UX GUIDE TO MICROINTERACTIONS : ESTABLISHING A CLASSIFICATION SYSTEM TO ENABLE MICROINTERACTION DESIGN LITERACY AMONG NOVICE UX DESIGNERS

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UX GUIDE TO MICROINTERACTIONS: ESTABLISHING A CLASSIFICATION SYSTEM TO ENABLE MICROINTERACTION DESIGN LITERACY AMONG NOVICE UX DESIGNERS

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SUMMARY

This study explores how identifying and classifying various animated microinteractions can help improve design literacy among UX/UI designers by integrating motion design elements. Microinteractions are small, task-specific actions that a user can trigger or experience within a user interface, such as liking a post, setting a status, or receiving a notification. They play a crucial role in providing feedback, guiding users, and adding an element of delight to the user experience. In this thesis, the focus is on the importance of microinteractions in enhancing the user experience (UX) and user interface (UI) design. To better understand how designers work with microinteractions and motion in product design, subject matter experts (SMEs) were interviewed who revealed that non-motion designers often need help understanding microinteraction design language. To address this, a classification system was developed and hosted online, which permits UX/UI designers to access microinteraction design language. Microinteractions are classified into a visual design system based on triggers, functions, and principles of motion. This classification system was validated by UX/UI designers using interviews and questionnaires. The results showed that the system promotes cross-disciplinary communication and collaboration among design team members by introducing motion design language and terminologies through an organized classification system.

CHAPTER 1. INTRODUCTION

Increased reliance on mobile computing devices has resulted in higher user expectations for interface clarity and performance of mobile applications. Fortunately, advances in technology have enabled new opportunities for interface designers to improve and change the previously static dimensionality of applications. Designers can now showcase more dynamic interface elements by including animated trigger feedback pairs, often called microinteractions (Saffer, 2013).

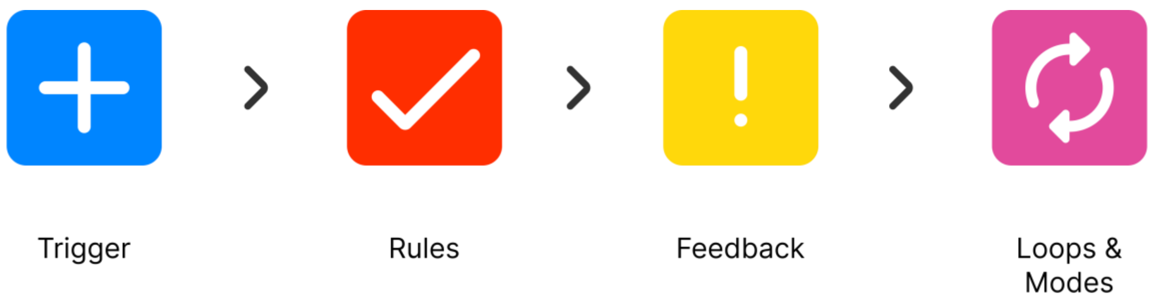


Figure 1 Structure of a microinteraction

Microinteractions are small, focused, contextual animations within a user interface that respond to user actions or system changes (Saffer, 2013). Each microinteraction is comprised of a user action or an alteration in the system's state that triggers a narrowly targeted response. The response is then communicated through small, highly contextual visual changes in the user interface. Recent technological improvements have made rendering animations in mobile applications easier, allowing designers to utilize microinteractions more effectively (Abdul-Karim, 2017).

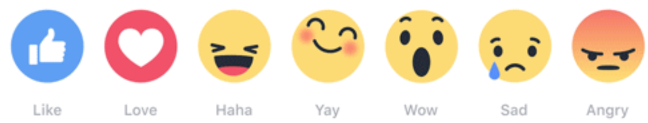


Figure 2 Facebook's reactions, an example of a microinteraction

While microinteractions significantly enhance user experience and add delight to user interfaces (Sosa-Tzec & Bergqvist, 2021), these animated interactions remained a niche in the design space. UX and UI designers are generally not exposed to motion design principles and often exclude these elements from the design process. Failure to consider animation and motion in the design process leads to losing a significant aspect of the product (Laubheimer, 2020).

This study aims to enhance design literacy around microinteractions for UX/UI designers, focusing on their underlying principles. This is achieved by developing a visual design system that categorizes microinteractions based on their triggers and respective functions. With increased design literacy in the domain of microinteractions, it is anticipated that UX/UI designers will be more informed about the functions of microinteractions in a user interface and will create opportunities for cross-disciplinary communication and collaboration with other design team members.

CHAPTER 2. METHODOLOGY

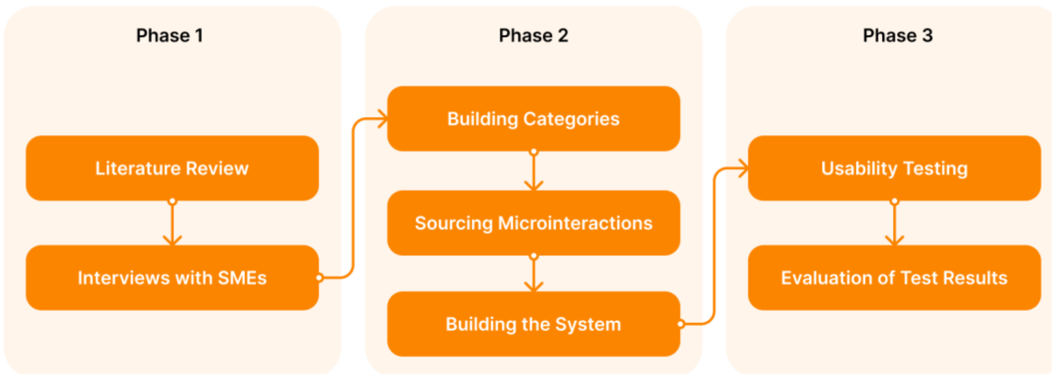


Figure 3 Methodology

The methodology for this study included seven primary activities: a literature review, subject matter expert interviews, establishing placement categories, sourcing microinteractions, system development, testing usability with designers, and data evaluation. Initially, a comprehensive literature review on microinteractions, motion design, and animation principles were carried out, uncovering prior work to provide context for understanding the current state of knowledge in the field. This informed the direction needed for the system's development and helped the researcher understand the lines of questioning to be used. Subsequently, subject matter experts in motion and product design were identified and recruited, with whom semi-structured interviews were conducted to gather insights into their workflows, terminologies, and perspectives on microinteractions. This information was crucial in understanding the nuances of motion design and its application in UX/UI design. The insights gained from the interviews helped shape the structure and design of the system. This classification system incorporated design systems, animation functions, and motion design principles. Lastly, interviews and questionnaires with students and professionals in the UX/UI domain were conducted to evaluate the efficacy of the classification system, asking participants to provide feedback on the system's clarity, utility, and relevance to their work. Feedback obtained from the participants was used to improve the system and make additional changes.

CHAPTER 3. LITERATURE REVIEW

3.1 Principles and Functions of Motion

Animation and motion have deep roots in the entertainment industry, with cartoons and other media utilizing hand-drawn animations to convey actions and emotions to audiences. Early work by Disney laid the groundwork for a craft that has continually grown and evolved. In their book "The Illusion of Life," Frank Thomas and Ollie Johnston outline the twelve principles behind animation in cartoons, demonstrating how these principles were based on natural movement observed in the world (Johnston & Thomas, 1995). These principles include squash and stretch, anticipation, and easing and have since been adapted and expanded to encompass animation found in user interfaces. As user interfaces differ from cartoons and require active user participation, the principles have been modified to meet the unique needs of interface design (Chang & Ungar, 1993). Building on Disney's original principles, Chang and Ungar established three main groups of animation principles for user interfaces: solidity, exaggeration, and reinforcement. These principles facilitate the transformation of static interfaces into intuitive, engaging, and effective user experiences.

Just as interfaces have progressed over the years, the implementation of motion has similarly evolved. Development of principles of motion first established a foundation for motion rules upon which to build. Newer interpretations of motion were developed to fit the structure of a growing library of design elements that perform different functions. These elements were examined by understanding how motion can be used to communicate the intent of the user interface. By using motion to showcase the affordances of the interface, users know what the interface intends to communicate. Key functions of animation in user interfaces can be characterized by relating the purpose of the communication to the nature of the animation (Novick et al., 2011). Motion can be used to effectively communicate context, value, status, and importance in a user interface (Novick et al., 2011). In this way, motion enables designers to create more immersive and responsive interfaces, facilitating seamless interaction and fostering a deeper connection between the user and the product. This evolution demonstrates the ongoing refinement and adaptation of animation principles, from their origins in Disney's work to their modern application in user interface design.

3.2 Knowledge of Motion within UX

The current knowledge of motion in UX design is encompassed within guidelines such as Apple's “Human Interface Guidelines” (Apple, 2023b) and Google's “Material Design” (Google, 2023a). While these guidelines provide valuable information on incorporating motion into design considerations, they often lack the depth and specificity needed to guide designers in effectively implementing microinteractions.

Apple's motion guidelines, for example, outline best practices for incorporating motion but do not provide accompanying reference imagery or examples to effectively illustrate these practices (Apple, 2023b). This approach contrasts starkly with their icon design guidelines, where clear guidance and visual aids support designers in adhering to best practices (Apple, 2023a). Similarly, Google's Material Design lays the groundwork for using motion in transitions within the design of Android apps (Google, 2023a). However, these guidelines primarily focus on a broad overview of motion implementation and, consequently, do not delve into the intricacies of microinteractions and their potential roles within a user interface.

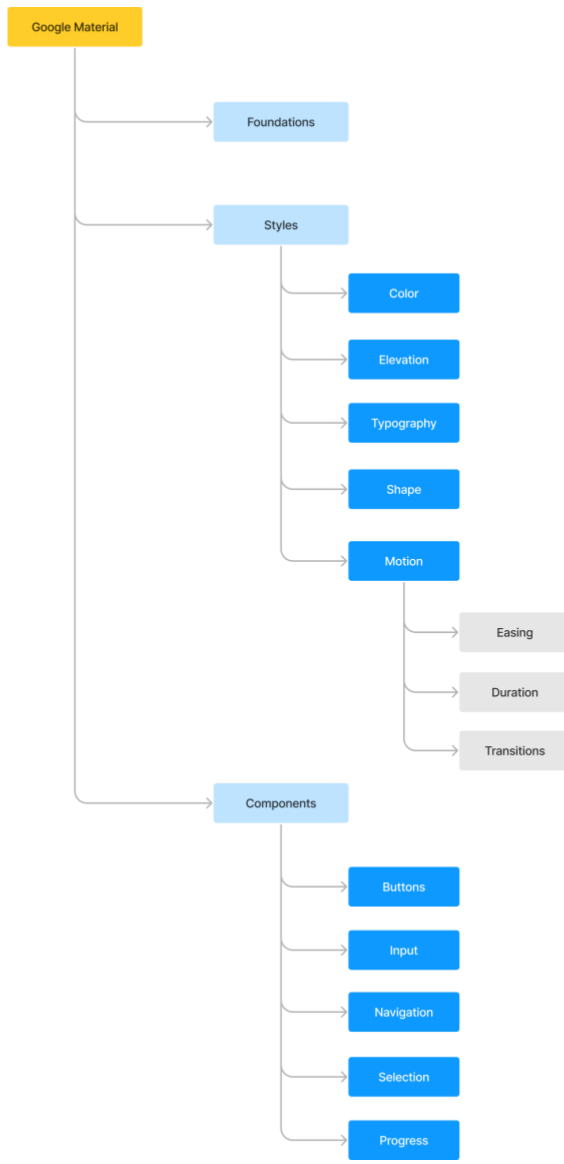


Figure 4 The Structure of Google's Material Design 3 Design System

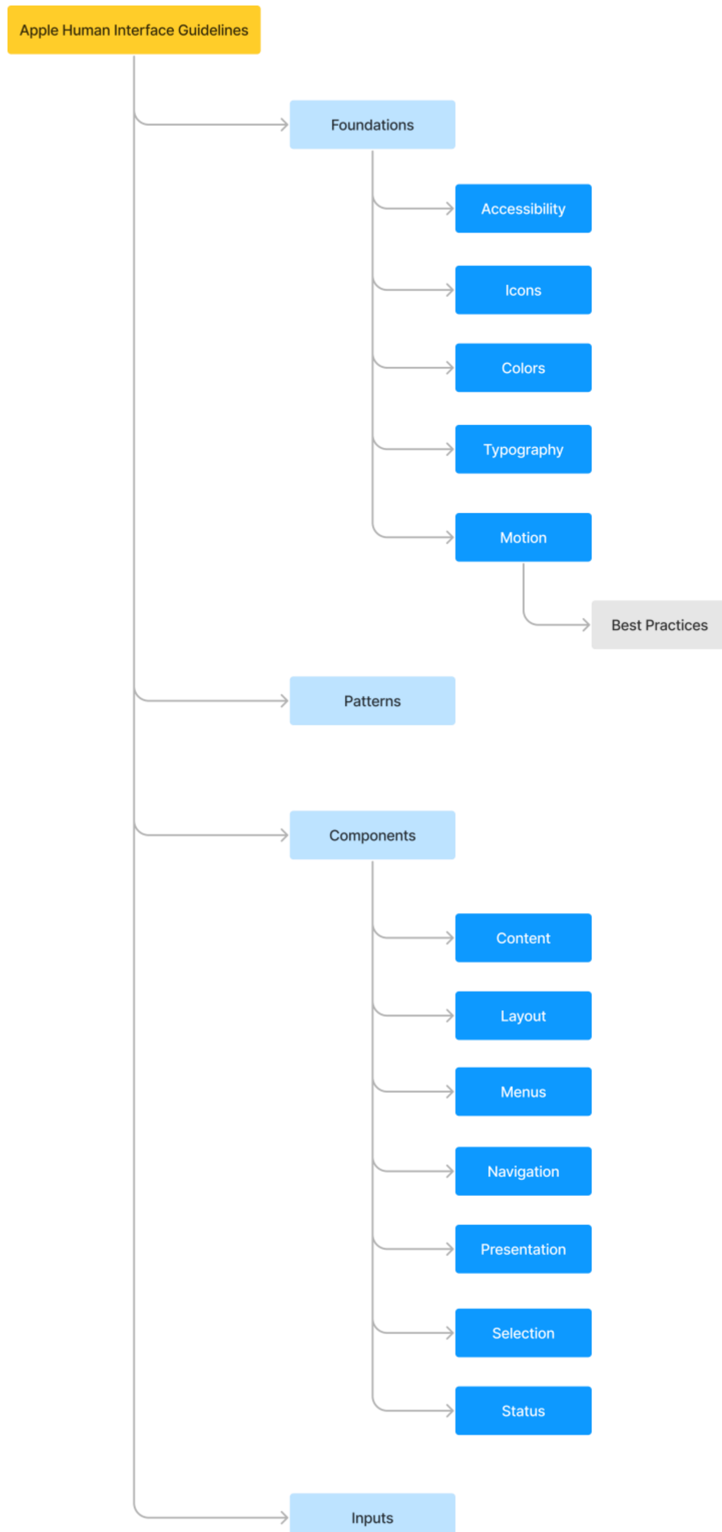


Figure 5 Structure of Apple's Human Interface Guidelines

Observing the structure of both Google’s Material 3 Design System and Apple’s Human Interface Guidelines, the emphasis provided to motion is not of high importance. In Material 3, motion is part of the foundation and has entries explaining easing, duration, and transitions. However, these explanations do not detail how they are implemented within each component. Similarly, Apple’s guidelines focus on Motion as a foundational element but do not relate it to how a component is built.

This lack of comprehensive guidance in both Apple's and Google's design guidelines highlights the need for more detailed resources that address the specific implementation and impact of microinteractions in UX design. By expanding the knowledge base in this area, designers can better leverage the power of microinteractions to create more engaging, intuitive, and delightful user interfaces that enhance the overall user experience.

3.3 Knowledge of Microinteractions within UX

Microinteractions play a crucial role in enhancing user experience. They can provide feedback, guide users through tasks, and add delight to the user interface (Saffer, Head, Sosa-Tzec, and Bergqvist). A microinteraction consists of four components: trigger, rules, feedback, and loops and modes (Saffer). The trigger initiates the microinteraction, while rules inform users about possible interactions. Feedback helps users understand the rules and stay informed about system changes, and loops and modes determine the microinteraction's behavior during ongoing actions and varying system states (Saffer).

Despite the potential of microinteractions to improve user experience, they are often overlooked in the curricula of university programs for UX/UI designers (Wilcox et al., 2019). This knowledge gap highlights a potential need for resources for UX/UI designers to understand and implement microinteractions effectively. Although taxonomies and classification systems for animation exist, they have yet to be explicitly applied to microinteractions.

3.4 Classification and Taxonomies of Motion

With motion and animation being increasingly used in user interface design to enhance usability and user experience, designers need guidance on what types of motion to use and for what purposes. As a result, several researchers have proposed taxonomies and classifications of motion to provide a framework for understanding the roles and functions of motion in interfaces.

Chevalier et al. proposed an expanded taxonomy for animation in information visualization with 23 categories across 5 groups: Keeping in Context, Teaching Aid, User Experience, Data Coding, and Visual Discourse (Chevalier et al., 2016). However, as Liddle notes, the focus on information visualization may limit applicability to broader interface design.

Looking specifically at user interface design, Novick et al. outlined 7 communicative functions of animation: signaling different context, value, status, importance/urgency, function, referent, and salience (Novick et al., 2011). They paired these functions with animation types to model appropriateness.

Analyzing mobile interface guidelines, Liddle extracted common roles of motion like revealing structure and indicating interaction processes. He compared these to previous taxonomies, finding new categories like consistency and delight missing (Liddle, 2016).

Most recently, Avila-Munoz et al. proposed 7 functions of animation in interfaces: Identifying, Structural, Guidance, Feedback, Didactic, Esthetic, and Emotive (Avila et al., 2021). Their taxonomy connects to communication theory and design principles.

This examination of motion taxonomy provides insight into how motion can used as a method of communication. Motion is treated as a medium of communication and the taxonomies revolve around common roles of guiding users, providing feedback, supporting understanding, and enhancing aesthetics.

