# A Holistic Approach to Design Systems

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**Abstract**

Design systems are an increasingly relevant topic in the present days, because their benefits are an integral part of any legitimate digital transformation initiative in the exciting upcoming years, and not a mere add-on. There are, however, differences between a practical design system, one that focuses on tools and artifacts; and a holistic design system, which accounts for human factors, is process-based and includes a governance model, allowing for longer-term results. There are considerable design benefits, as well as business advantages, linked to the use of a holistic design system. These can be complex to setup, run and maintain; and are highly dependent on the scope and project's complexity; company's needs, and preferred tooling. Building on my professional experience collaborating in the creation of a minimum viable multi-brand design system for a large banking group in the UK, through subsequent secondary research based on existing industry and academic knowledge, and using multiple industry thought leaders as sources; this article explores the essential requirements of a holistic design system and develops an understanding of the skills, mindset shift, and advocacy required for its success.

Keywords: Design Systems, Product Design, Design Process, User Interface, Development.

## 1. Introduction

With the increase of change and complexity in the web and user interface landscape, design systems have become a central subject in the product design world (Curtis, 2015; Kholmatova, 2017). Vesselov, S. and Davis, T. (2019) also stated that "articles, books, and talks discussing the importance of design systems are rising in popularity" (p.2). A design system in the context of product design, is a relatively new term (Ruissalo, 2018); this is also due to the problems it is trying to solve — with the increase of digital products, screen sizes and number of devices that exist today. This is one of the reasons why the term is still unclear, and there are different interpretations of what it means, which in turn allows for frequent misuse (Curtis, 2017a). As organizations and user bases grow, along with the rapid changes in technology and software business, there is a need for design to scale accordingly (Ruissalo, 2018). With the increase in design scaling, companies need to create solutions that work for multiple problems and enable faster and effective design processes, that lead to higher quality output. To solve contemporary challenges in product design, it is important to think about design systems holistically, by not only considering the final output, consistency and quality of the design assets; but also the design process as a whole: how teams collaborate and approach design, and how design systems thinking is integrated into an organization's culture. From late 2016 to early 2018, I was part of a project entailing the research and creation of a minimum viable multi-brand design system, for a large banking group in the UK. This experience, and subsequent secondary research over the past 16 months, opened my eyes to the broader picture: the relevance of a direct connection between design and development, and most importantly, the underlying system and the human aspects, intrinsic to its ongoing maintenance and support (Frost, 2016). While practitioner literature contains advice on the practical aspects of design systems and its components, as well as organizational factors; academic studies and research literature providing evidence on the human

and organizational factors intrinsic to a holistic approach to design systems, are still scarce. This study aims to clarify what a holistic design system is and highlight potentially overlooked requirements for its success. Through researching the question: "what are essential requirements of a holistic design system?", based on existing industry knowledge; this article develops an understanding of the skills, mindset shift, and advocacy required to implement a holistic design system beyond its contents, with the goal to extend previous knowledge in a useful way, in the interest of other professionals in the product design field.

## 2. Literature Review

This article describes the concept of a holistic design system based on existing industry and academic knowledge, and using multiple industry thought leaders as sources, to explain its components beyond a traditional assets point of view, providing literature review perspective to my research question. The key concepts to be explored in this article are structured as follows:

***- Mixed terminology used when referring to a design system and its components***

Terms such as *design* and *system* can be misleading, since these are used interchangeably and in different contexts within the design sphere. A similar situation happens when using terms such as *style guide*, *pattern* or *component library*, which can be a starting point of a design system - and are in fact the most common artifacts; but are not the only component; specifically in the context of a holistic design system (Curtis, 2016; 2017a). This section aims to clarify the differences between *design guidelines* and *style guides*, *living style guides* and *holistic design systems* (Curtis, 2009; Feather, 2014).

