Design Systems

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Design and development represent core functional disciplines within software product teams, and each discipline has evolved rapidly on its own. And while there are mature solutions targeting designers or developers exclusively, solutions targeting a design-to-develop story are still in their infancy.

From a business success standpoint, enterprises acknowledge the need to deliver compelling UX in applications. However, delivering compelling UX requires a high degree of collaboration between design and development. And this level of collaboration can prove expensive given the remote and distributed nature of modern work. The cost of delivering UX is also compounded by other factors, like the effort required to communicate design intent and for transforming visual specifications into code, to name a few. Unless we bring down these costs, it may be infeasible to deliver on compelling UX even for the most willing enterprises.

In recent years, design systems have emerged as a solution to improve collaboration between design and development. The design system approach has been embraced by organizations like Salesforce.com, IBM, Atlassian, etc. and serves as testament to its appeal.

A design system, in simple terms, represents a deliberate inventory of UX patterns and brand style guide which are then realized as matching software components that can be reused or contextualized for building software applications. A design system can also be extended to contain voice and tone guidance for writing content, page templates, and even user flows. It is handcrafted for each organization's specific application domain and usage context. Above all, it serves as a single source of truth for product teams when building applications and represents a collaboration-contract between design and development.

In this article, we will review:

- Stages of design-development collaboration
- The anatomy of a design system
- Benefits of using a design system
- The future for design systems

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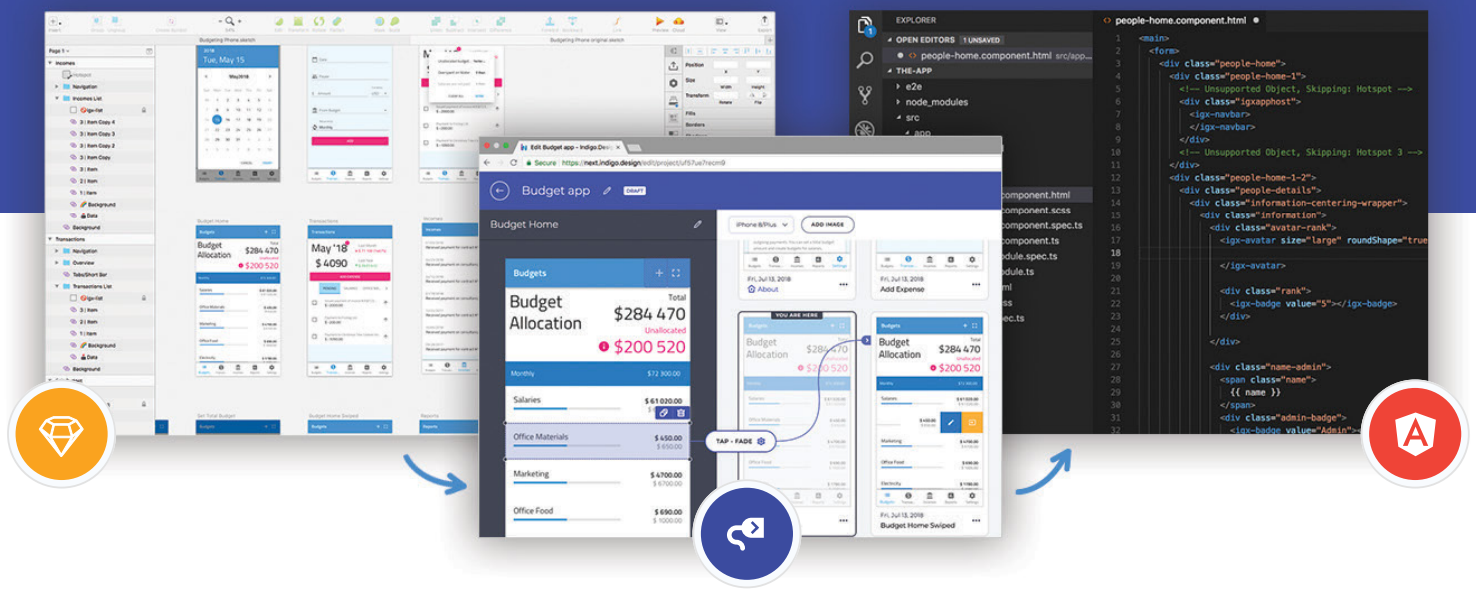