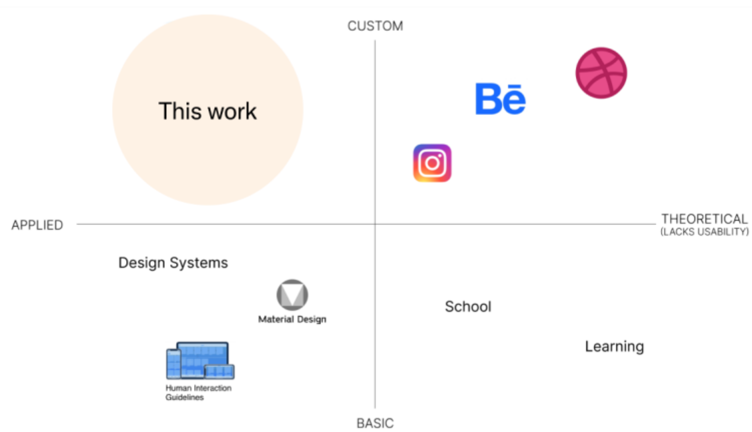


Figure 6 Positioning of this study

This study represents a unique intersection in the design landscape, positioning itself as a highly customized yet applied system. It aims to fill a gap in the ecosystem of a specialized framework for microinteraction design that goes beyond the foundational principles of established design systems like Google's Material Design and Apple's Human Interface Guidelines. Social media platforms like Behance and Dribble showcase microinteractions but do not contain implementable aspects that can be shipped. By focusing on the intricate details of microinteractions, this study aims to serve as a bridge between theoretical learning and practical application, fulfilling an educational need within the UX/UI design community that directly influences real-world usability.

CHAPTER 4. INTERVIEWS WITH SUBJECT MATTER EXPERTS

Understanding the current state of motion design knowledge required identifying and recruiting subject matter experts (SMEs) in the field. SMEs were identified based on their expertise in working with motion design in product design-related areas. These experts were recruited through LinkedIn and Reddit by targeting those working at motion design studios specializing in building animations for products and in-house motion design teams at large tech companies. A snowball sampling method was also employed to gain more leads from the recruited participants. A total of seven SMEs were recruited, three from Linkedin, one from Reddit, and three more from snowball sampling. Experts were chosen and interviewed until there were similarities in the themes of their answers. The SMEs were interviewed using a semi-structured approach, with questions focusing on their workflow, interactions with UX/UI designers, and the inclusion of motion in products. Subjects were also encouraged to freely discuss their experiences with motion design and the processes they used to build their mental models regarding motion. Interview data from the participants were coded, and a thematic analysis was performed to draw out common themes across the participants. Insights gained from interviews with subject matter experts informed the decisions made in the subsequent phase.

Table 1 List of SMEs interviewed

Participant	*Title*
P1	Creative Director
P2	Motion Designer
P3	Freelance Motion Designer
P4	Product Designer
P5	Creative Producer
P6	Motion Designer
P7	UX Motion Designer

4.1 Interview Analysis

Data from transcripts were coded and sorted into groups using descriptive coding to identify topics in the transcripts and notes inductively. Interviews were first coded individually, resulting in a range of topics and associated quotes for each interview—examples of these initial topics include: what is the focus of the designer's work, relationships between UX and motion design, the relationship between motion and brand guidelines, the role of animation and motion, evaluating design, development and implementation practices, collaboration with other teams and stakeholders, communication and education in large organizations, tools for motion design, design philosophies, and so on.

4.2 Interview Insights

"We want to move the conversation about motion earlier in the design process rather than after the visual design stage" – Quote from Participant P4

Interview observations highlighted the need for incorporating motion discussions earlier in the design process rather than treating it as an afterthought to enhance visual aesthetics. Experts emphasized the importance of understanding the intent and actions behind motion in product design. They suggested that a more thoughtful approach towards microinteractions could enable designers to better articulate their design decisions and integrate these considerations earlier in the design process.

"It's not about the tools that you end up using, but rather the process. Why does this thing move in a certain way? What is it telling you?" – Quote from Participant P3

Furthermore, the conversation explored how designers acquired knowledge within specific workflows, revealing the usefulness of design systems as a basis for conveying where microinteractions would be present in a product. A system that categorizes UI components into groups, referred to by Churchill as a design system, was used as the foundation for grouping microinteractions (Churchill).

"I binged all the videos on the GreyScaleGorilla YouTube channel one summer, it was like watching Netflix but with tutorials" – Quote from Participant P1

Experts also expressed the need for a single, comprehensive repository of documentation. They noted that during their learning process, they encountered fragmented information regarding motion, its principles, and functions across various platforms, including websites, blogs, video-sharing, and image-sharing platforms. This fragmentation made it challenging for them to understand certain terms and draw parallels, leading to the conclusion that a single source of information explaining concepts and showcasing their applications would be beneficial. They noted that any system should build a comprehensive repository of information related to motion and microinteractions, drawing from both literature and works exhibited on social media platforms.

4.3 Design Directions

Design goals were established based on interview insights to guide progress. Three major system requirements were defined.

Design Direction 1: The system should provide comprehensive knowledge of the purpose and functions of microinteractions is essential for designers.

The system should be designed to encapsulate the intent behind designing microinteractions, offering an extensive repository of knowledge that not only showcases where microinteractions belong in interfaces but also elucidate their underlying principles and functions. The system should equip designers to discern the subtle interplays of microinteraction design, enabling them to craft more refined and responsive user interfaces.

Design Direction 2: The system should facilitate informed conversations about microinteractions with other stakeholders.

The system should establish a common framework for microinteractions that will aid in bridging communicative gaps among stakeholders in the design process. The system should allow for a unified understanding and articulation of design choices, enabling stakeholders to understand the rationale behind incorporating specific microinteractions.

Design Direction 3: The system should be easily accessible for on-demand use.

The system should be readily accessible to UX/UI designers and stakeholders in the design process at all times to help facilitate an immediate learning experience for both novices and seasoned professionals.

CHAPTER 5. BUILDING CATEGORIES

A classification model was chosen as the next step in presenting the microinteractions to designers. This was chosen as a model as it helps to organize and clarify the many design elements involved. As there are various microinteractions present in interfaces, a classification system brings order to this diversity, making it easier for designers to understand and locate specific interaction types. The system can break down complex processes into manageable parts, helping designers to systematically approach the design of microinteractions. Additionally, a shared classification system can facilitate better communication between designers, developers, and other stakeholders by streamlining discussion as all the stakeholders involved use the same terms and concepts. This structured approach can also play a part in improving design literacy as designers can use the structured classification system to navigate and learn about the functions of microinteractions easily.

5.1 Motion as a Communication Tool

The insights gained from interviews with the subject matter experts revealed that motion design should be viewed as a communicative tool within the user interface. Experts emphasized the need to understand the intent and purpose behind each microinteraction, suggesting that motion conveys information to the user regarding the interface's capabilities and responses. Viewing motion through this lens of communication allows designers to be more thoughtful and intentional when incorporating microinteractions into a product's user experience. As participant P3 noted, designers should ask themselves, "Why does this thing move in a certain way? What is it telling you?" to ensure the motion aligns with the interface's overall goals. Using motion effectively as a mode of communication requires designers to think beyond aesthetics and consider how users will interpret and respond to animated elements. With this communicative perspective, microinteractions become potent mediums for conveying feedback, status, relationships, and more to users through motion.

5.2 Lasswell’s Communication Model

Lasswell's communication model provides a valuable framework for understanding how microinteractions function as communicative tools within an interface. This model outlines the critical components of the communication process as sender, message, channel, receiver, and effect (Lasswell, 1948).

Figure 7 Laswell's Communication Model

When applied to microinteractions, the sender is the interface or system triggering the microinteraction. The message is the information conveyed through the motion, such as feedback on an action or change in state. The channel is the motion itself, including the visual design, animations, sound, etc. The receiver is the user perceiving and interpreting the microinteraction. Finally, the effect is the user's response after receiving the message, such as understanding that an action was successfully completed. Examining microinteractions through this communication model makes the intent and purpose behind each microinteraction more apparent. Designers can utilize this model when conceptualizing microinteractions to ensure that the sender, message, channel, receiver, and intended effect are all aligned to craft intuitive, purposeful motions that effectively communicate to users. With motion as a communicative tool, designers can create more meaningful microinteractions that advance usability and user experience.

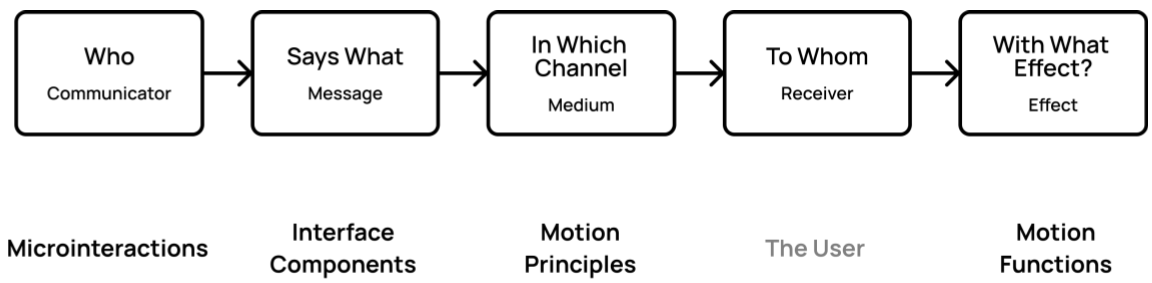


Figure 8 Mapping Laswell's Model to Microinteraction Classification

Applying the elements of Laswell's communication model to microinteractions, four distinct categorization elements emerge. The Communicator can be categorized based on the type of microinteraction. The Message is broken down based on what the interface element attempts to convey to the end user. The channel in which the communication takes place is determined by the type of motion, which the principles of motion can explain. Lastly, the effect of the communication can be categorized by the motion function, which describes the action the motion intends to convey. The receiver for all these communicative actions is the end user operating the interfaces; therefore, they aren't part of the classification system.

5.3 System Categories

5.3.1 Component Groups

Component groups are high-level thematic groups that contain more minor interaction elements of a user interface known as components. Components are interactive building blocks for creating a user interface (Google, 2023b). The microinteraction components are aggregated into these component groups to understand better their relationship and the actions that trigger these elements. The components and component groups are sourced from Google's Material Design System (Google, 2023b). Microinteractions are initially grouped into five major component groups listed in Table 2 below.

Table 2 List of Components

Component Group	*Interface Elements*
Action Components	Buttons Floating Action Buttons (FAB) Icon Buttons
Communication Components	Onboarding Progress Indicators System Status

Table 2 List of Components (Continued)

Navigation Components	Nav Bar
Selection Components	Checkboxes Radio Buttons Sliders Switches Pickers
Input Components	Text Input Audio Input

Action Components

Action components are elements within a user interface that facilitate user actions and interactions.

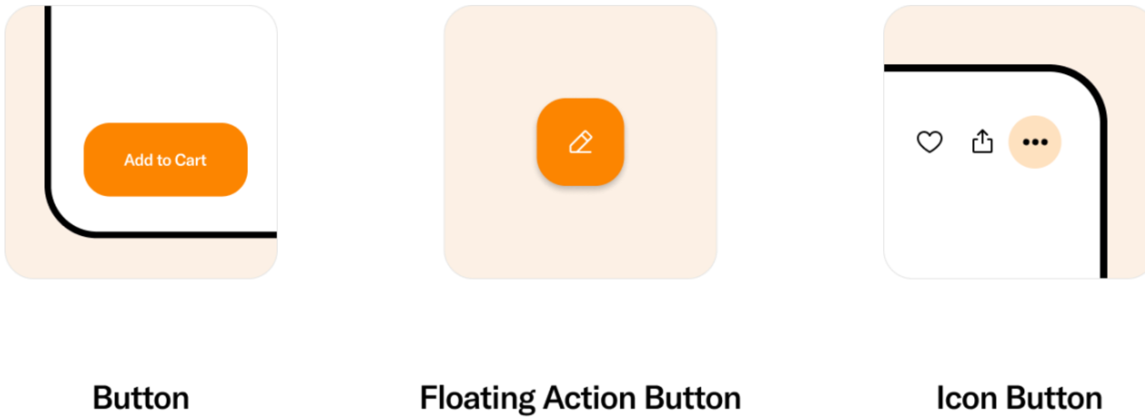


Figure 9 Interface Elements of Action Components

Communication Component

Communication components are elements within a user interface that are designed to convey information to the user.

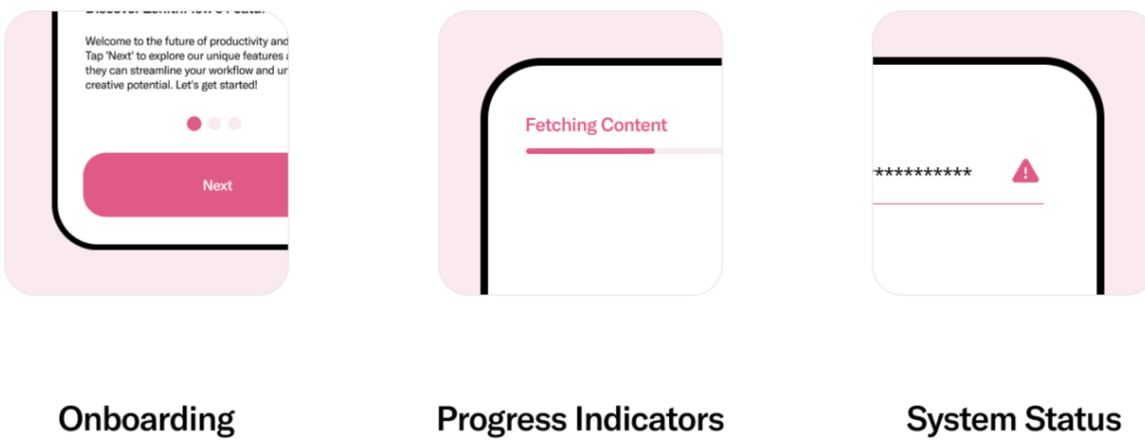


Figure 10 Interface Elements of Communication Components

Navigation Component

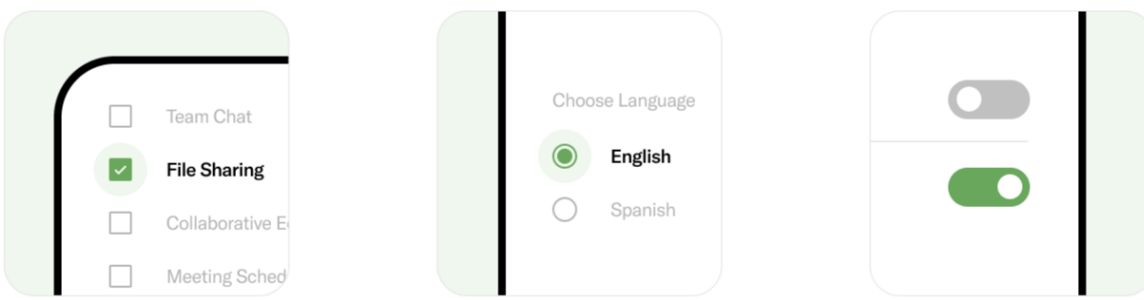
Navigation components are elements within a user interface that enable users to move between different screens or sections of the UI.

Nav Bar

Figure 11 Interface Elements of Navigation Components

Selection Component

Selection components refer to the interactive elements in a user interface that allow users to choose from a range of options or select from a list.



Checkbox Radio Button Switches

Figure 12 Interface Elements of Selection Components (a)

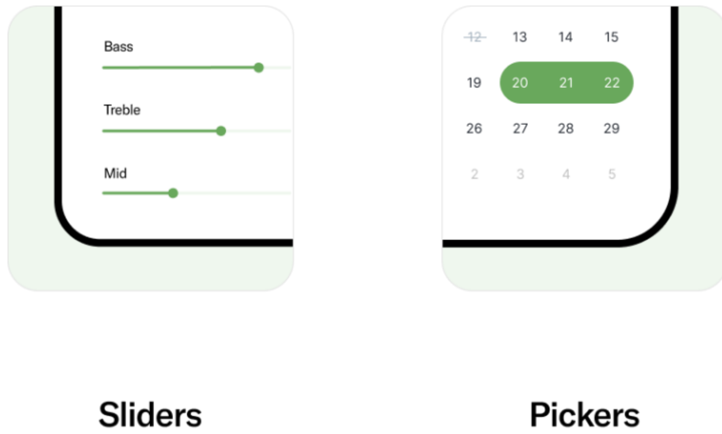


Figure 13 Interface Elements of Selection Components (b)

Input Component

Input components, such as speech recognition and text boxes, enable users to provide information through spoken commands or text.

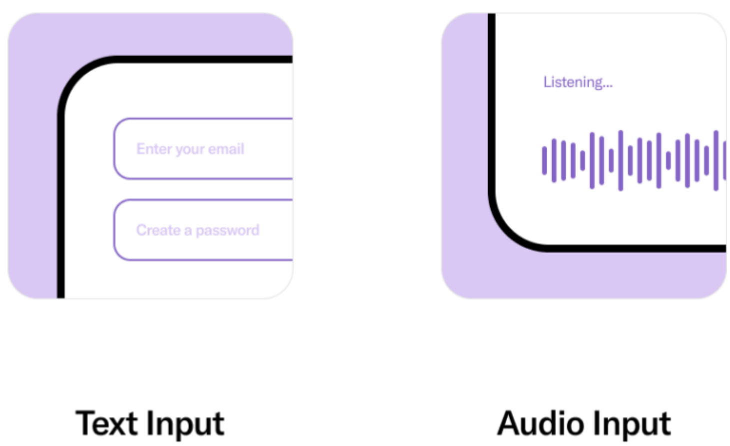


Figure 14 Interface Elements of Input Components

5.3.2 Motion Functions

Motion Functions are used to understand the intent behind employing a microinteraction (Avila et al., 2021). Eight key functions were identified to help communicate this intent. The functions achieve this by pointing out the affordances provided by the component groups that the microinteractions are a part of. The motion functions identified are listed in Table 3 below.

Table 3 Description of Motion Functions

Motion Function	*Description*
Identifying Function	This type of motion permits the identification of elements in an interface and their function.
Structural Function	The motion fulfills a structural function by highlighting the interface format, helping the user understand the information architecture and create a mental model of the system.
Guidance Function	The motion guides and orients the user during navigation, indicating where or how to interact with the interface elements.
Feedback Function	The motion keeps the user informed about the status of the system or the progress of

Table 3 Description of Motion Functions (Continued)

	an operation, including responding to user input or other input devices.
Didactic Function	The motion provides instructions on the operation of the interface and the execution of tasks, helping users achieve the goal for which they use an application.
Aesthetic Function	These elements add aesthetic or decorative value, provide visual coherence, and help define the visual style of an application.
Emotive Function	How an element moves can represent and convey different sensations and emotional states.

5.3.3 Motion Principles

Motion principles were identified to provide UX/UI designers with an understanding of how the intent was conveyed. The principles are used to examine the current instances of microinteraction media and showcase the strategies they use to convey the motion functions that were previously laid out. The basis of motion principles can be traced back to Disney's twelve principles of animation (Johnston & Thomas, 1995). While the principles outlined in the book lay a good foundation for understanding the principles of animation, the work mainly caters to character animations.