***- Definition of a holistic design system, its human and organizational factors***

A holistic design system is comprised of many parts, not only the tangible output and tools, but also the additional layers, not necessarily visible in a public-facing platform, such as processes and a governance model, which are a direct reflection of how teams approach design at a specific company or organization (Curtis, 2015 and 2017b; Frost, 2016; Kholmatova, 2017).

***- The mindset change, ownership and advocacy required for a successful design system***

In many cases, teams still focus on the final implementation aspects of a design system, as opposed to the system that underpins how individuals in different roles collaborate effectively, how the system is maintained over time, and how a streamlined design process can empower teams and enable good design outcome (Frost, 2016; Curtis, 2016). In a nutshell, design teams and leadership need to be on board with design systems; and dedicate continuous time and resources to ensure its maintenance and success over time.

## 3. Methodology

As explained earlier, this research study seeks to further explore the difference between the tangible components of a design system, and a holistic approach to design systems; to answer the question: what are essential requirements of a holistic design system? Based on these objectives, and to extend and corroborate the knowledge acquired during my professional experience, I conducted secondary research divided into two parts:

- *Secondary research part I*

Evaluation of existing literature and studies from prominent individuals and professionals within the design industry, namely Alla Kholmatova, Brad Frost and Nathan Curtis, with concrete focus on gathering data around design systems' best practices and benefits; as well as analyzing existing design systems' repositories, used as sources of knowledge to inform my current research topic (Pate, 2017; StyleGuides.io 2014; UXPin 2018).

- *Secondary research part II*

The second part of this research focused on data collected in the past, both qualitative and quantitative, by reviewing publicly available case-studies: the U.S. government and GE Design Systems, found through online sources; with the goal of understanding how large organizations have implemented design systems successfully and how product teams experienced its use. These specific case-studies were selected due to its scale, since it relates to my specific research problem: the larger the organization, the more prevalent and challenging coordination, knowledge sharing and executive buy-in are (Ruissalo, 2018; UXPin, 2017). The data was collected in the form of annotations and organized through affinity mapping, from which I identified common themes and extracted the relevant insights. There are potential limitations to this research approach, given the fact that the conclusions I drew from existing data didn't allow for extensive detail regarding methodologies, cause and effect, nor include direct observation. However, this method proved to be successful when consolidating prior knowledge and diversifying my point of view, through a variety of external, mature studies, and the experience of respected authors in the design industry.

## 4. Findings and Discussion

### *1. A design system is an ecosystem of components, guidelines, tools and processes, with the goal of uniting product teams and streamline the design process.*

It is important to clarify that a design system is not a visual system or a design language; it is not a style guide, not a CSS framework, nor a pattern library; and yet, all these artifacts use system thinking (and system design), which is not new to the design community. This is why words like *design* and *system* can be misleading. A style guide or a pattern library can be a starting point of a design system, but they are not the only component (Curtis, 2017a). Curtis (2016) stated that "focusing on style guide delivery as the climax is the wrong story to tell. A system isn't a project with an end, it's the origin story of a living and evolving product that will serve other products" (February 26). It is therefore useful to look at the differences between a) *design guidelines* and *style guides*; b) *living style guides*; and c) *holistic design systems*:

a) *Design guidelines* and *style guides* are static guidelines, non-editable in principle. A great example is the NASA Graphics Standards Manual (NASA, 1976). Style guides and UI toolkits provide the building blocks and design elements, along with guidance, theory and principles behind components and its usage.

b) *Living style guides* are a step further in the design process. In addition to the design guidelines, they embed the actual UI elements and are a trustworthy representation of the current state of things, with automatic rebuilds (Feather, 2014). For this reason, they are also easier to maintain, in contrast with style guides created in a PDF format. Material Design developed in 2014 (Google 2019), Lonely Planet (2013) and Mail Chimp (2013) are great examples of living style guides, they display the real components along with the respective code. They are extremely useful for quick testing, because it is possible to immediately test the components' behavior in different browsers.

