations where change is slow to spread. Designers have to take on the responsibility to push these efforts forward in organizations that may not have a history of prioritizing design when allocating budget and other resources. The situation seems to be improving as more and more companies are receiving the support necessary to create design systems and knowledge about design terms is gradually growing beyond the field of design. This awareness will likely continue to grow.

Design systems will likely grow as well. While the experts did not predict any upcoming evolutions of the term in the near future, such a transition is not unlikely. The term itself is quite new, but was preceded by others which are still in use. Even within

the design systems that exist today, it is not uncommon to find sections called “guidelines” or “pattern library.” According to some of the existing definitions of a design system, that is because design systems include those things. One could imagine that design system could eventually become engulfed as well in a yet larger term. Other factors could also lead the change. Some of the designers interviewed mentioned that the evolution in collaborative technology has created new ways of working and driven the need for a new broader term than what existed previously. Further advances in technology could take things to the next level. Artificial intelligence is increasingly integrated in work processes while the most successful products are those that somehow still come across as feeling human (Dearborn et al. 2018). Would a document that addresses how designers, developers and artificial intelligence can collaborate to create human products with good user experience still be called a design system? Whatever the next challenge, the designers, as the stakeholders who investigate users’ needs, would likely be the prime advocates for improving work processes.

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