Microinteractions occupy a different space in our understanding of animation and motion and thus need principles that ground them within the context of their use (Willenskomer, 2018b). Motion principles that cater to user interfaces as a medium are required to understand the implementation of microinteractions. Motion principles have been identified (Willenskomer, 2018a) and tabled below.

Table 4 Description of Motion Principles

Motion Principle	*Description*
Easing	Object behavior aligns with user expectations when temporal events occur.
Offset & Delay	Defines object relationships and hierarchies when introducing new elements and scenes.
Parenting	Creates spatial and temporal hierarchal relationships when interacting with multiple objects.
Transformation	Creates a continuous state of narrative flow when object utility changes.

Table 4 Description of Motion Principles (Continued)

Value Change	Creates a dynamic and continuous narrative relationship when value subject changes.
Masking	Creates continuity in an interface object or object group when utility is determined by which part of the object or group is revealed or concealed.
Overlay	Creates narrative and object spatial relationship in visual flatland when layered objects are location dependent.
Cloning	Creates continuity, relationship, and narrative when new objects originate and depart.
Parallax	Creates spatial hierarchy in visual flatland when users scroll.

Table 4 Description of Motion Principles (Continued)

Obscuration	Allows users to spatially orient themselves in relationship to objects or scenes not in the primary visual hierarchy.
Dimensionality	Provides a spatial narrative framework when new objects originate and depart.

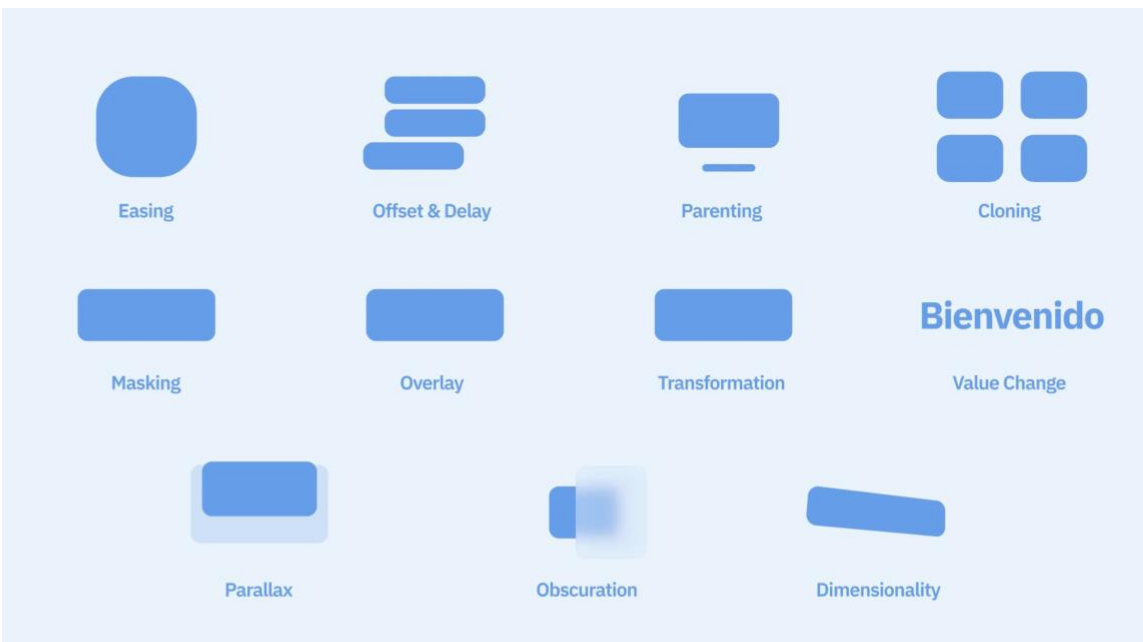


Figure 15 Principles of Motion in UX

5.3.4 Microinteractions

Having provided the structure, microinteractions for the system were sourced from Dribbble, an online community and social networking platform primarily used by designers, artists, and creative professionals to showcase their work and connect with others in the industry. Dribbble allows users to upload and share screenshots or short animations of their work. It was chosen as the platform to source microinteractions due to its accessibility and the ability to search and index microinteractions based on the established component nomenclature. After creating a repository of microinteractions, the previously interviewed experts were asked to sort through the repository and select microinteractions to be used in the system. The experts were instructed to consider the system's structure and how a chosen microinteraction would explain the motion functions and principles related to a specific component. Ultimately, 49 different examples of microinteractions were selected for incorporation into the system.

5.4 Structure of the System

The system was structured to have the component groups as the highest-level elements. These would correspond to the trigger function of the microinteraction and would showcase the intent of the microinteraction. Under a high-level component group were subcategories of the components that were present. Accessing a component would present a screen showcasing the motion functions and examples. The motion functions section would address the function of the microinteractions and what they convey to the users. This section would also address the affordance offered by different functions and how certain functions would vary based on implementation. The examples section addressed how the motion principles could be used to convey a certain message as defined by the motion function. Each component showcases multiple different examples that discuss how different principles can be leveraged to communicate different aesthetics and emotions. The examples serve as the system's focal point, as the understanding of motion-related theories requires the presentation of motion media to draw parallels and improve understanding.

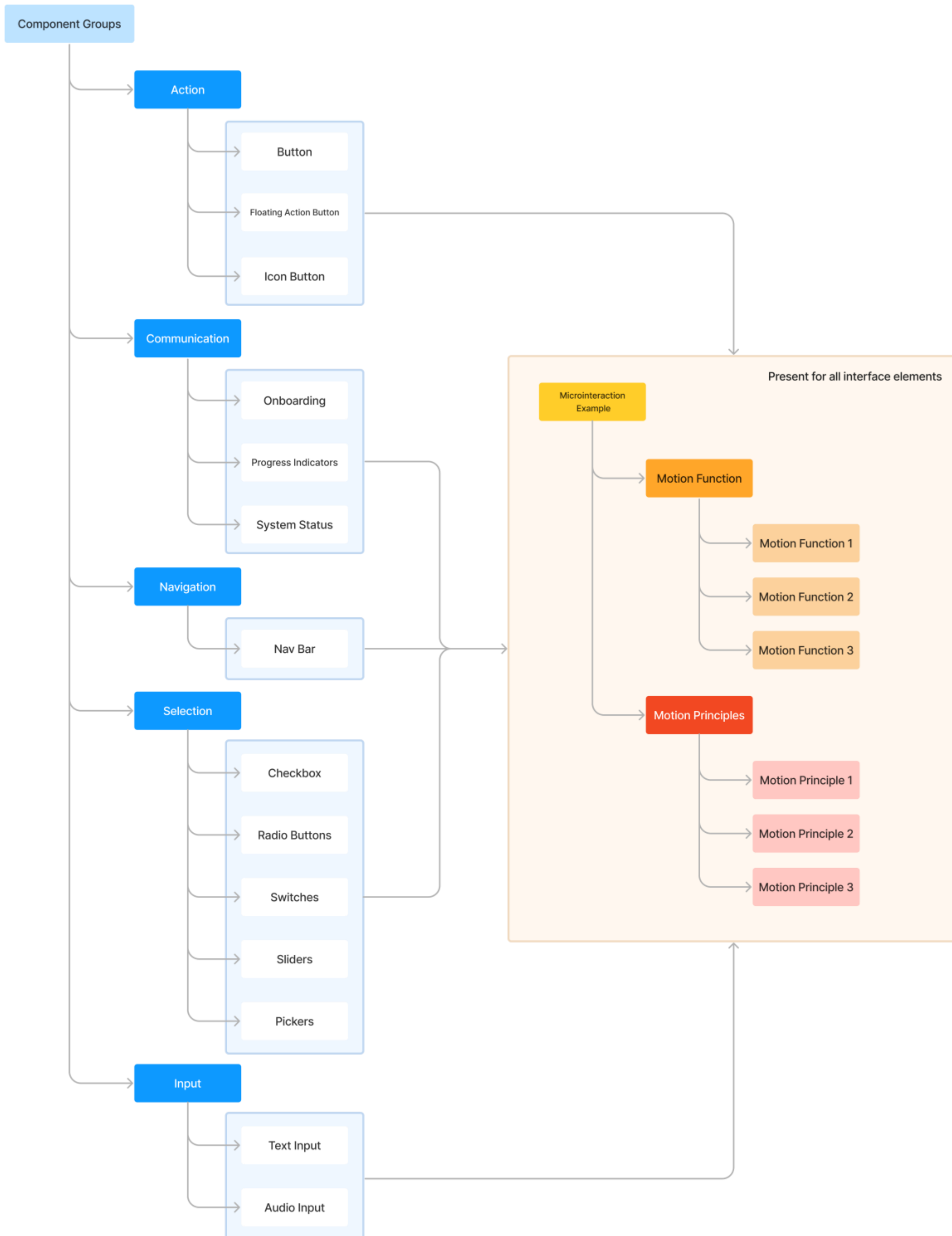


Figure 16 Structure of the proposed classification system

CHAPTER 6. CREATING THE SYSTEM

The proposed system structure was then developed and built out. Each interface component had one or more microinteraction examples associated with it. Each example was explained with the corresponding motion principle and associated motion function to showcase the intent of the microinteraction.

6.1 Action Components

Action components are elements within a user interface designed to facilitate user actions and interactions. These components typically include buttons, links, menus, and other clickable or touchable elements that users can interact with to complete tasks or navigate the UI. Effective action components are designed to be clear, intuitive, and easily accessible, and are often designed with visual cues such as color, shape, and animation to communicate their function and importance. Action components play a critical role in creating usable and intuitive interfaces, allowing users to complete tasks and achieve their goals.

6.1.1 Buttons

Buttons communicate actions that users can take. They are typically placed throughout UI, including dialogs, modal windows, forms, cards, and toolbars.

<u>Motion Functions</u>

- Guidance
- Emotive

- Feedback
- Aesthetic

The primary function of a button is Guidance. Buttons are used to navigate through the interface. They indicate where to interact with an interface and guide the user through a particular set of actions.

Buttons can also have a set of secondary functions. They can be used to convey emotions based on the motion design used. In certain instances, they can be playful, aesthetic expressions that convey the brand language. Buttons can also have a feedback component integrated into them as the user waits on an action to be performed.

Microinteractions and Motion Principles Used

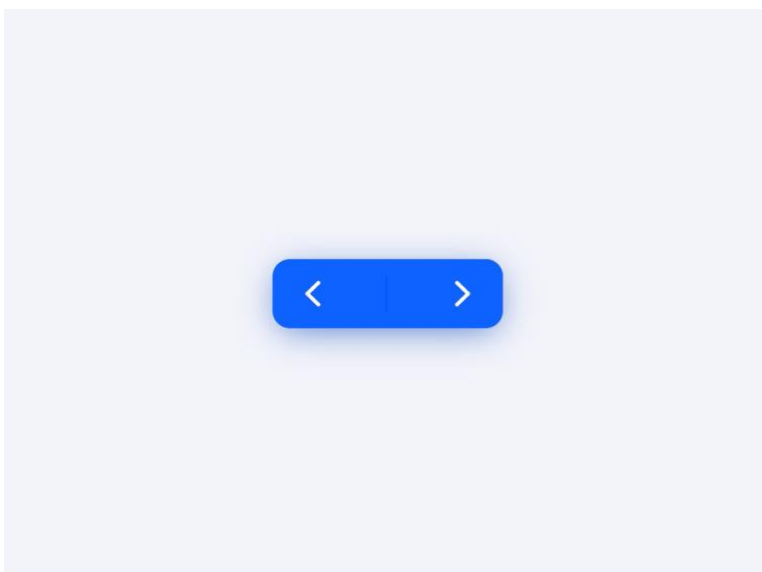


Figure 17 Button by Cosimo Scarpa

In the above example (Scarpa, 2020a), the button has a left and right arrow to guide the user as to when the action will lead them towards. The button also leverages the principle of dimensionality to provide a narrative element to the interaction and visual design. The button slightly skewed to the direction in which it is clicked provides feedback to the user about where the click has been registered and the direction of the action.

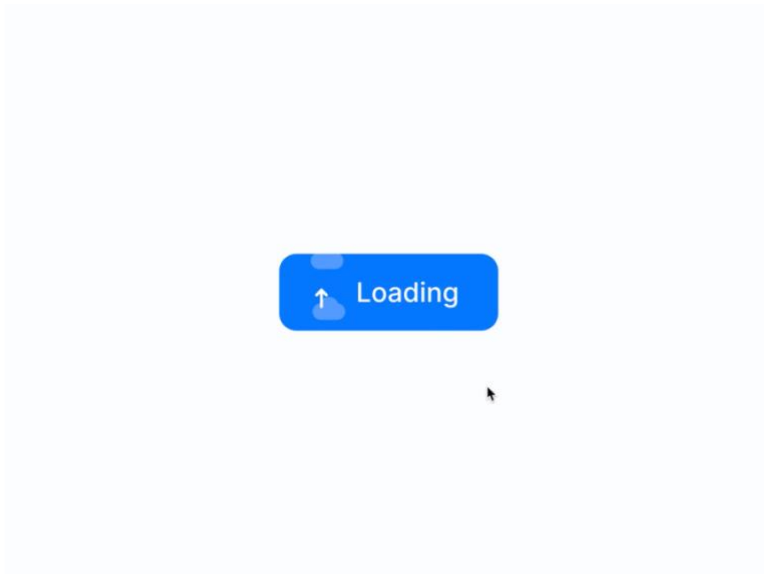


Figure 18 Publish button animation by Aaron Iker

In this example (Iker, 2020c), the button uses principles of Transformation to communicate the actions taken and provide feedback to the user. The button expands to fit the text dynamically as it changes and the arrow squashes and stretches with the clouds behind it moving faster to show a parallax effect. This simulates the idea of the arrow moving through space by manipulating the shapes and position of a few parameters.

•

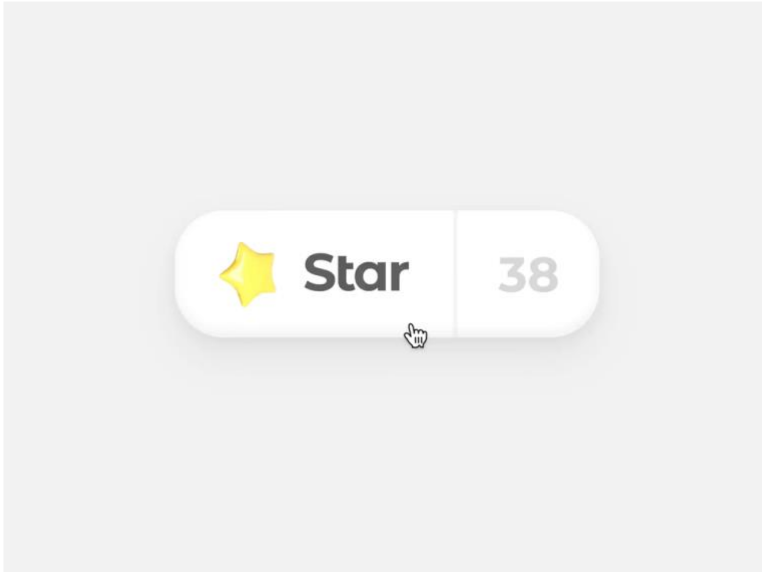


Figure 19 Star Button by Edoardo Mercati

In this example (Mercati, 2021), the star button provides guidance and feedback to the user while using a playful star motif for its aesthetic. The button has a greyed-out star that transforms into a fully colored star while hovering. When clicked, the word "Starred" moves in first, and then the value update is offset to have a more apparent impact on the action. The fast movement of the star in the button conveys a presence of energy and impact within the button.

6.1.2 Floating Action Button (FAB)

The FAB represents the most important action on a screen. It puts key actions within reach.

<u>Motion Functions</u>

- Guidance
- Structural

Floating Action Buttons allow users to access primary information on the page. The primary function of a FAB is Guidance and Structure. The FAB shows users where they can access elements of an interface, and the interface is structured. The expansion of the FAB can give more information as to the affordances of the interface.

Buttons can also have a set of secondary functions. Aesthetic functions can be incorporated into the FAB based on how the contained elements expand.

Microinteractions and Motion Principles Used

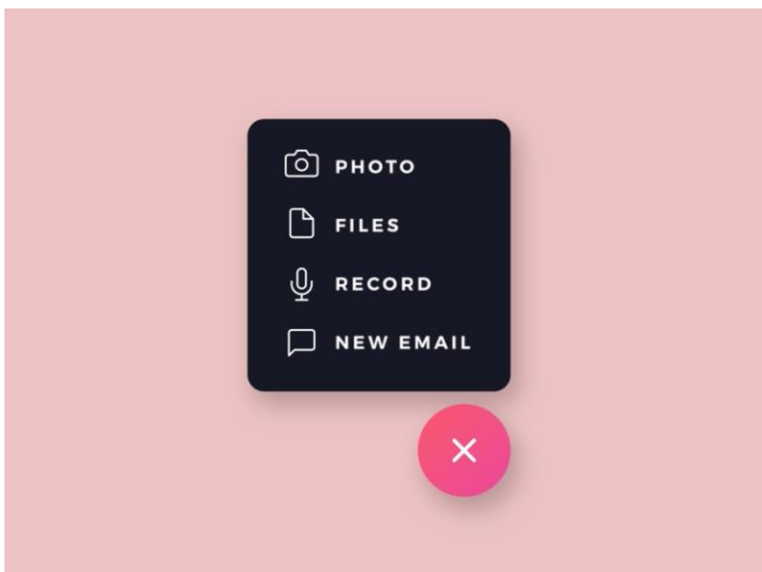


Figure 20 Floating Action Button Interaction by Mauricio Bucardo

The FAB presented above (Bucardo, 2019) relies on transformation, masking, obscuration, and cloning principles to achieve the intended functions of structure and guidance. In the above example, the button reveals a layer underneath that contains the possible functions.