c) A holistic design system includes all design assets and tools, but also a governance model, ways of working and processes. BBC GEL (2020), Salesforce Lightning (2017), Westpac GEL (2017) and the GOV.UK design system (2018) are perfect examples of design systems available publicly. In the case of the GOV.UK platform, there is a community section with rules about how to propose and develop a new component or pattern, as well as a defined criteria for contribution. There is a system in place with clear guidelines, managed by teams of people who

are responsible for its outcome. The manifestation of a design system can be a website but fundamentally it is an ecosystem, it affects the organization. Curtis (2016) stated that "a style guide is an artifact of design process. A design system is a living, funded product with a roadmap and backlog, serving an ecosystem" (February 26).

It is also relevant to add that just because a digital product looks cosmetically consistent it does not mean there is a system underlying it — a design system is not visible at a glance (Frost, 2016). It is challenging to judge how companies work internally, their level of automation, or if there is more to the system than what is being shared. It is worth keeping in mind that not every organization is fully transparent about their internal processes and design methodology, and what is frequently shown on the web is just 'the tip of the iceberg'. A Design System is an ecosystem of components, interfaces, guidelines, architecture and processes, to satisfy requirements of a product or organization, and build deliberate outcome. It enables teams to collaborate and build good design outcome, guided by standards and design principles. It is a cross-disciplinary platform that streamlines the design process, it improves cross-team collaboration and defines how teams design (Frost, 2018).

***2. Everything is part of the system, from how a team operates, to the granular aspects of a pattern. A design system needs to be carefully designed to facilitate collaboration.***

Another important finding from the research is that creating a design system requires designing the system itself. A holistic design system does not solely involve digital design and development, it is made of many parts. The UI toolkits, the UX patterns, the code, documentation and accessibility guidelines, are the tools, the tangible output; but there are also the invisible layers (not necessarily reflected in the platform, but essential) such as processes and a governance model — it is about how people work and communicate, what is the process for design reviews and feedback, and how new patterns are created and approved. It is about how a specific company or organization approaches design.