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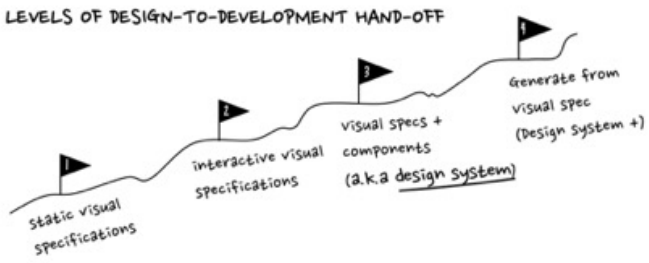
EVOLVING STAGES OF COLLABORATION BETWEEN DESIGN AND DEVELOPMENT

Before diving into design systems, let's review how the collaboration artifacts between design and development have progressed. We can classify this broadly into four levels:

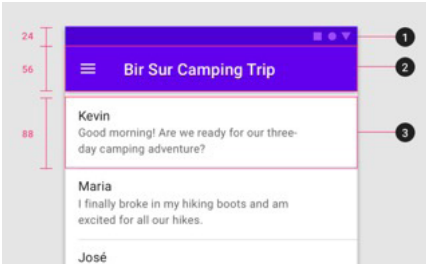
1. Static visual specifications
2. Interactive visual specifications (inspect)
3. Visual specifications linked to UI components (design systems)
4. Generating components from visual specifications (design systems +)

In all levels, it is assumed that some form of design activity precedes development. That is, specifications for the UIs and flows are created prior to development.



LEVEL 1: STATIC VISUAL SPECIFICATIONS

This form of design-to-development communication is most common. At this level, visual mock-ups are created using tools used by visual designers (e.g. Sketch, Adobe XD). The specifications for styles, layout, sizing, etc. are added as annotations on top of the mocks for review.

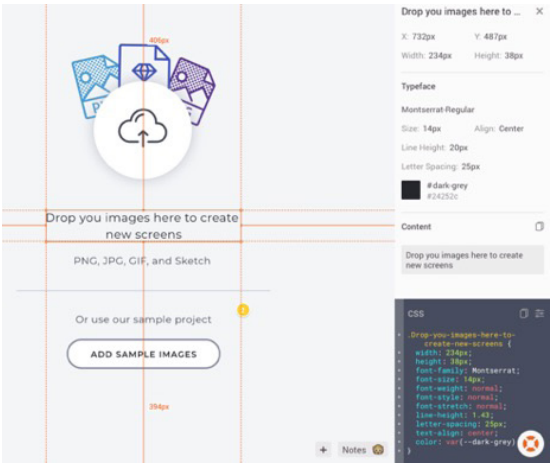


Vertical spacing guidance — Google Material Design.

Developers refer to this documentation as part of their development process and manually transfer this into code form. This approach is okay for custom one-off projects that don't need to be maintained.

LEVEL 2: INTERACTIVE VISUAL SPECIFICATIONS (INSPECT)

At this level, the visual design team is still sharing mockups and style guides with developers, but instead of a static document, they rely on tooling to provide the specs in a more accessible format. Using tools such as Zeplin.io, designers can upload their designs without taking the effort to markup the designs and developers can then view designs in the browser. More importantly, as they click on the design, developers can view the specifications on demand — even in a format that aligns with the target platform (e.g. HTML, CSS).

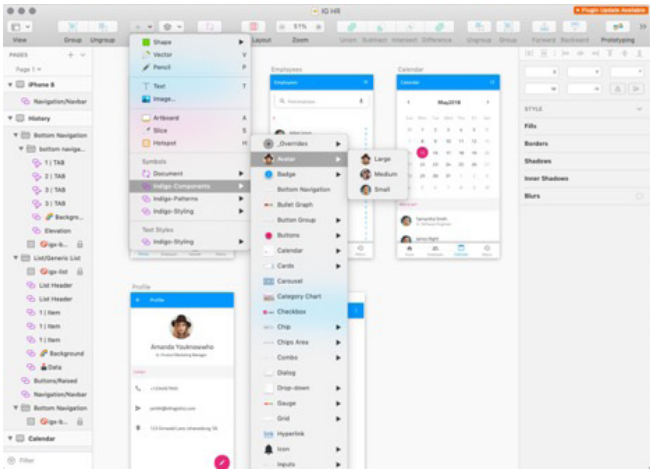


Viewing design specifications on demand using Zeplin.io.

The key benefit of this approach is that designers don't have to worry about manually adding annotations, and developers can still grab assets and specifications for any part of the UI. However, it's not directly linked to any software components that are used by the organization.

LEVEL 3: VISUAL SPECIFICATIONS LINKED TO UI COMPONENTS

At this level, we can expect that design and development have collaboratively created an inventory of styles, layouts, and UI components that are relevant for their app domain; in other words, a design system. At this stage, design teams tend to create designs using a UI kit that reflects the design system. UI kits are collections of reusable visual design elements created using the design tool itself (e.g. Sketch) and match the components in the codebase. This makes it easier for the development team to implement the designs because matching UI components exist.