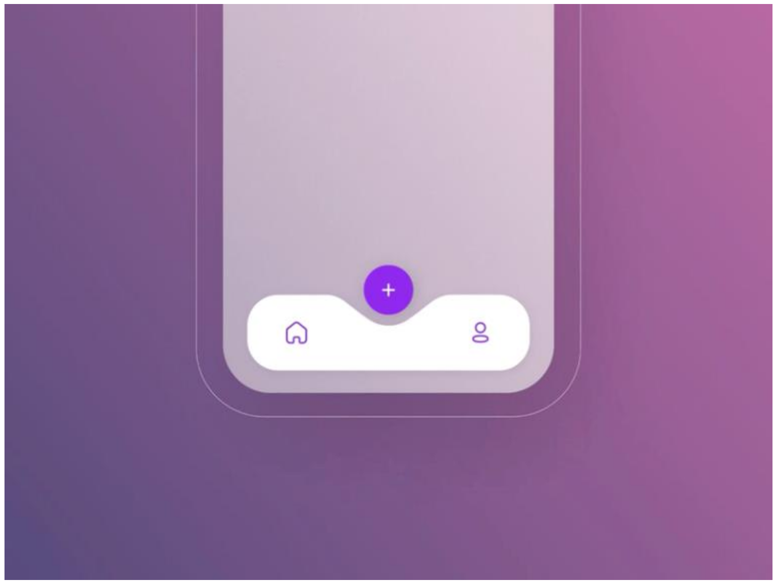


Figure 21 Liquid Tab Bar Animation by Dmitry Lauretsky

In this example (Lauretsky, 2021), the FAB uses the principle of cloning to show that there are four icons that are part of the expanded set to draw the realtionship that they are a subset of the action performed (tapping the FAB)

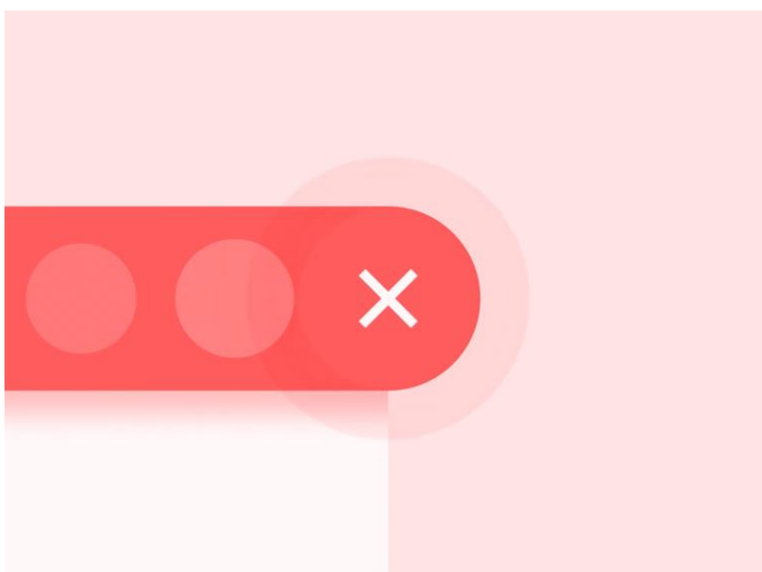


Figure 22 Share Button Interaction Concept by Oleg Frolov

Here the FAB (Frolov, 2019b) transforms from a circle to a rounded rectangle and has its children elements offset and populate the rectangle. The movement of the button presents the user with a relationship that shows that the expanded button contains all the children actions.

6.1.3 Icon Buttons

Icon buttons help people take supplementary actions with a single tap.

Motion Functions

- Identification
- Aesthetic
- Emotive

Icon buttons are often used to represent a specific action or function and are designed to provide a visual cue to the user about its purpose. The primary function of an icon button is Identification. Animations and motion within an icon button can give the user an idea of the button's task.

The icon buttons can convey a sense of delight with their aesthetic design choice and emotional appeal. Motion Principles can be used to arrive at these functions of the animation.

Microinteractions and Motion Principles Used

Figure 23 Front to Back Camera Switch Microinteraction by Oleksandr Pronskyi

The icon button here (Pronskyi, 2019) leverages the principle of transformation and dimensionality to change shape from a person to a camera. Along with the direction arrows, this icon helps the user identify what state the camera is in and shows a change of state by moving the arrow and transforming the shape from the front of the screen to the back of the phone. The action mimics rotating a phone, and the added dimensionality to the microinteractions helps ground it in reality.

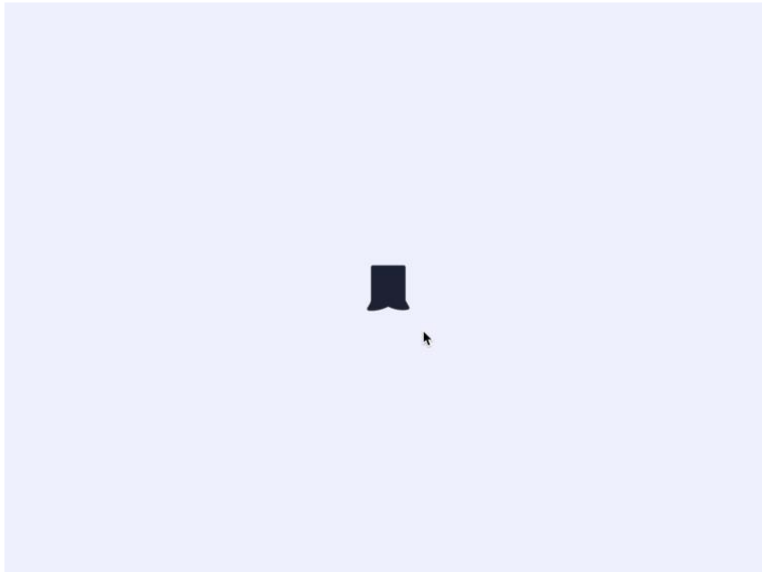


Figure 24 Bookmark by Aaron Iker

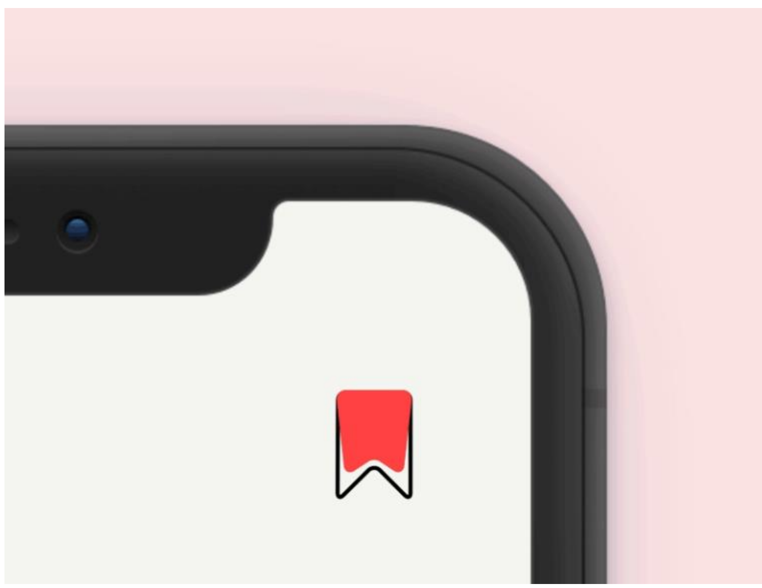


Figure 25 Add to Bookmark Interaction by Paarth Desai

The bookmarks (Desai, 2019; Iker, 2020b) show dimensionality and a state change when pressed, helping the user identify the action performed and a way to undo the action. The stylistic interpretation of the examples are different, but convey the same information.

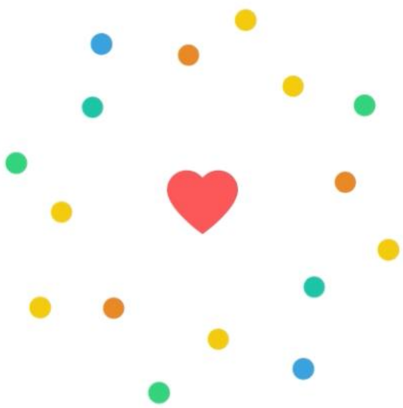


Figure 26 Custom Like Animation by Margarita Ivanchikova

The like animation microinteraction (Ivanchikova, 2019) leans heavily on aesthetics to convey the emotion of having "liked" something. It leverages the principles of offset and delay along with an accelerated easing curve to pack emotion into a tiny, liked-sized package.

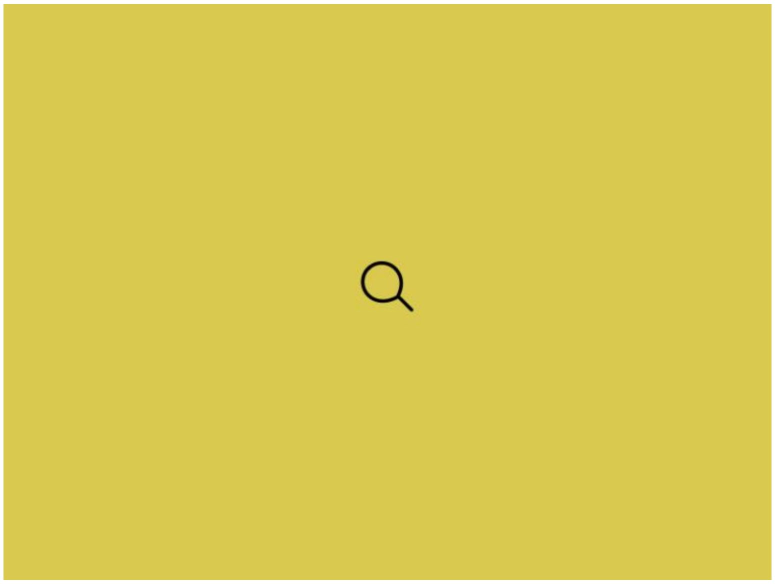


Figure 27 Search & Close Microinteraction by Paarth Desai

This search microinteraction (Desai, 2018) uses a morphing interaction to transform from a magnifying glass to an x-icon to communicate to the user the change in state. The handle of the magnifying glass conveys the idea that the glass has transformed into a button and the interaction state has changed.

6.2 Communication Components

Communication components are elements within a user interface that are designed to convey information to the user. These components may include text, icons, images, alerts, and other visual and auditory cues that provide feedback, guidance, or instruction to the user. Effective communication components are designed to be clear, concise, and easily understandable, and are often used to convey important information such as error messages, notifications, or contextual help. Communication components are a key aspect of UX design, as they help users to understand the purpose and functionality of the interface, and facilitate effective and efficient interaction with the interface.

6.2.1 Onboarding

Onboarding is the process of familiarizing new users with a product, service, or application, and helping them get started with using it.

Motion Functions

- Didactic
- Guidance
- Aesthetic
- Emotive
- Feedback
- Structural

Onboarding is typically designed to provide users with a smooth and seamless experience using a new product or service. The primary function of an onboarding process is Didactic. The didactic functions of the onboarding process include graphical descriptions introducing users to critical features and functionalities, providing helpful tips and tutorials, or guiding users through a step-by-step process to complete a task. A graphical representation helps the users understand how the product aims to function and behave.

Along with the didactic functions of the onboarding process, the representation of instructions can be used to convey the structure and function of the information in the product. This is dependent on the information provided and can be used to guide the users.

Microinteractions and Motion Principles

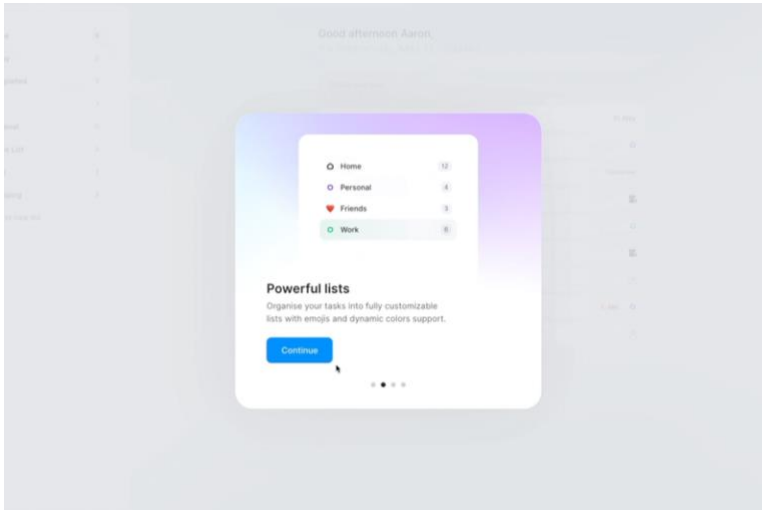


Figure 28 Onboarding by Aaron Iker

In the Dona onboarding (Iker, 2022), the onboarding provides a didactic and structural function. The user gets educated on how to use the interface by calling out the visual appearance of the interface and keyboard shortcuts present in the product.

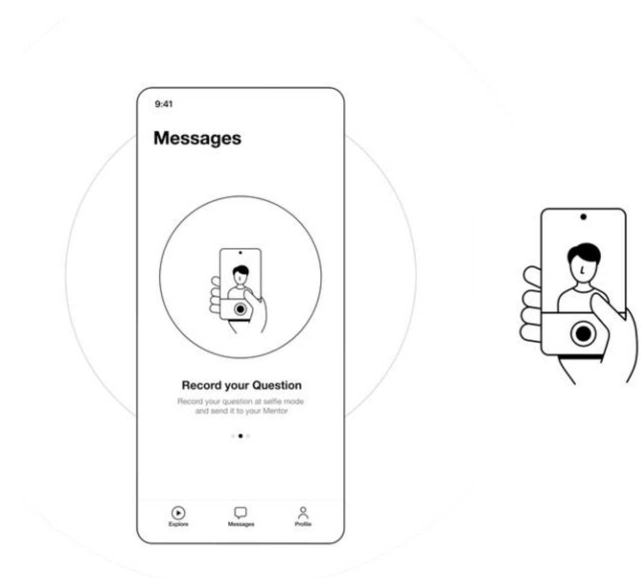


Figure 29 Mentorcam - Onboarding by Yup Nguyen

With the Mentorcam Onboarding (Nguyen, 2021a), the animations provide a didactic reference for the user to understand the operation of the product. This piece also guides the users on the usage of the product and the features it presents.

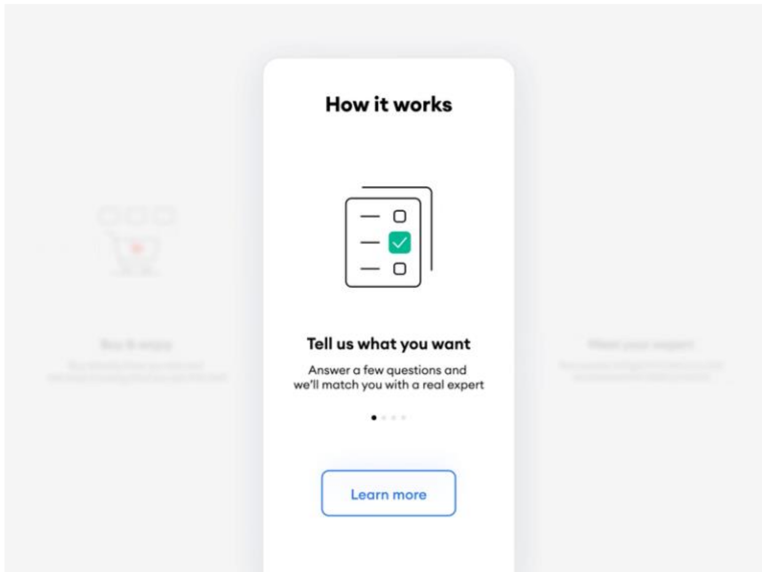


Figure 30 Curated - How it works by Yup Nguyen

The onboarding for Curated (Nguyen, 2021b) is geared towards a more Aesthetic function. In this style, the user is presented with an experience of what using the product would look like, with aesthetics and abstraction playing a part in reducing the information needed to be conveyed.

6.2.2 Progress Indicators

Progress indicators inform users about the status of ongoing processes, such as loading an app, submitting a form, or saving updates. They communicate an app's state and indicate available actions, such as whether users can navigate away from the current screen. There are two types of progress indicators.

Determinate Progress Indicators

A determinate progress indicator displays a progress bar or percentage indicator that shows how much of a task has been completed.

Indeterminate Progress Indicators

An indeterminate progress indicator does not display the progress of a task but shows that a task is ongoing.

Motion Functions

- Aesthetic
- Emotive
- Feedback

The primary function of a progress indicator is Feedback. These indicators provide feedback to users depending on the task they are performing. Determinate and Indeterminate indicators have slightly different feedback mechanisms but convey a similar intent.

The aesthetic and emotive functions apply more towards indeterminate loaders as they have to keep the user waiting for an unknown amount of time; as such, the impact that aesthetics can have is maximized in this process.

Microinteractions and Motion Principles

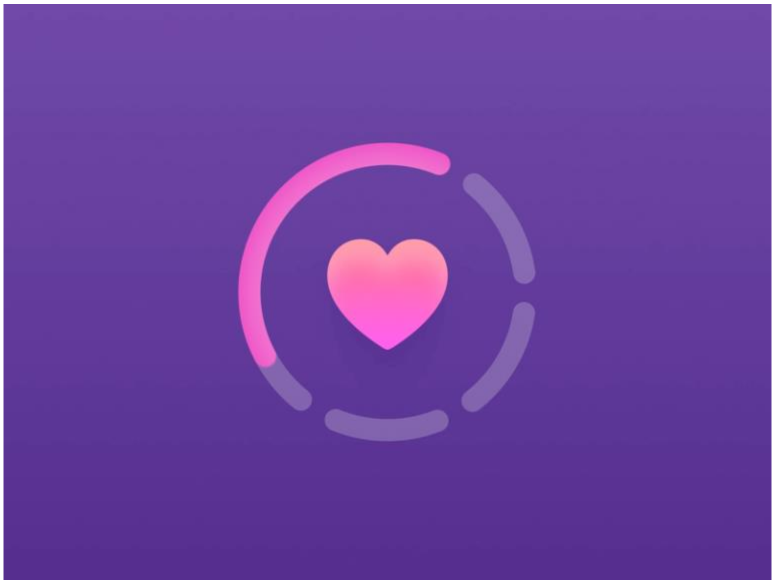


Figure 31 Heart Progress Bar Animation by Chethan KVS

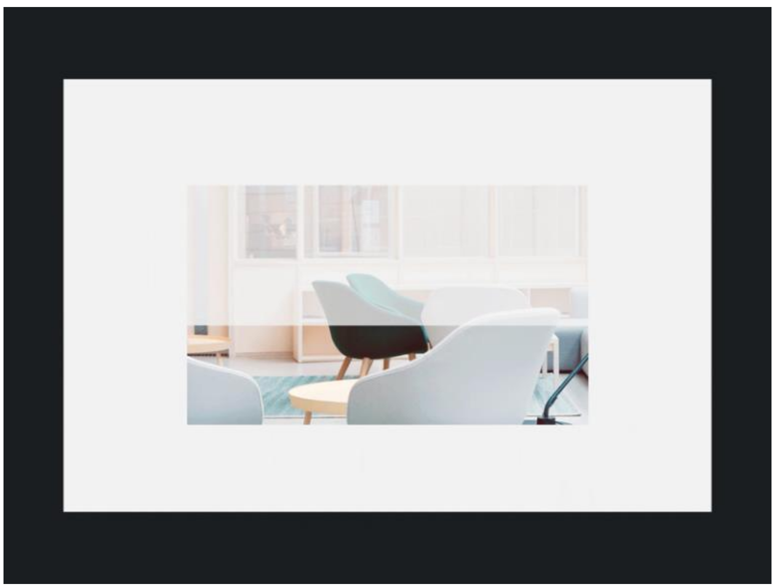


Figure 32 Service page loading animation by Gil

Determinate progress indicators (Gil, 2021; KVS, 2021) have straightforward feedback functions. In both the above examples, there is a set path that the indicator has to travel to let the user know that progress is being made. The principle of value change is used here to communicate the state of progress.