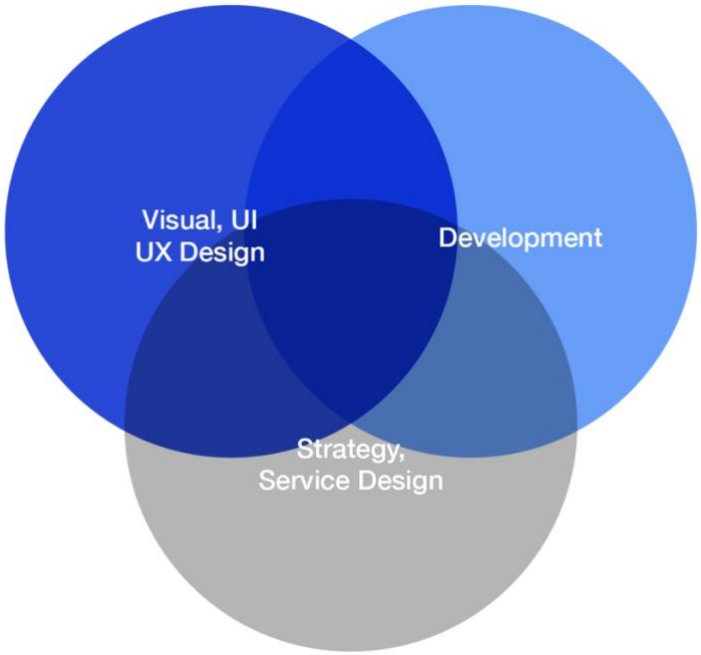

**Figure 1**: Venn diagram: core skills for the creation of a holistic design system. Mira (2019).

The creation of a design system blends different skills: visual, user interface and user experience design, development, strategy and service design (as shown in figure 1). A big part of it is about the service this system provides to the design teams. A design system encompasses different audiences as well: the company and teams at large (by shaping the way an organization approaches design, their vision and mission); the individual users of the system (product owners, UX and UI designers, developers, content strategists); and the end-users, the people who use the digital products - the final, tangible output of the system (Ruissalo, 2018; Frost, 2016). Curtis (2016) stated that "A Design System isn't a Project. It's a Product, Serving Products" (February 26). To add to the different facets, a design system needs constant maintenance, it is a living organism. When talking about the design system for the U.S. government and the importance of empowering teams, Benari (2017) stated that "you'll need a multidisciplinary team with expertise from user experience research and design, visual design, and front-end development. You'll need someone to fulfill the role of project manager and product owner to guide the project forward toward the right goals" (October 3). It is worth stating that a cross-disciplinary team is especially relevant in product design because different perspectives also account for more use cases (Kholmatova, 2017).

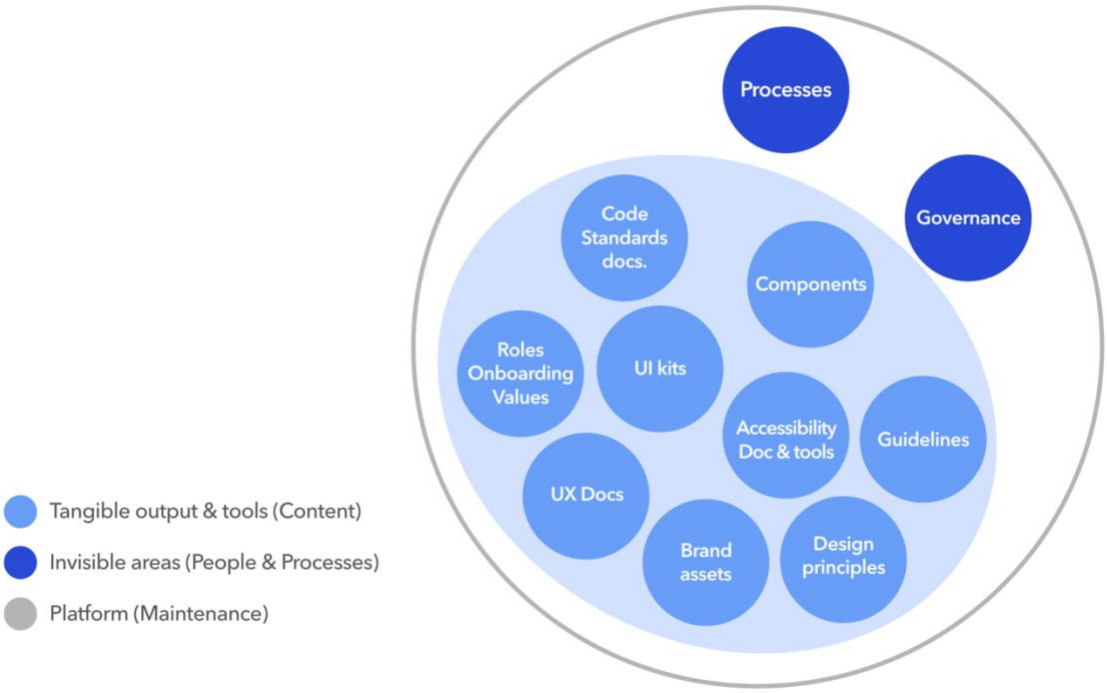


**Figure 2**: Conceptual diagram: the different layers of a design system. Mira (2019).

In terms of best practices and to paraphrase Brad Frost, a design system is based on four pillars: Content, People, Processes, and Maintenance. It becomes clear why a design system is never completed and needs to be maintained, continuously (Frost, 2016). The real challenge is approaching it from this perspective. A holistic, long-lasting design system requires a mindset

shift from focusing on the tangible artifacts and final implementation, to focusing on the actual system that is underlying everything. Frost (2016) stated that "a design system needs ongoing maintenance, support, and tender loving care for it to truly thrive" (Chapter 5). It is common for teams to still keep their focus on the final implementation aspects, rather than the underlying system.