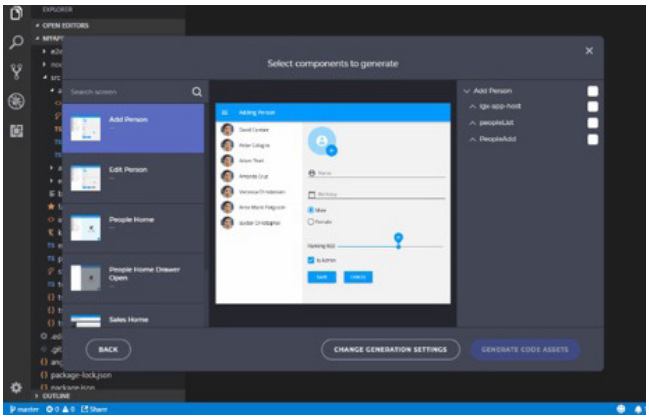
UI kit for the Indigo.Design System for use in the Sketch App.

This by no means implies that the application is done. It's just that developers can re-construct the mockups in code more easily. As you can tell, developers will still need to write UI code to make it looks like what's specified, but at least they are doing it using reusable components that they know exist. This approach also reduces potential for miscommunication.

However, the bigger issue is that not all organizations have invested in a design system, so this level of collaboration is still in the future for most.

LEVEL 4: GENERATING COMPONENTS FROM VISUAL SPECIFICATIONS

Having a design system does not automatically ensure that UIs can be quickly created, but it makes it easier. Within the enterprise, an application may get updated over time (versions) and the UI updates may not be that significant. This reduces the dependence on generating complete UIs. However, for those organizations that are getting started with large migration projects — for example, moving desktop apps to web apps — being able to create UIs in a visual tool and then generating "good" UI code is significant in terms of cost-savings.



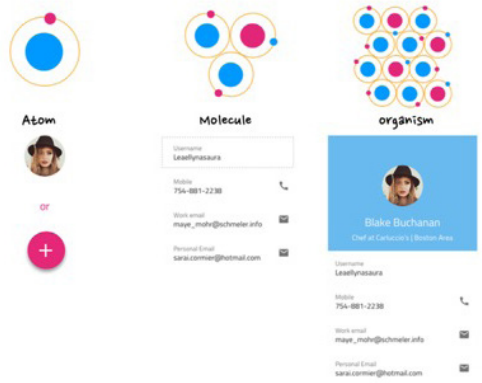
Generating components or UIs from visual specs using the Indigo.Design Code generator.

Solutions like Indigo.Design aim to kick-start a design system for organization who don't have one, and at the same time help generate the new UI components for a target platform (e.g. Angular). The additional ability to generate layouts for the components is unique. Using the Indigo.Design approach, designers can create their mockups using the Indigo.Design UI kit and developers can use a code generator extension in their IDE to select and generate components from the mock-ups.

THE ANATOMY OF A DESIGN SYSTEM

Now that we have a better idea of where a design system fits in the design to development story, let's see how it's structured.

A design system uses an approach for building scalable elements that can be best illustrated as atoms, molecules, and organisms. It's generally referred to as the Atomic Design Methodology created by Brad Frost. It has become a popular approach for describing the structure of a design system.



Illustrating the atom-molecule-organism concept with examples.

Returning to the metaphor of atoms, molecules, and organisms, you start by designing the tiniest component (e.g. button, avatar, label, heading, etc.). This tiniest component is referred to as an atom.

Going one level deeper, atoms consist of particles such as protons and neutrons. For a design system, this can be mapped to the base color palette and typography, which define the brand identity for the organization.

Going one level up from atoms, you have molecules, which are composed of atoms. Molecules can be mapped to components and represent more complex structures such as menu item, list item, and dropdown item.

Then, by combining layouts and multiple components, we get next hierarchal unit: UX patterns. If we're sticking to our biological comparison, that brings us to organisms. These encapsulate UX best practices by following "good" design principles and are built for the specific needs of a product.

The point of illustrating design systems as atoms, molecules, and organisms is to draw parallels with a living system. A design system should not be static and never-changing — it should reflect the product's UX needs and constantly evolve with the product and technologies used. New requirements emerge because of new device layout requirements. New product features and brand identity changes are inevitable. We must be sure that our design system is flexible and ready to change for us to adapt to these changes.

BENEFITS OF USING A DESIGN SYSTEM

STANDARDIZED UX

One of the strongest benefits of a design system is preserving consistency around different devices, products, and sub-products, as well as coordinate with marketing and branding.