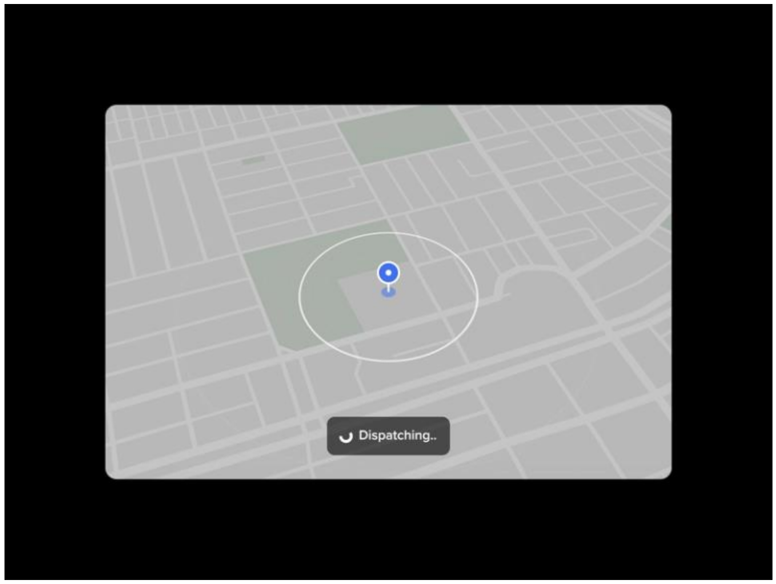


Figure 33 Transition by SeungHyun Yoo

Figure 34 Listing card loading by Nicolas Solerieu

Indeterminate progress indicators (Solerieu, 2021; Yoo, 2020) have feedback functions informing the user of an action related to the interface. In the first example, a pulse is constantly sent out from a location, giving the user feedback that it is looking for something nearby. In the second interaction, the skeleton loader helps inform the user how the interface and contents will look and that information is being retrieved.

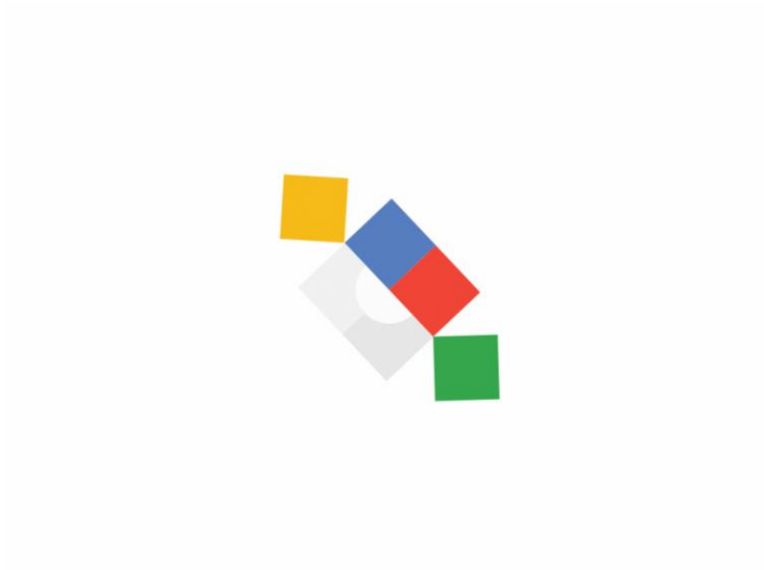


Figure 35 Loading Animation Concept by Pedro Aquino

Figure 36 Wix App Builder by Gur Margalit

Indeterminate loaders (Aquino, 2018; Margalit, 2019) can also be purely aesthetic in function. The above loader microinteractions are indefinite loops that help reflect brand values and inject a sense of delight while waiting during a loading section. The principles of easing and transformation are heavily used to match real-world physics.

6.2.3 System Status

Status indicators are typically used to communicate important information to the user, such as whether an action has been completed successfully or not.

<u>Motion Functions</u>

- Emotive
- Feedback

The primary function of a status indicator is Feedback. Users need to know whether their action has been completed successfully or not. Additionally, an error or success message can be punctuated by adding Emotive functions to drive home the action's result.

<u>Microinteractions and Motion Principles</u>

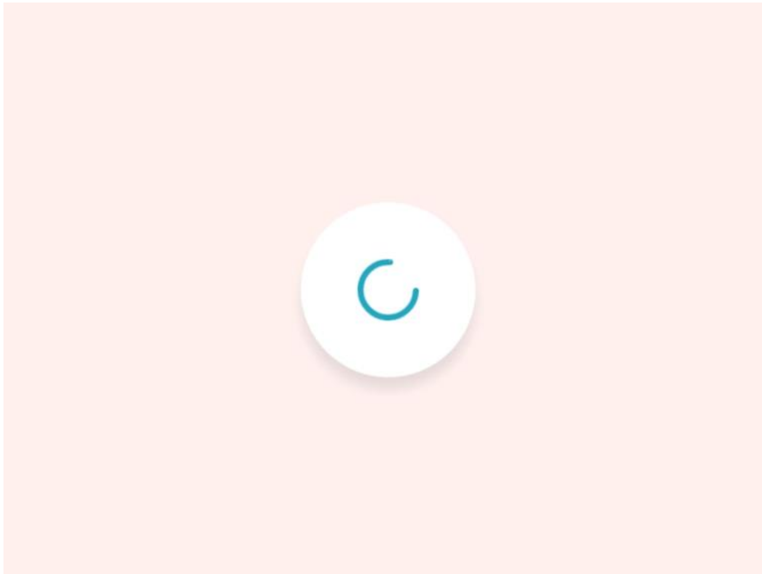


Figure 37 Button with success/error states by Andrei Mironov

The above example (Mironov, 2015) is used to give feedback to users on whether their action was successful. Feedback is provided with a change of color and warning symbol. The color change drives a strong emotional response, as red is associated with warnings and errors. The movement of the transformed button helps provide additional reinforcement to the emotional response.

user.

Figure 38 Email Verification by Denys Sergushkin

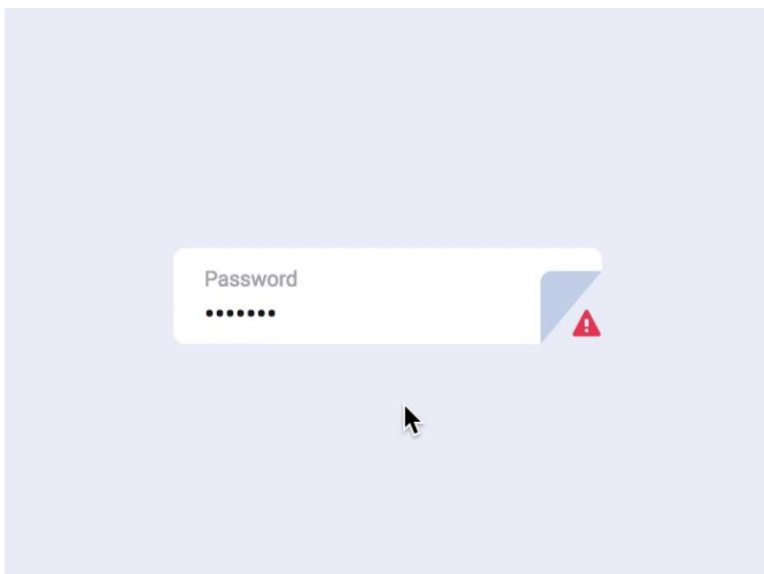


Figure 39 Password error animation by Aaron Iker

Similar themes can be found in the above two examples (Iker, 2018; Sergushkin, 2022), where color change and subtle motion drive an emotional feedback response to the user.

6.3 Navigation Components

Navigation components are elements within a user interface that enable users to move between different screens or sections of the UI. These components may include menus, buttons, tabs, links, and other interactive elements allowing users to navigate through the interface and find the necessary information or functionality. Effective navigation components are designed to be clear, consistent, and easy to use. They are often accompanied by visual cues such as icons, color coding, or animation to help users understand their purpose and importance. Navigation components are a critical aspect of UX design. They help users explore the UI and find the information or functionality they need to complete tasks or achieve their goals within the system. In this system, the various types of navigation components are condensed into a single nav bar type.

6.3.1 Nav Bar

Navigation bars offer a persistent and convenient way to switch between primary destinations in an app.

<u>Motion Functions</u>

- Identification
- Structure

Identification and Structure are the motion functions associated with a Nav Bar. The icons on the nav bar are extensions of icon buttons and show the user what functions they perform. The extended set of icons also informs users of the structure and information layout of the interface and helps them understand the significant features present in the product.

Microinteractions and Motion Principles

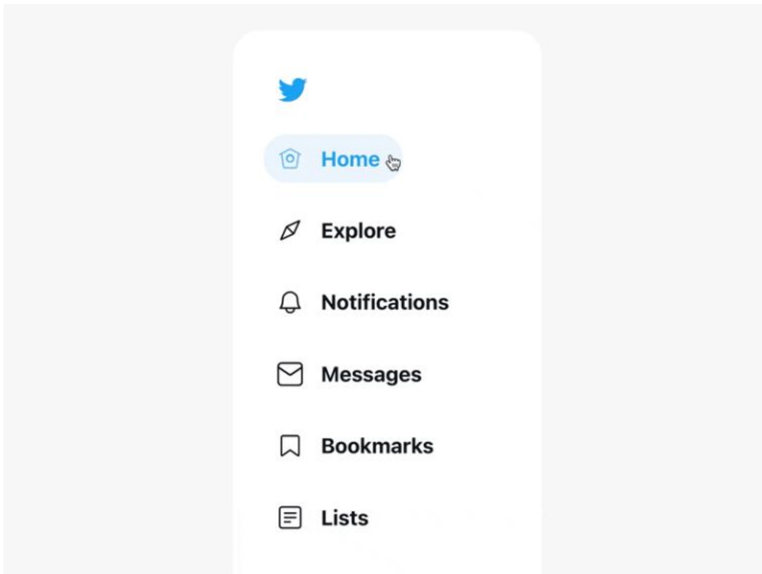


Figure 40 Twitter Sidebar (Light) by Aaron Iker

In the sidebar example (Iker, 2020d), the navigation bar consists of groups of icon buttons with text. These buttons have similar functions to the icon button, where they permit the identification of the task the user wants to perform. AS there are multiple buttons grouped, the user also gains an understanding of what the structure of the interface looks like and how they can navigate through it.

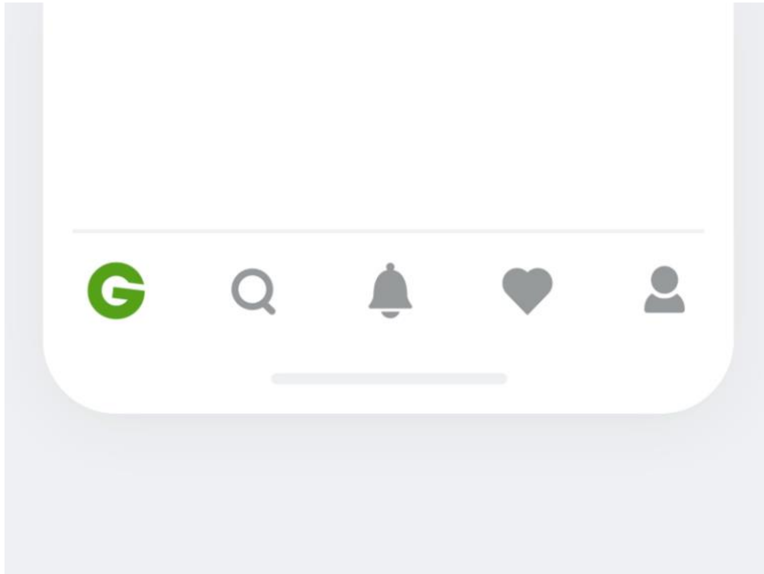


Figure 41 Nav Bar Animations with Lottie by David Schnorr

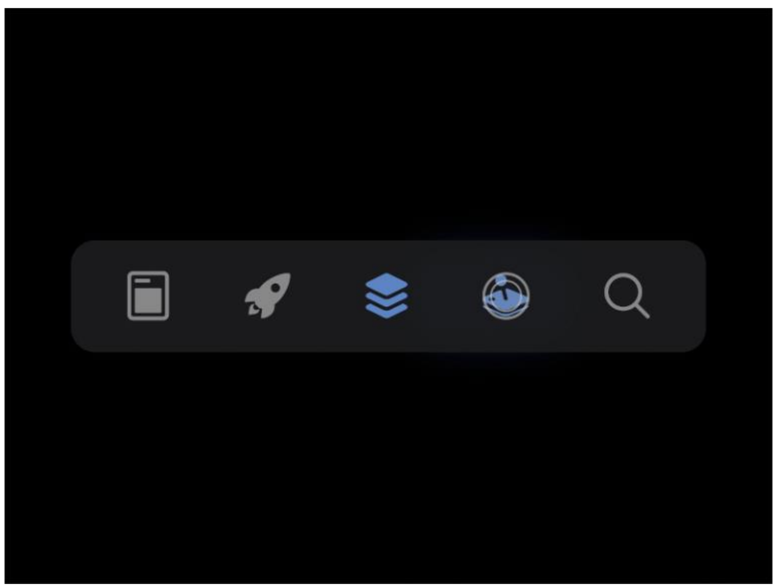


Figure 42 App Store Tab Bar Interaction by Erfan

Similarly, in the above examples (Erfan, 2021; Schnorr, 2019), icon buttons are grouped to make up a bottom navigation bar. These buttons have a color change and transformation to react to the user's input. The selected icon button is always highlighted to inform the user of where they are within the interface.

Figure 43 Nav Interaction by Ayana Campbell Smith

Tab bars are another form of a navigational bar. These can use text or icons to enable switching between multiple tabs on a page. In this example (Smith, 2019), the parenting principle showcases the relationship between the rectangle that shows the selection and the selected item. When selecting a tab, the rectangle moves underneath that text field, highlighting their relationship.

6.4 Selection Components

Selection components refer to the interactive elements in a user interface that allow users to choose from a range of options or select from a list. These components can include checkboxes, radio buttons, drop-down menus, sliders, and other similar elements. They are designed to be user-friendly, easy to navigate, and typically feature labels or additional information to help users understand their choices. Effectively using selection components is crucial to creating a positive user experience. They enable users to interact with the system and select options that meet their needs or preferences.

6.4.1 Checkboxes

Checkboxes allow users to select one or more items from a set. Checkboxes can turn an option on or off.

Motion Functions

- Feedback

The function of motion within a checkbox is to give users feedback on the properties they have selected. Motion can orient users' actions and ease the transition between selection and feedback.

Microinteractions and Motion Principles

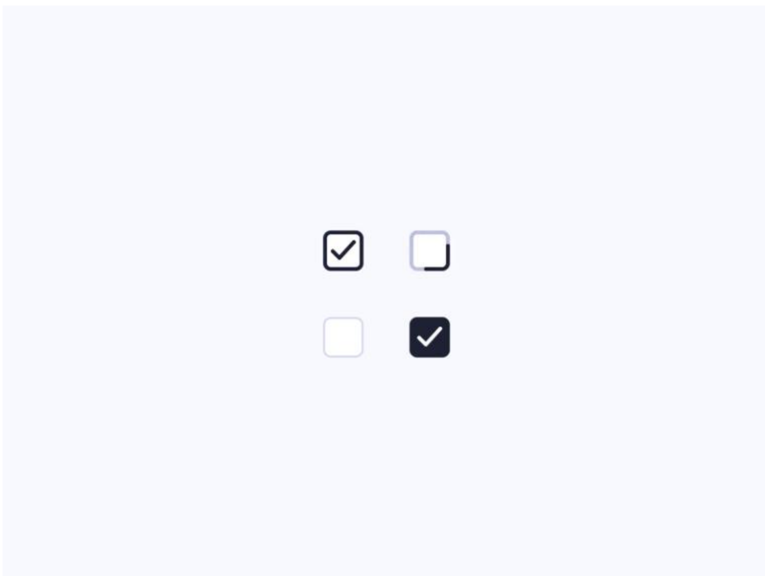


Figure 44 Checkbox by Aaron Iker

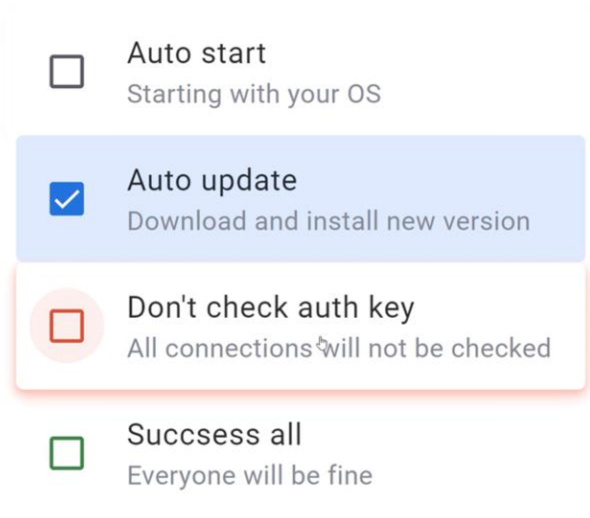


Figure 45 Checkbox Selection UI by Roman Kamushken

In the above examples of checkboxes (Iker, 2019; Kamushken, 2019), the motion is offset with an initial state either on hover or right before being pressed, which then transitions into the checked state. Having different states helps orient the user to what action is being performed and which checkbox they are currently clicking on.

6.4.2 Radio Buttons

Radio buttons allow users to select one option from a set.

<u>Motion Functions</u>

- Feedback

The function of motion in a radio button is Feedback. Motion can highlight the relationship between radio buttons that are clicked on. As radio buttons are used to select a single option, motion can show the relationship of the selection from one button to the next.