### *2.1 Governance and team models*

It is crucial to have a solid governance model in place and review processes for teams to work more efficiently (Frost 2016). Part of it is the creation of a dedicated team responsible for standards and design integrity, guidance, resources and processes such as: approving new components - when there is the need to create new ones; evaluate whether a pattern is an exception or reused enough across the journeys to become part of the design system; facilitate design discussions, feedback implementation, and foster effective communication. As an example, David Cronin, explains that an organization needs people that are stewards of the design system, to encourage teams to do the right thing, when talking about the evolution of the GE design system; what they have learned through a more open-ended system and how to better convey the spirit of the design language (UXPin 2019). There is a need for allocated time and effort into supporting the teams using the design system, regardless of how well it is documented. Cronin also shares their initial process flow for contribution (min 38:16) and explains how teams that are creating components, discuss it during the design phase and share the code regularly. It is an ongoing process, based on knowledge sharing and continuous communication. During this webinar in October 2019, Cronin mentioned that GE had over 100 UX designers in the GE digital ecosystem, aligned to their digital products. The Predix platform team was comprised of around 40 designers; and their dedicated design system team was comprised of 15 people approximately: 3 designers, 1 design leader, 7 to 8 developers, 1 development leader, 1 QA lead and 1 technical product manager.

Nathan Curtis wrote about different team models for scaling a design system and the importance of a team that helps the organization stay cohesive in all its facets (Curtis 2015). The author detailed the difference between a "solidary", "centralized", and a "federated" team model. For organizations of high-performing talents, he highlights the "federated" model, as a more complicated but best suited path to pursue. This model entails an empowered subset of designers and leaders from multiple product teams, designated to collaborate on the system for a period of time, making design decisions collectively. There are various dimensions to consider, such as a mixture of representation in terms of disciplines, allocated time and investment in a central effort. It is also important to spread expertise across disciplines and include directors and talented leads, to distribute decision making and doing across the management hierarchy. It is crucial to have a clear sense of who is responsible for documenting decisions and how these are communicated; there is the need of a centralized component of staff who are the direct contributors of the system, dedicated to continuously evolve it. The team is not based on exclusivity, and instead should embrace peripheral designers who are willing, and able to, contribute (Curtis 2015). It is important to consider however, how organizational structures, team culture and specific product needs, influence the direction of a specific team model (Kholmatova, 2017).

### *2.2 Documentation and onboarding*

A successful design system provides a clear framework and a centralized library for teams to create and test consistent, effective and valuable digital products. This is not possible without a solid documentation. The design system's platform should give the teams all the information

needed to create and maintain digital products, their structure and guidelines, in addition to the components and UI toolkits. Vesselov, S. and Davis, T. (2019) stated "provide clearly defined rules for how each component will be used. Readers should be able to answer the what, when, where, and why of each component" (p. 87). Alongside with design documentation, onboarding materials should be comprised of every aspect that supports using and contributing to the design system (i.e. guidelines for designers on how to use certain tools; guidelines for library contributors, or for the creation of new libraries or toolkits, in the case of a new product or brand; guidelines for research and exploration of new patterns, for design standards and sprint etiquette). This is important to be documented when onboarding new hires, or new team members who joined a project recently. Frost (2016) stated that "a great way of injecting your design system into your company culture is to bake design system training right into the onboarding process for new employees" (p. 171). A good onboarding process ensures everyone is working from the same baseline.