A common source of inconsistency is when different developers and designers are involved in the development of the product. Meanwhile, the increasingly decentralized nature of work, even across time zones, makes it expensive to do 1:1 reviews. With a design system in place, designers and developers can work independently in their own tools without requiring low-level checks around design implementation. They can instead focus on high-value interactions around outcomes.

From the customer's perspective, meaningful consistency across applications offered by the same organization allows users to reuse what they've learned from past interactions with apps.

As Diana Mounter from GitHub puts it:

- **Design systems bring order to chaos**. Everyone is kept on the same page, so the entire product remains consistent and polished throughout.
- **Design systems improve the user experience** through the repeated use of familiar and proven patterns. Designing anything from scratch leaves room for error, so try to use what already works.
- **Design systems improve workflow efficiency**. Product teams know exactly how components of new features should look and how to implement them."

SHARED VOCABULARY BETWEEN DESIGN AND DEVELOPMENT

While consistency is a big win, something as simple as mutually agreed upon naming for components and patterns can go a long way. This is helpful for current users of the design system and also for onboarding future members. Making the naming convention explicit and shared makes it easier for both developers and designers to find the components in their respective tool environments.

Over time, the names for the UX patterns will start surfacing in conversations, serving as a surrogate for user requirements. For example, when someone mentions we should use a combo-box component, it's clear to both designers and developers what type of behavior it supports and how it can help with the user's task experience. Since a design system documents a component as a pattern, it usually explains when to use a specific component and how to use it the right way — with examples. So, in that sense, a design system can fulfill the need for approachable UX guidance, thus evangelizing design practices.

SPEED UP DESIGN PROCESS AND DEVELOPMENT

Speed to delivery is an explicit benefit of reusing components in a design system. From a design perspective, efficiencies come from not having to create new components or patterns since they are already part of the design system UI kits. Even when faced with the need to create a new complex pattern, designers can rely on the design system guidelines and build something using the "atoms" or "molecules" already available. From a developer's point-of-view, being able to generate the code for this component or pattern helps avoid inconsistency between design specs and code.

Learning speed is a not-so-obvious benefit of using a design system approach. Now that designers are freed up from pixel crafting, they can return to the true design process, focusing on designing user journeys or flows and evaluating them with users. The approach used for creating design deliverables can also be used to produce interim prototypes for usability testing and getting feedback from stakeholders.

WHAT'S THE FUTURE FOR DESIGN SYSTEMS?

As we discussed, design systems can help align design and development. It's a forum where teams can codify (as much they can) best practices. And since it's supposed to be a living system, it also provides opportunities for new patterns and requirements to be discussed and then absorbed. More importantly, a design system is not just a repository, but a way to collaborate. However, it's not a silver bullet for challenges faced by designers and developers when collaborating, nor does the existence of a design system preclude meaningful conversation between the two disciplines.

The biggest challenge for many enterprises is to get started with a design systems approach. For those who already have wide variety of apps in the wild, the initial phase is a tedious one. While there are several design systems available for reference, each has been created for its own parent organization. At the same time, they also share a lot in common with UX patterns and best practices, so there is a need for tooling and services to help organizations quickly create their own design system, rather than blindly copying.

It's important to note that a design system is not just a set of UX best practices and UI kits. You also need matching UI components on the development side. While the design systems movement has traditionally been championed by design teams within large organizations, for it to truly succeed, the development team also needs to become a co-owner/contributor of the design system.

Also, the atoms-molecules-organisms structure is only a starting point for design systems; it does not have to stop there. It can contain additional information on how the apps are supposed to behave. The following is a list of potential candidates for inclusion in a design system, which by no means is exhaustive:

- **Interaction design guidance** describes how users will interact with the applications, (gesture driven, mouse-and-keyboard driven, etc.). It outlines the do's and don'ts.
- **Motion and transitions** are becoming increasingly common to provide a level of dynamism and delight when using apps. However, while we may understand some of the transitions in isolation, it's good to standardize it for the apps (e.g., slide transition for master-detail transition).
- **User stories** can help document how some of the common or specialized tasks have been realized in the app. It can serve as inspiration for new designs.
- **Reference apps** show how the different pieces of a design system can work together.

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George Abraham is an interaction designer by training, and is currently a Sr. Product Manager at Infragistics, Inc. with 10+ years of experience in UX and product strategy. He enjoys working in unfamiliar and messy design domains, asking questions, and prototyping. He believes design is synonymous with making trade-offs, and good design is the pursuit of discovering good trade-offs. George also holds a PhD in Human-Computer Interaction from Drexel University's College of Computing and Informatics.

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