Microinteractions and Motion Principles

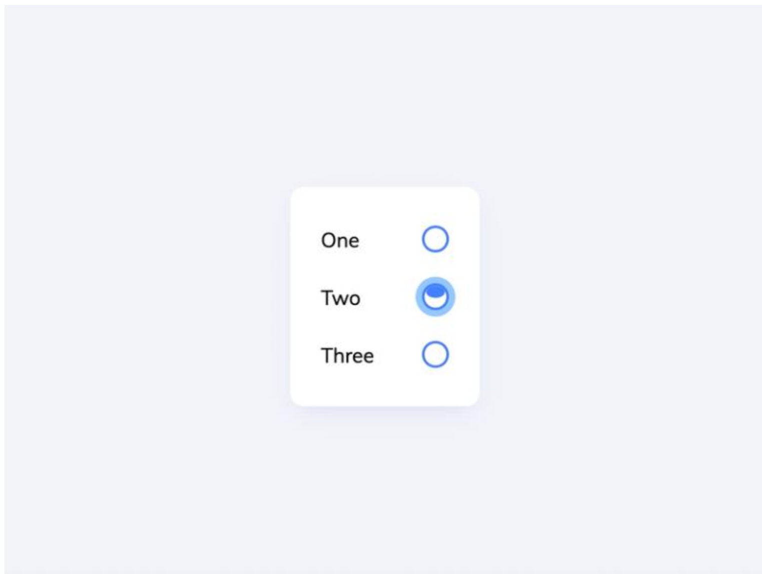


Figure 46 UI Radio Button by Cosimo Scarpa

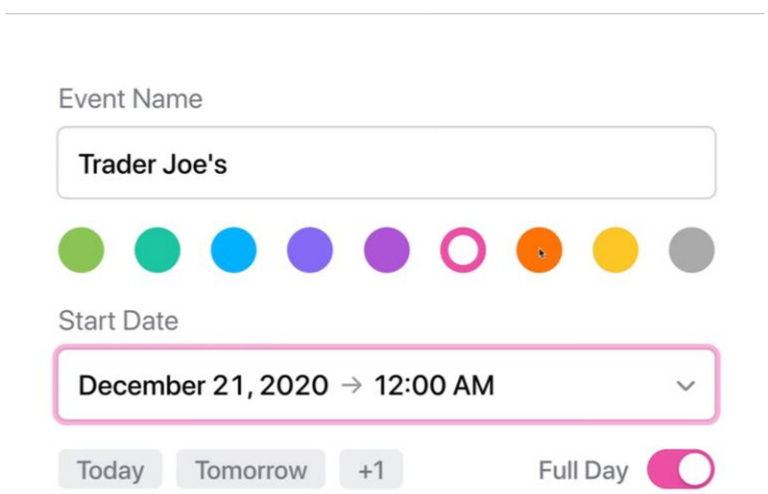


Figure 47 CSS UI Interactive Elements by bg-d

In these radio buttons (bg-d, 2020; Scarpa, 2020b), motion is used to convey the movement of the selection button from top to bottom or left to right. Using the principles of masking, the selection seems to move behind the interface between states and adds a layer of dimensionality to the interface.

6.4.3 Sliders

Sliders allow users to make selections from a range of values.

<u>Motion Functions</u>

- Didactic
- Feedback

The function of motion in a slider is Didactic and Feedback. Changes in values in sliders can be highlighted by numerical or text changes and visual indicators that correspond to the slider's use. Motion can highlight the relationship between the range in which the slider moves and the properties affected by this change.

<u>Microinteractions and Motion Principles</u>

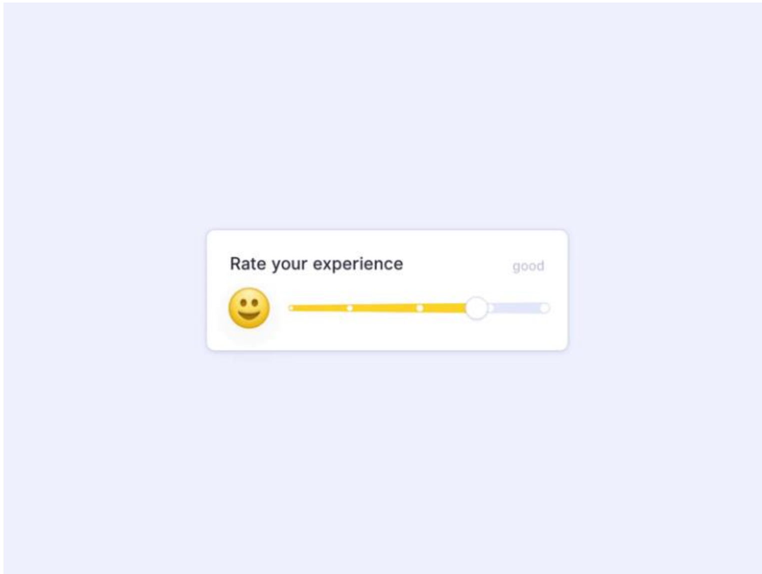


Figure 48 Rating slider by Aaron Iker

In the above example (Iker, 2020a), the change in the value of the slider leads to a change in the emotion conveyed by the face that matches the selected range in the slider. This change in emotion conveys didactic information to the user about the properties of the slider. Additionally, the principle of parenting demonstrates to the user that when the slider changes, so does the emotional response to the emoji.

Figure 49 UI/UX slider by Benjamin Zehrfeldt

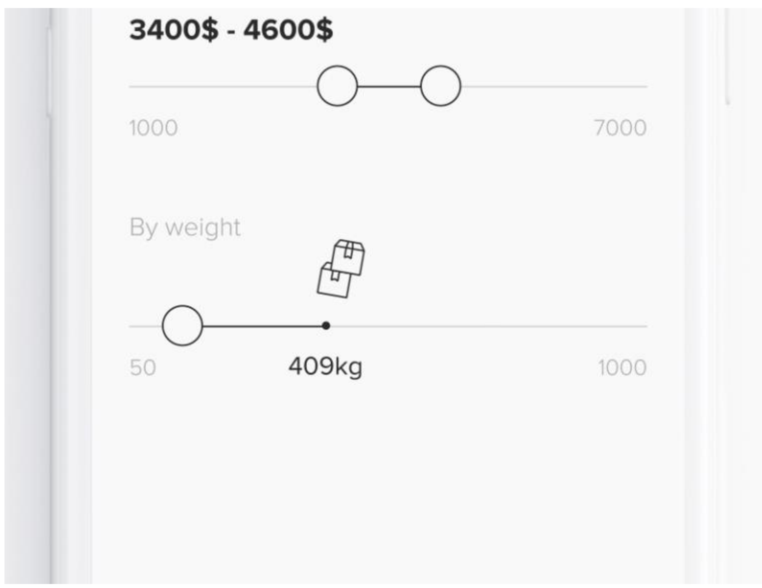


Figure 50 Weight slider exploration designed by Tony Pinkevych

The sliders above (Pinkevych, 2020; Zehrfeldt, 2022) demonstrate the principle of value change. The dynamic changing of the values shows the user what the selection they are making is. Secondary animations with the color change on the first one and the change in boxes on the second one reinforce the user's action. These actions inform the user that they may be reaching an upper or lower bound of the slider.

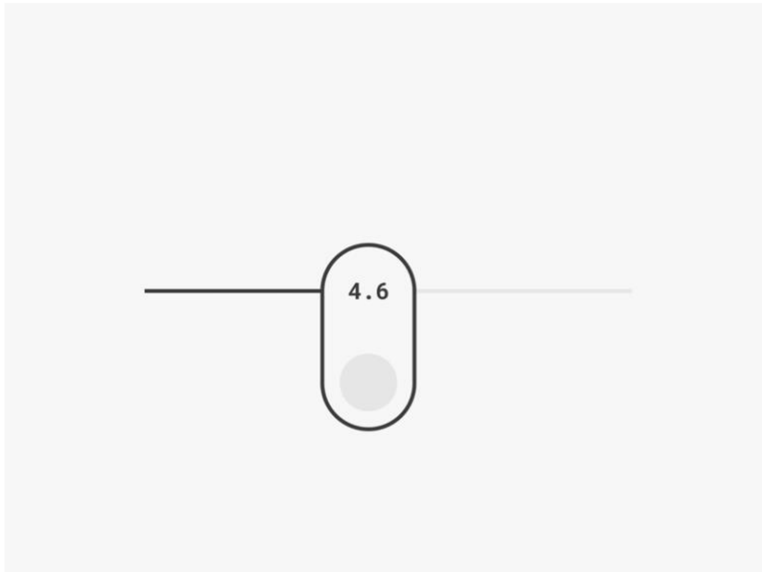


Figure 51 Slider designed by Oleg Frolov

Similarly, this example (Frolov, 2021) also demonstrates a value change along with the parenting principle. When the slider moves across space, the value contained within changes. This gives the user information that moving it across the line will change the relationship it has with the number and will also give them the magnitude of the change.

6.4.4 Switches

Switches toggle the state of a single item on or off

<u>Motion Functions</u>

- Structural
- Feedback

The function of motion in a switch is Structural and Feedback. Switches can provide the user access to other states and functions in the interface if turned on or off, enabling the user to access and control additional parts of the interface. Switches can also provide clear feedback to the user by showcasing the state they transition to.

Microinteractions and Motion Principles

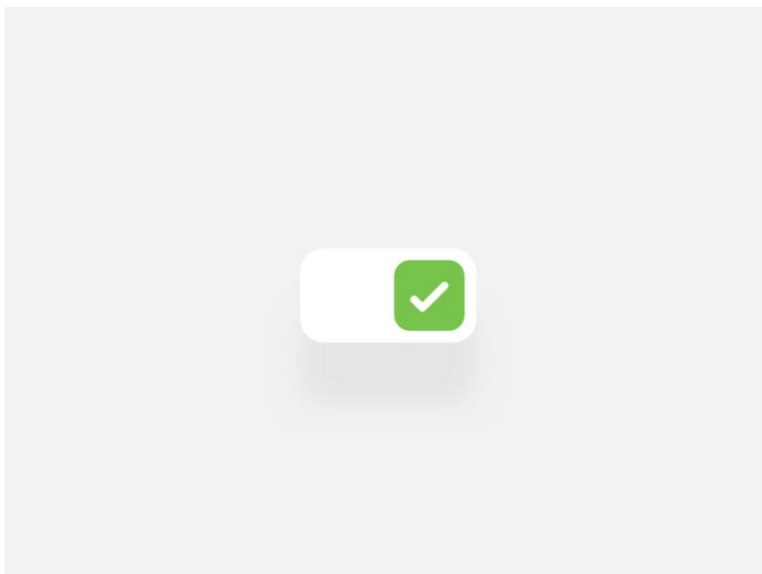


Figure 52 Checkboxswitcher by Oleg Frolov

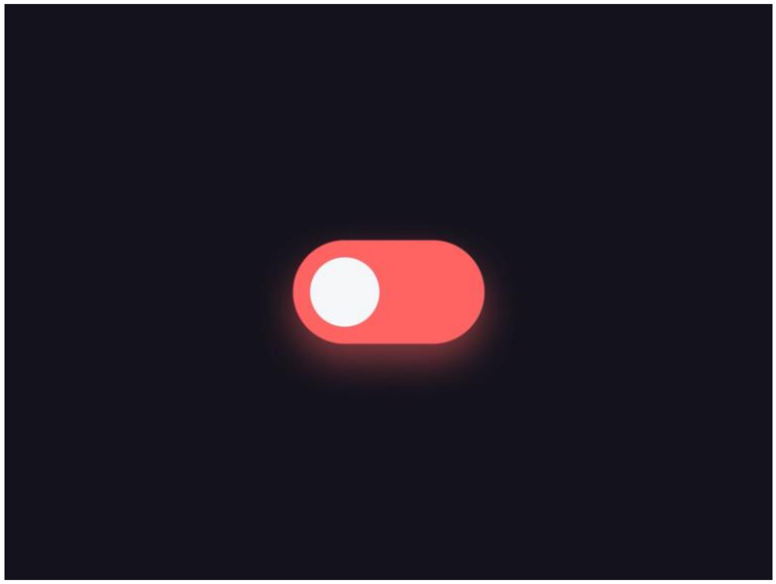


Figure 53 On/Off Switch by Anton Zaderaka

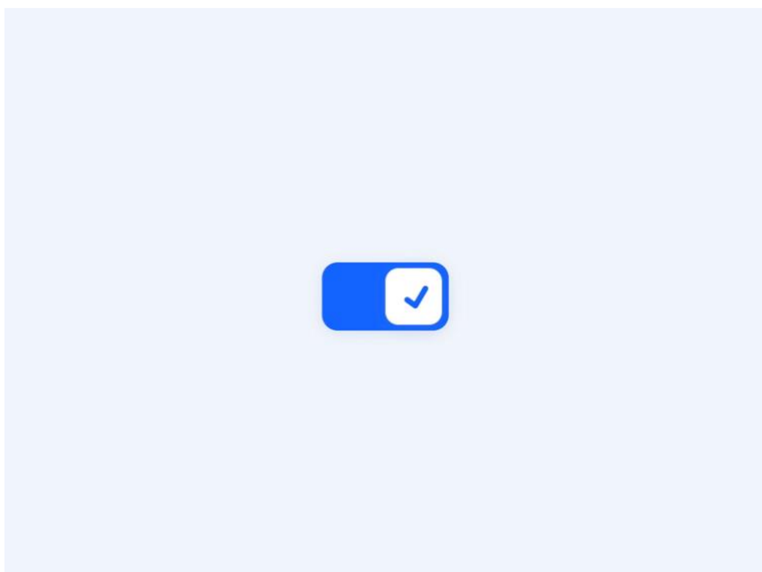


Figure 54 Toggle Switch by Cosimo Scarpa

The above examples of switches (Frolov, 2019a; Scarpa, 2021; Zaderaka, 2020) all follow similar structures. They use the principle of transformation to transform from an "OFF" state to an "ON" state. The transformation is accompanied by a change in color to indicate this state change, along with icons that indicate the state.

6.4.5 *Pickers*

Pickers let users select a date or a range of dates.

<u>Motion Functions</u>

- Didactic
- Feedback

The function of motion in a picker is Didactic and Feedback. A picker allows for users to see the range they selected and how their selection is framed on a calendar. Feedback is provided by showcasing a range or selected date to the user.

<u>Microinteractions and Motion Principles</u>

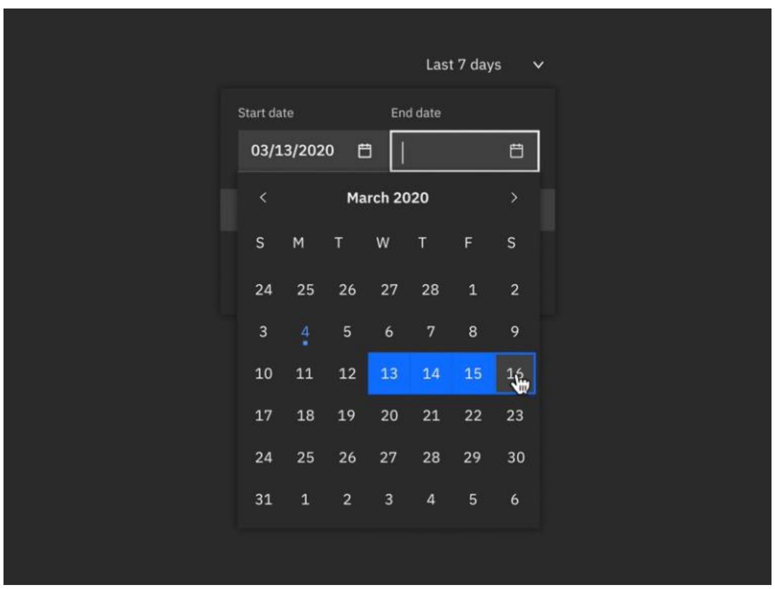


Figure 55 Date Picker by ampersandrew

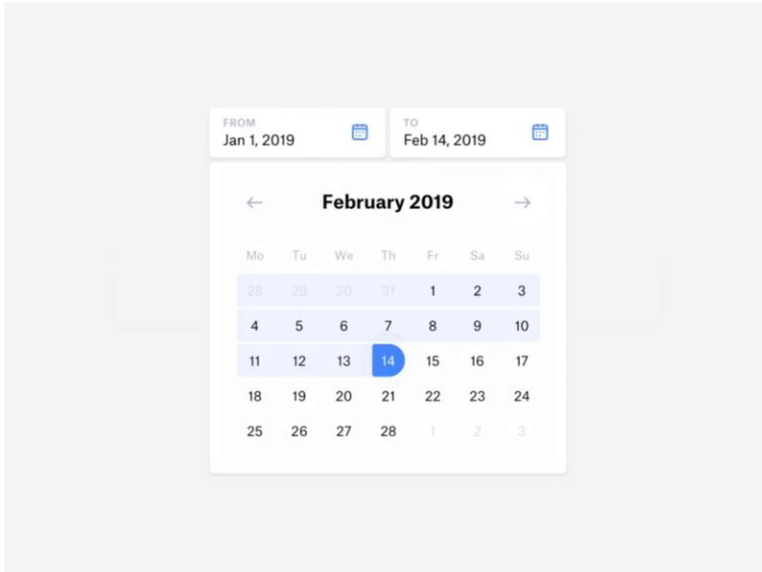


Figure 56 Date Picker by David Rodríguez Arias

In the above examples (ampersandrew, 2020; Rodríguez, 2019), the user selects a range of dates. The principle of value change is used to show the selection. Here the value is static and dates do not change so the user know they can make a selection within this range.

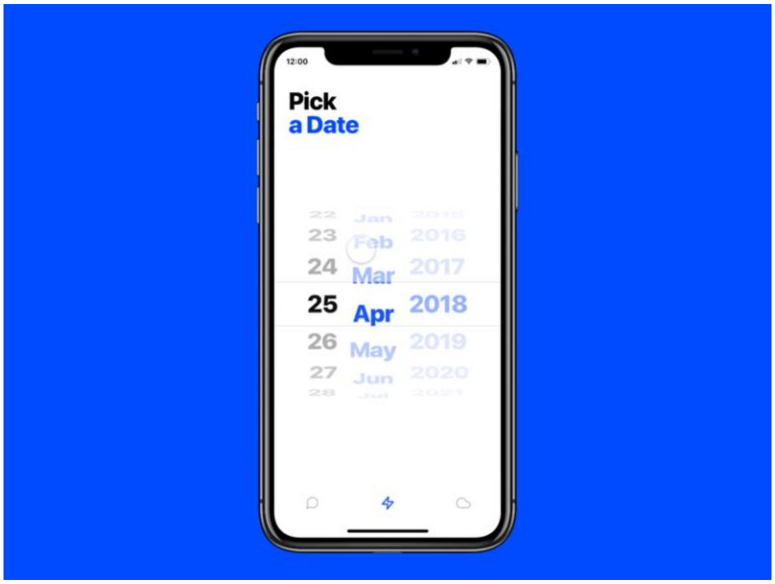


Figure 57 Page Tool: Momentum by Edoardo Mercati

Here the picker (Mercati, 2018) is being used to select one specific date. The value change here is dynamic and can help the user choose the exact date from a carousel of available dates. The carousel also has an added layer of dimensionality to it, which helps it mimic the structure and functions of a real-world flippable carousel, helping ground the interface.