### *2.3 Shared vocabulary*

Designers and developers often use different terms when referring to components and patterns, it is crucial to establish a common language to support the flexibility needed during development, the creation of digital products, and for true collaboration to occur (Curtis, 2009). Naming conventions and its structure should be discussed between the design and development teams, to arrive at terms that make sense for how designers create an interface, but also for how things are built in code. Atomic Design principles are an essential reference for organizing and dividing components into categories that make sense for both teams, by asking questions such as: 'how are molecules and organisms generated and built upon, in code?' and 'what is the logic for designers to assemble UI elements?'; these categories can and should be adapted to a company's specific needs. A shared vocabulary is particularly relevant as the number of people working on a project increases (Frost, 2016).

### *2.4 Design principles*

Another important facet of a design system are its overarching design principles to solidify a collective understanding. These will inform every new component or product that is designed in the company. When designing a new component, the teams should cross-reference the output with these rules, to make sure it responds to the overall design goals and requirements. Ideally they should be kept high-level enough to apply to the different domains (not only interaction, motion or visual design, but also tone of voice and content), as well as the desired qualities of the end-product as a result; while remaining flexible and open to future adjustments (for example: product teams and expertise required, or product's audience and consumers, when expanding offering). Design principles should serve cross-functional teams, facilitate collaboration and promote design consistency through a shared philosophy (Kholmatova, 2017).

## *3. For a holistic design system to thrive, there needs to be ownership and a strong sense of advocacy.*

In order to bring the project forward in the organization, everyone needs to contribute. Very frequently a design system requires significant investment, and a big part of the initial process is socializing and selling it internally; this was the case with the multi-brand design system project I was part of, for a large banking group in the UK. Because without everyone on board there is no design system, a company's culture needs to be matured in order to adopt it. Ruissalo (2018) stated that "the commitment should exist both on the company management level and product team level" (p. 43). It is not just about 'what is designed' but also about 'the way it is designed'. When users and contributors of the system have ownership of their design process, they become

advocates of the transformation. A case-study on the U.S. web design system (Ashida, A. and Strenio, E. 2019) synthesizes the team's learnings from centralization efforts. 18F documented the process the USWDS team used to create version 1.0 and interviewed them about what happened since the original launch in 2015. Their challenge was to create visual consistency across the nearly 30,000 U.S. federal websites, in order to save the government considerable time and budget on design and development resources. The outcome was the U.S. web design system, a centralized tool that is free and accessible for all federal agencies, with an impact of $100,000 estimated savings per project that uses USWDS, on design and developer resources; and a much better experience for the American public, when interacting with consistent, easy-to-use government services.

### *3.1 Empowering teams*

Their learnings emphasize the importance of empowering teams, building consensus, and inviting the design system users to participate throughout the process and make it their own. Ashida, A.; Strenio, E. (2019) stated that "when you give people a stake in the system, they'll feel invested to use the service and contribute back, increasing your chances of success in the end". Another crucial strategy consists in offering multiple feedback outlets and keep communication channels open. USWDS for example, have a standing monthly call to stay in touch with their users. This call serves as an open forum for agency partners to join and hear more about what is happening, it is a chance for the design system team to share updates and allow any community members to provide feedback.

### *3.2 Promoting the system*

Evangelizing the design system efforts should happen even before the system is off the ground (Frost 2016). It is important to articulate the value the teams will get when using it. Listening to stakeholders to understand their needs when creating economies of scale, also goes a long way in getting everyone onboard. In his book Atomic Design, Brad Frost (2016) highlights the importance of making it official, for a design system to stand the test of time; the author states that "in order to establish a truly impactful design system that creates long-term success for your organization, the design system needs to evolve into an officially sanctioned endeavor" (p.148). This entails demonstrating real value - why and how it is useful - and presenting a concrete plan of action. Vesselov, S. and Davis, T. (2019) stated that "to start implementing your design system, you must first assess your organization. Come to understand how your type of organization will affect the decisions you must make when building your system. Learn whether you have stakeholder buy-in or if this is something you will have to develop over time" (p.88).