6.5 Input Components

Input components in a user interface can take on many forms, including those that allow audio and text input. Audio input components, such as speech recognition, enable users to provide information through spoken commands or recordings. Meanwhile, text input components, such as text boxes or drop-down menus, allow users to enter information using typed or selected text. Both input components should be designed to be user-friendly, clear, and easily understandable, with appropriate labels and placeholders to guide users in providing the necessary information. Using audio and text input components is essential in creating a seamless and positive user experience, enabling users to interact with the UI and complete tasks efficiently and effectively.

6.5.1 Text Input

Text input allows for users to enter text into an interface.

Motion Functions

- Guidance
- Feedback

The function of motion in a text input is Guidance. Motion helps guide users as to where the text can be input and when it is ready to accept it. Additionally, motion provides feedback to the user by displaying input information.

Microinteractions and Motion Principles

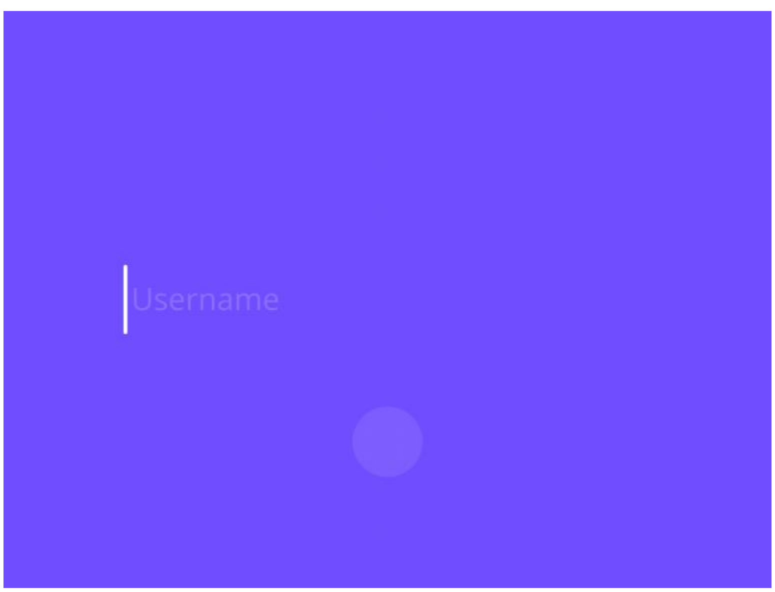


Figure 58 TextField Interaction by Oleg Frolov

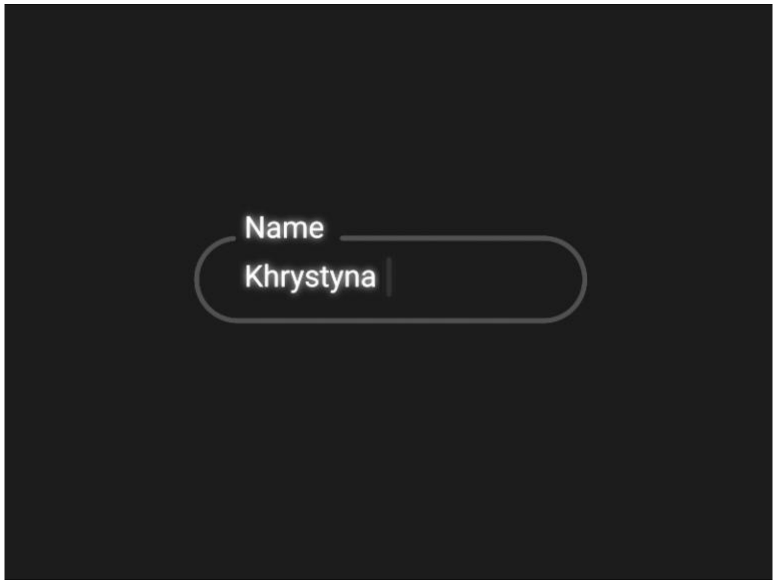


Figure 59 Name Field designed by Khrystyna

In the above examples (Frolov, 2018; Khrystyna, 2018), the text field is first displayed in a state visible to the user as an input field where they can input the text. Once they click on the field, the state changes to show the users that they can type into it. Motion supports this state change by using principles of transformation and masking to alter the text box's shape and make the cursor blink, drawing attention to its change of state.

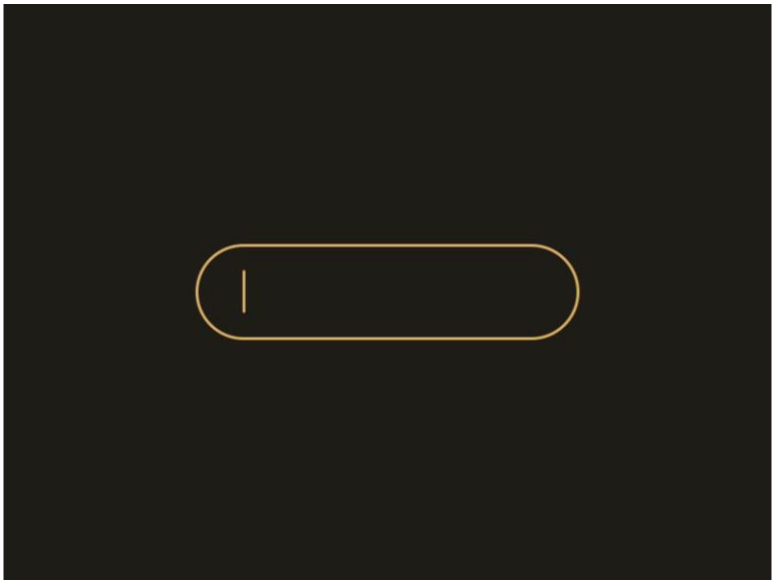


Figure 60 Search micro interaction by Jimmy Rodenburg

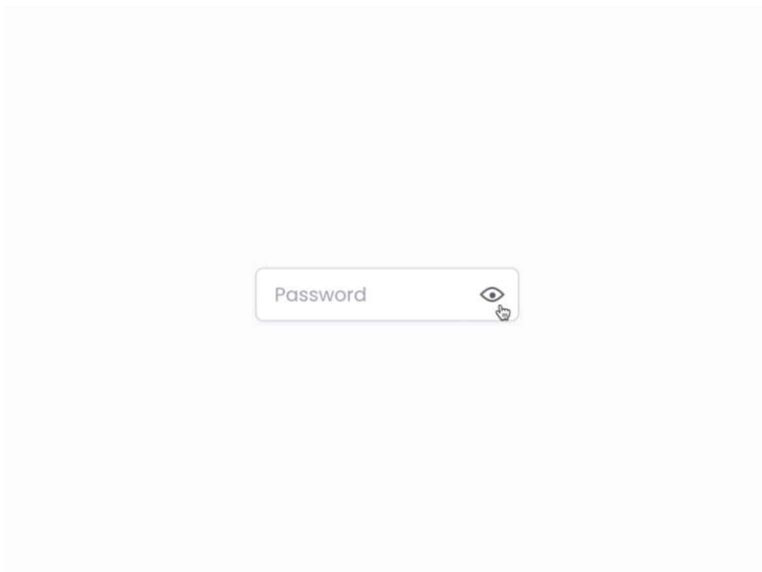


Figure 61 Password field animation by Aaron Iker

Similarly, In the first example (Rodenburg, 2019), the search icon transforms into a cursor, letting the user know that the input field relates to the search bar and that any text input will be used as keywords for a search. In the next one (Iker, 2020e), on the bottom, the password field shows whether it is active by displaying a colored border. Additionally, a password field has a visible and hidden state that needs to be triggered by the user. (The icon to trigger this action follows similar functions and principles as an icon button).

6.5.2 Audio Input

Audio input enables users to provide information or interact with the system using spoken commands

Motion Functions

- Structural
- Guidance
- Feedback

The function of motion in an audio input is Guidance and Structure. Motion can help users understand that an interface supports audio input, and it can be an input modality. Motion can also help guide users to where the audio can be used as input. Additionally, motion plays a crucial role in helping users understand that they are actively speaking into the microphone and that their actions are being understood.

Microinteractions and Motion Principles

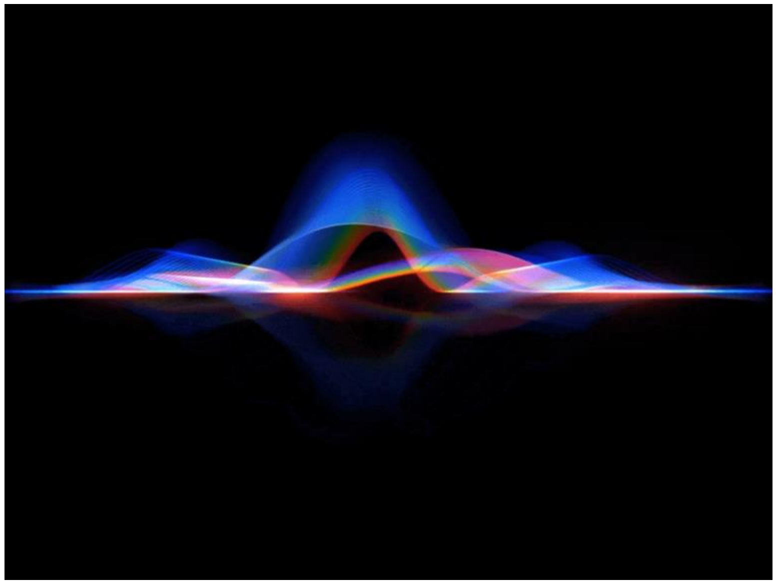


Figure 62 Voice visual design by Gleb Kuznetsov

A waveform, like the one shown above (Kuznetsov, 2022), is a way to represent audio interactions. Showcasing a waveform to a user helps them understand the presence of audio. Animating the waveform to match the users' spoken sounds helps them understand that the system has received the information they want to convey.

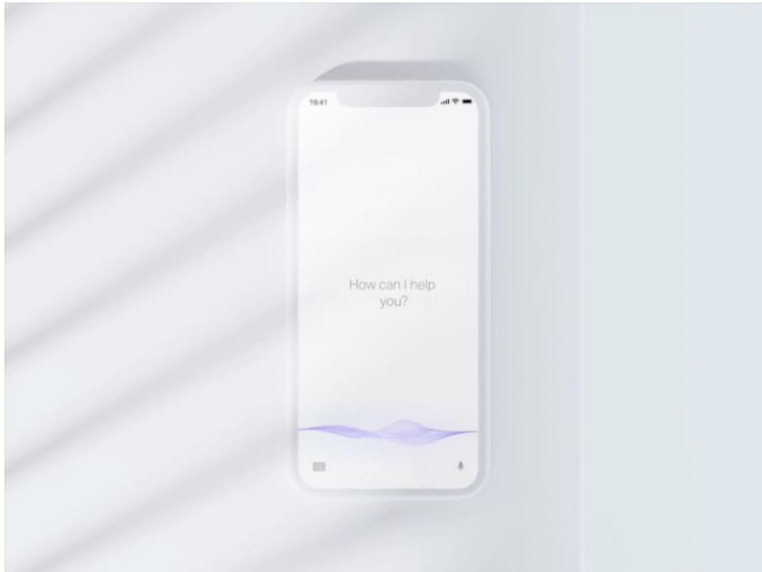


Figure 63 Voice file manager by Gleb Kuznetsov

Waveforms, when combined with text, help users understand that as the device is hearing the audio, it is also interpreting it correctly. In the above example (Kuznetsov, 2020), the principle of parenting is used here to give the relationship between the audio waveform and the text. The text animates on screen using the offset and delay principles along with easing. Each word is slightly staggered to give the appearance of an ongoing conversation, and the words decelerate into their final position.

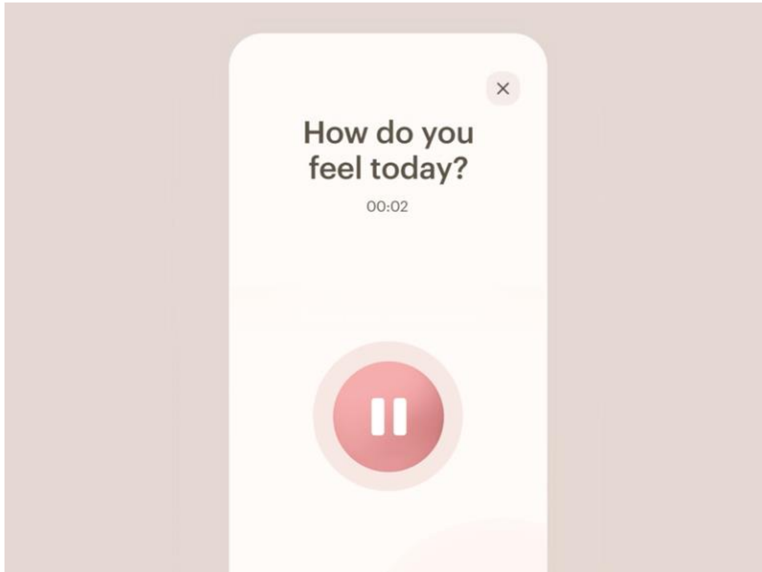


Figure 64 Kintsugi Voice Journaling by Slavo Glinsky

A waveform is not the only way to convey audio. Simple transformations, scale in this case, oscillating to the sound can be used as shown in the above example (Glinsky, 2021). These mimic the function of a real-world speaker, where the vibrations create sound. These transformations can be used to mimic the sensation of vibration. This gives the user feedback that the system is hearing audio.

CHAPTER 7. DEPLOYING THE SYSTEM

After assembling the necessary information for the system, the next step was deployment and construction. To ensure constant accessibility, a key design objective, it was decided to host the system on an online repository instead of within a static document. This approach also had the advantage of fully displaying microinteractions with all their dynamic animations. For this purpose, Gitbook was selected as the preferred platform. Gitbook's ability to manage and present a vast amount of information online in a user-friendly manner made it an ideal choice, particularly given its design and structure, which are reminiscent of conventional design systems.

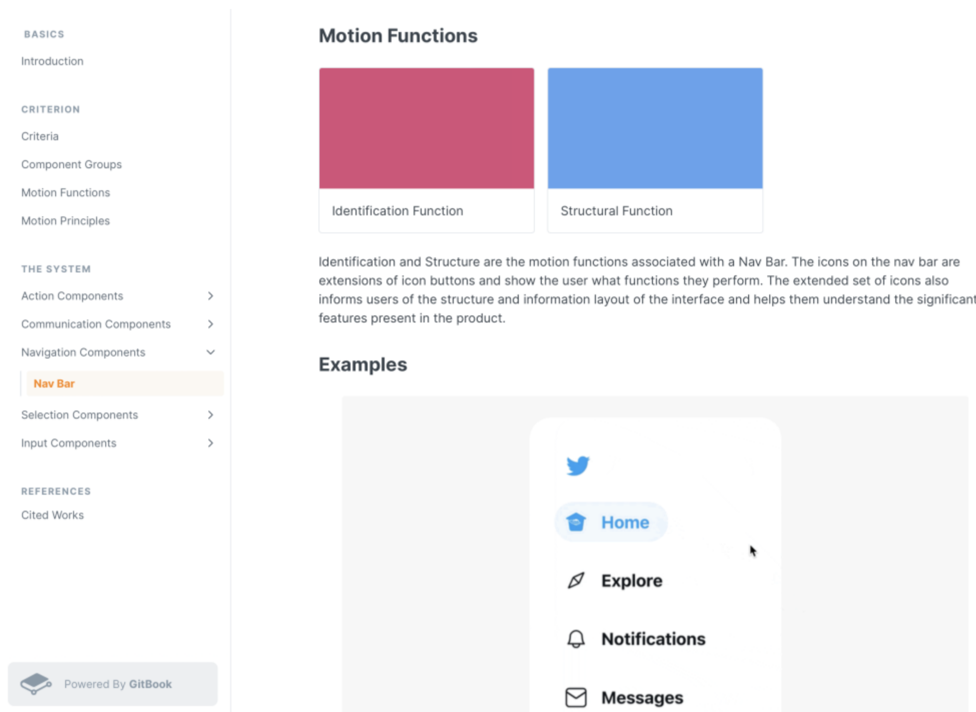


Figure 65 View of the system as hosted on Gitbook

The system was organized into three primary sections. The first section, the introduction, established the system's groundwork and its underlying motivations. This was followed by the criteria section, which included the classification system used for organizing the microinteractions. This section provided a succinct overview and delved into specifics about component groups, motion functions, and motion principles. The final section was dedicated to showcasing the system itself, presenting the information in an organized and comprehensible format.

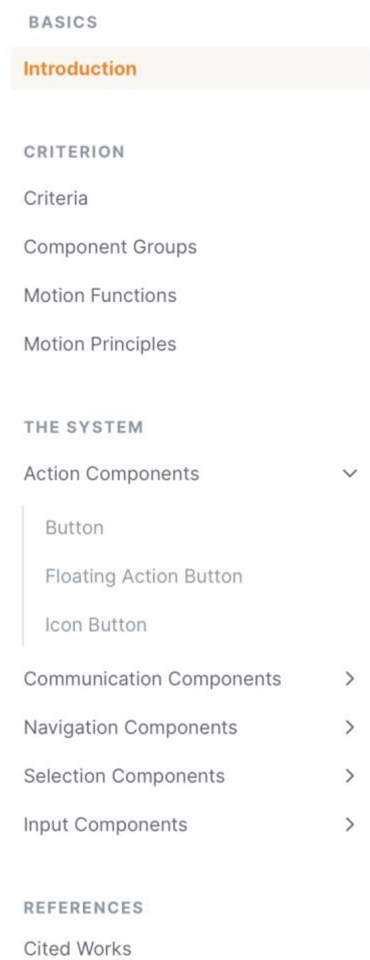


Figure 66 Navigational structure of the system

The system can be accessed at the link below :

https://abhishekshankar.gitbook.io/uxm/

CHAPTER 8. USABILITY EVALUATION

A survey and questionnaire were selected to assess the system's usability and to determine whether users experienced an improvement in their microinteraction design literacy.

8.1 Participant Recruitment

A survey and questionnaire were selected to assess the system's usability and to determine whether users experienced an improvement in their microinteraction design literacy. The system was presented to a group of five novice designers with years of experience under 3 years and three experienced designers with over 10 years of experience. These designers included working professionals and UX/UI design students. The group of designers were chosen based on a response to a recruitment survey circulated through social media, where designers indicated their interest in participating in the usability testing. This recruitment survey was used to screen designers who had varying levels of motion design experience. The purpose of involving professionals and students with varying levels of experience as participants was to ensure that the system was evaluated by users with different levels of experience in UX/UI design, providing a more comprehensive understanding of the system’s effectiveness and usability when reaching audiences in professional settings and academic settings.