### *3.3 Encouraging transparency and accountability*

Visibility and transparency are crucial to the ongoing health of a design system. Transparency is critical when new patterns are considered for inclusion, for example. It is important to have visibility of everything that is being created to avoid duplicated patterns. On a global level, it helps to promote accountability and encourages progress. Setting up places to communicate changes and document progress creates awareness and can also build excitement. The U.S. government web design system created in 2015, has contribution guidelines (USWDS 2019), a page on GitHub for its contributors (USWDS 2015 - 2020), and a product roadmap with an up-to-date report on goals, features, and long-term direction of their design system, and status of their progress publicly available (USWDS 2018). It is imperative to establish a culture of communication early in the process (Frost 2016).

## 5. Conclusion

Based on the research performed during this study, a condensed answer is presented to my research question: what are essential requirements of a holistic design system? These recommendations can be summarized as follows:

***- A holistic approach entails thinking about the system as an ecosystem***

It is important to design a design system from a service design perspective and approach it as an ecosystem, which needs ongoing maintenance to serve its users. Apart from its contents and tools, a design system is as much about enabling collaboration and human connections, as it is about technical solutions. Everything is part of the system and maintenance should be embedded in the process. It is crucial to think about a design system as a product, meant to grow and evolve over time, as opposed to a project with a finite scope (Frost 2016). The system must be supported from multiple angles and disciplines.

***- The system needs to be designed in a way which facilitates alignment and collaboration***

Creating a cohesive vision gives context to the team's work and helps everyone to stay on track and in sync. A common purpose defines what an organization, team or product want to achieve and why it is important. It creates clarity and alignment, and grounds decision-making. To design the system itself, organizational aspects need to be considered, such as a governance process for teams to create together and build on one another's work, a shared vocabulary for effective cross-discipline collaboration, and continuous communication. Frost (2016) stated that "the not-so-secret secret about creating effective design systems: it all comes down to people truly collaborating and communicating with one another" (p. 95).

***- Ownership and advocacy are vital for a holistic design system to flourish***

Promoting the system, articulating its value, and encouraging discussion and knowledge sharing, are essential to get the teams involved. When people have a stake in the system and share a common purpose, they are more likely to contribute. It is important to empower leaders to own the decisions, build consensus, and establish a culture of communication to fully embrace the design system's mission.

***- Time and resources need to be allocated to fully support design system's efforts***

A holistic design system should be approached with a solid strategy and roadmap. It is a long-term commitment with the ambitious goal or redefining how an organization creates digital work. Guth, M. (2018) stated that "a strong mandate is essential to get the resources necessary for long-term operation and to be able to work towards a common goal across departments" (p.15), and "as with any project, we must ensure that we proceed in a structured manner and always keep an eye on the big picture (p.16). The malleable nature of the digital world urges us to create living design systems that adapt to the ever-changing aspects of the medium, user needs, and the needs of the business they serve. This shift in thinking is not only necessary, but also changes fundamentally the scope of our work. Understanding the requirements of design at scale is vital in a holistic design system. The larger the project, the more important the process becomes. The scope and complexity of a company-wide design system is also very different than creating a suite of websites or an application. The system needs to enable scaling, it should grow and adapt along with the teams and the technology.

This article took a stance at clarifying the importance of a well-considered design and collaboration processes to achieve good design outcome. While this article does not aim to provide a final definition of what a holistic design system is, also due to its ever-evolving nature, it took into consideration industry knowledge to highlight its essential requirements, and what differentiates a practical approach from a holistic viewpoint to design systems. As Ruissalo

(2018) stated, “design systems are an established concept in the industry, but still very novel and unresearched when a broader perspective is taken” (p.66). There are various aspects that offer possibilities for future research, such as evidence on the best strategies in organizational approaches - that have provided real value in a large-scale context - and the circumstances in which those were introduced; further detail on design methodologies for the creation of the underlying system and processes; research on the impact that the increase in automation can have in traditional design roles, as well as the increased blurred lines between design and development. This article could merely touch upon these topics due to the scope of the research; therefore, further research in this area is suggested.

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