Table 5 List of Usability Testing Participants

Participant	*Title*	*Years of Experience*	*Motion Design Expertise*
U1	UX Designer	2 years	Novice
U2	UX Motion Lead	16 years	Expert
U3	UX Motion Designer	14 years	Expert
U4	Product Designer	3 years	Novice
U5	CX Designer	2 years	Novice
U6	Product Designer	<1 year	Novice
U7	UX Designer	<1 year	Novice
U8	Student	<1 year	Novice
U9	Motion Designer	13 years	Expert

8.2 Evaluation

The evaluation of the system was carried out with two sets of tests. The expert and novice participants were given 30 minutes to explore the entire system and understand its contents. Following this, the expert participants were asked to verbally share their opinions on the system. These participants were questioned on the perceived effectiveness of the system and were asked to help understand how the system could be used to help novice UX designers understand concepts and implementation behind microinteractions in interfaces. The experts were also asked to provide feedback on the structure of the system and the examples provided, along with being asked to examine the system for inconsistencies. For the novice designers, following the perusal of the system, they were asked questions about the knowledge they gained about the system. These designers were asked how well they could follow along with the system documentation and their confidence in understanding concepts related to microinteractions. These designers were also asked to envision how they would use such a system in a professional or academic setting. Following this, the novice designers were provided with a survey to gather their perspectives on their knowledge of microinteractions. Additionally, they were presented with a System Usability Scale (SUS) (Brooke, 1995) to evaluate the system's usability. The SUS scale was chosen for its ease of administration and reliability in producing results with smaller sample sizes (Peres et al., 2013).

CHAPTER 9. RESULTS

When UX/UI designers used the system, they gained an understanding of microinteractions implementation. Designers successfully interacted with the system and reported that it helped them recognize various instances within a product where they could include microinteractions. Designers appreciated the inclusion of examples in the system, as they found that these grounded the text and made it easier to understand how certain principles applied to specific microinteractions. They also commented on the system's structure, noting that it facilitated easy navigation. Figures 56 and 57 illustrate the opinions of UX/UI designers on topics such as the system's ability to help them understand the intent behind microinteractions and usability. Designers mentioned that the system assisted them in comprehending the concepts and intent behind microinteractions. They found the structure straightforward to navigate, allowing them to locate information effortlessly.

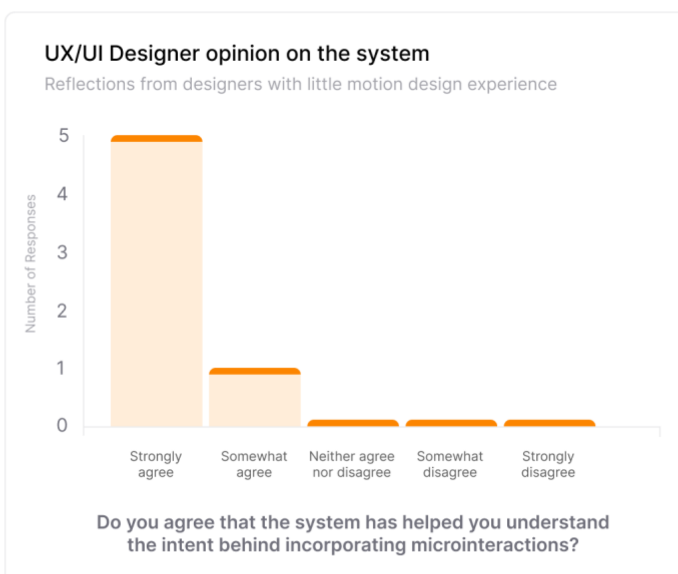


Figure 67 Opinions of novice UX/UI designers on the system

Experts felt that the system would serve as a valuable resource for novice designers to grasp the concepts and implementation of microinteractions. They felt that the system's organization in the form of a design system would be familiar to UX/UI designers. They also echoed positively on showcasing examples to link microinteractions with the relevant motion principles and functions.

Designers reported that the terminologies specified in the system were very helpful, enabling them to describe certain actions they might have struggled to convey previously. They particularly appreciated how the examples highlighted the use cases of the terminologies and reinforced the application of principles and functions in the designed microinteractions. A designer felt that the system could be used to advocate for the inclusion of specific microinteractions during brainstorming sessions.

Figure 68 Ease of Use and Confidence in the System

The system scored an average of 79 on the System Usability Scale (SUS). The SUS is scored on a percentile scale, with a score of 68 representing the 50th percentile and 80.3 considered among the top 10% of all scores (Sauro, 2018). The average SUS score of the system falls just below the top 10%, indicating that users generally perceive the system as having good usability and superior performance, although there is room for improvement.

Experts noted that the system tended to be verbose and claimed that it would be more user-friendly if the text were supported with more animated visuals to guide the eye and the end user. They also noted that the examples provided, while being useful, were unlikely to be put into production and therefore are not reflective of microinteractions present on digital products.

Designers reported that the system introduced them to the terminologies behind microinteractions and motion, but they were not yet confident about collaborating with motion designers immediately. They felt they would require additional time to interact with the system to take in the information present within fully. Designers also remarked that they would require additional resources to understand how to create microinteractions before becoming comfortable collaborating with motion designers on projects. These resources included instruction on creating motion design pieces and exposure to motion design tools such as After Effects, which were absent within the system. They felt that the information present in the system would be more valuable to understand when in the context of actively designing microinteractions. Designers also believed they would require more hands-on experience with microinteraction implementation before feeling confident about incorporating them into their design process.

9.1 Modifications to the system

Based on the feedback provided by the participants in the verbal summary and the usability scale, the system was modified to make it more digestible and easier to parse through. The major issues faced by the participants were inconsistency in understanding the differences between motion principles and motion functions. To better understand these aspects, custom animations were built to emphasize the intent conveyed by the motion functions. These animations were presented on the individual category page, where users could understand how the functions interface with the rest of the classification system.

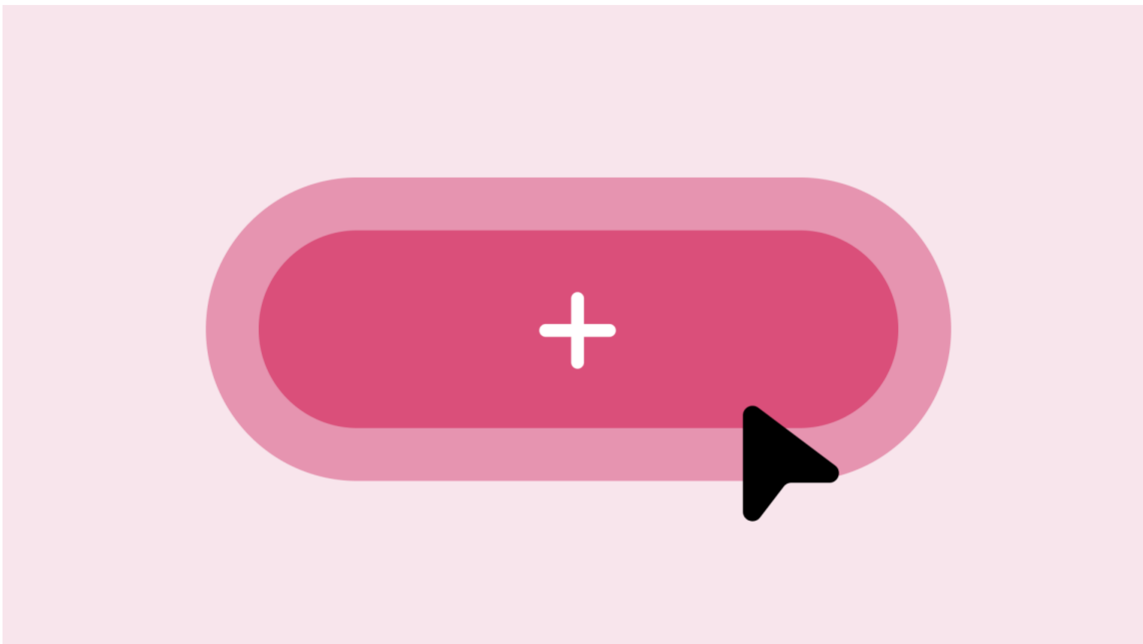


Figure 69 Animation for the Identification Function

Figure 70 Animation for the Didactic Function

Figure 71 Animation for the Structure Function

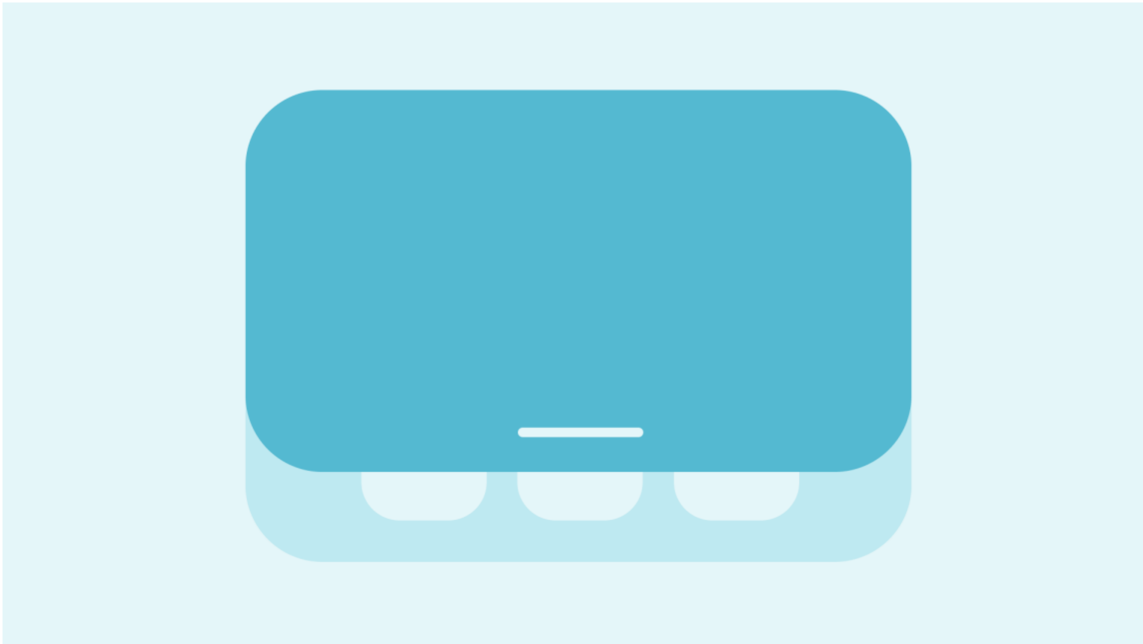


Figure 72 Animation for the Guidance Function

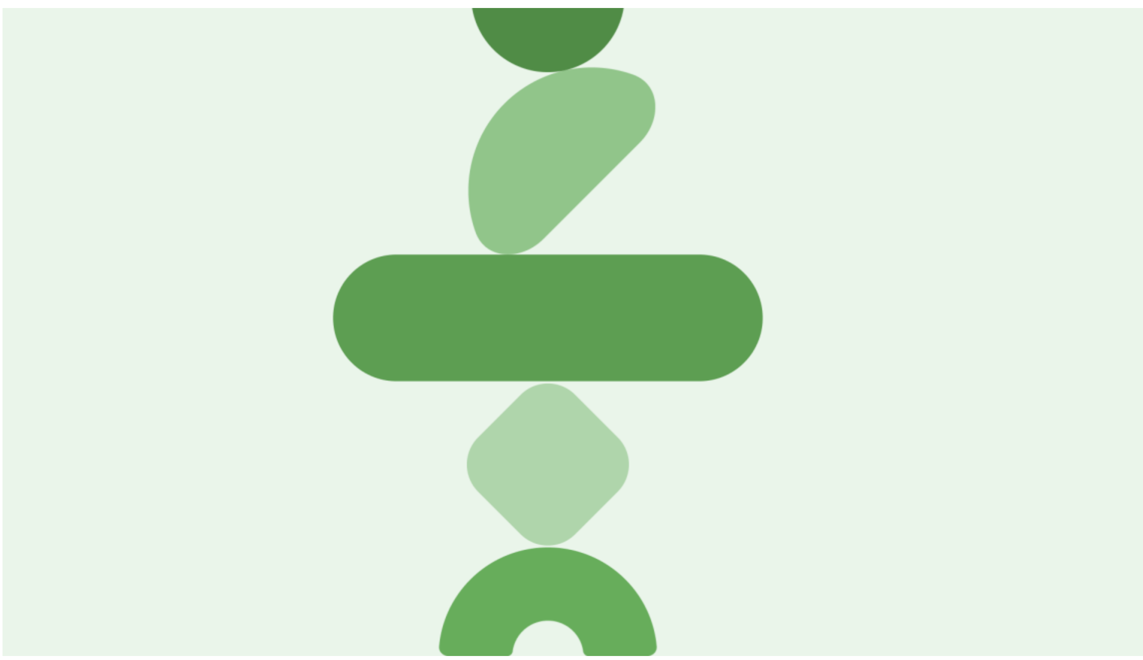


Figure 73 Animation for the Aesthetic Function

Figure 74 Animation for the Feedback Function

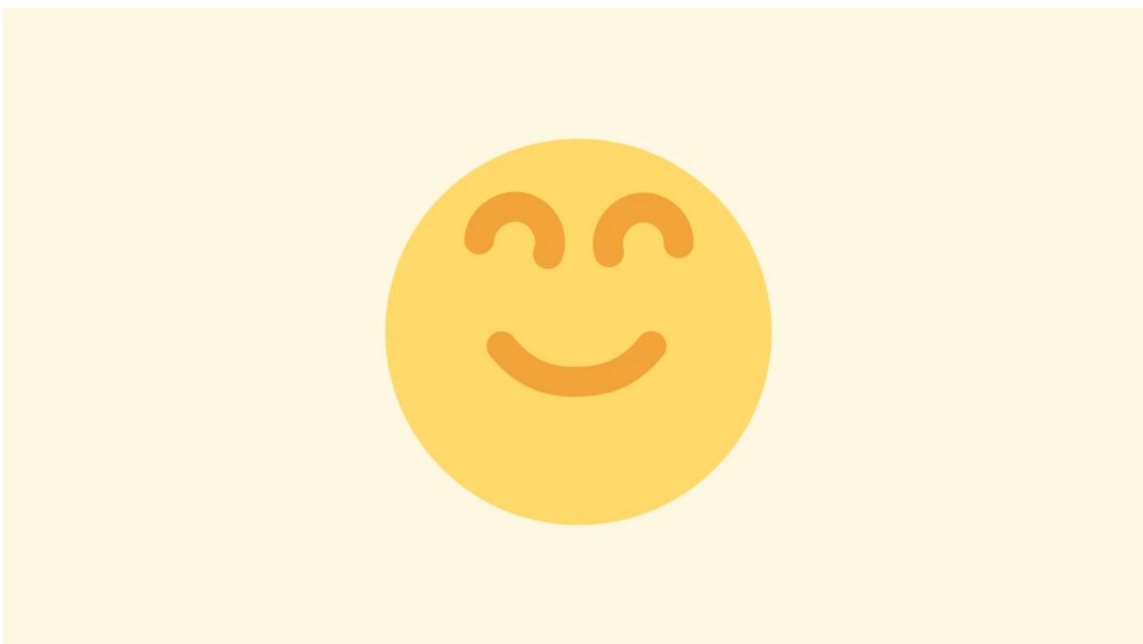


Figure 75 Animation for the Emotive Function

In addition to the revamped animation list for the motion functions, the motion principles section also had animations added to fit the visual language of the system. An overview of the motion principles employed are shown below.

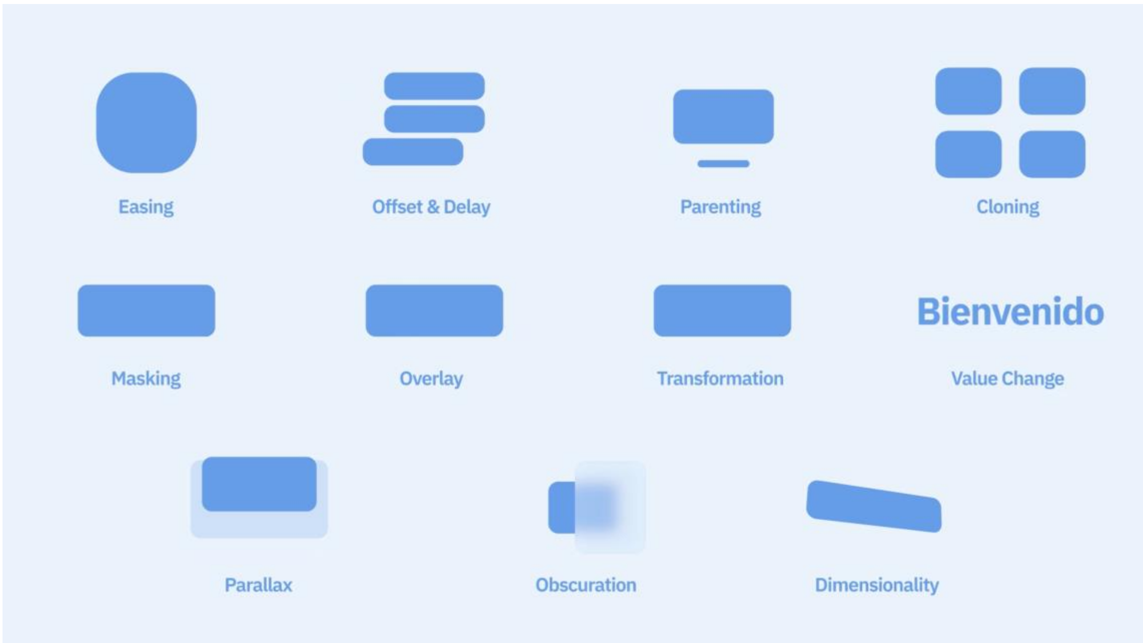


Figure 76 Revamped Motion Principles

CHAPTER 10. CONCLUSION

The use of a classification system for microinteractions proved effective in enhancing design literacy among UX/UI designers. The test results demonstrated that the designers found the system user-friendly, which facilitated their understanding of the principles and functions of microinteractions. This allowed them to gain insights into various use cases of microinteractions within the context of user interfaces. The system also provided designers with a justification for including microinteractions in the design process.

This work goes beyond enhancing the design literacy of microinteractions among UX/UI designers. This classification system can serve as an educational tool for designers in the classroom and in the industry to understand the impacts and uses of microinteractions. By offering a comprehensive system that illustrates various types of microinteractions, a deeper understanding of these elements can help designers incorporate them more effectively into their products. This, in turn, can lead to an enhanced user experience across a wide range of digital products in the future. Moreover, this research has the potential to encourage cross-disciplinary collaboration between UX/UI designers and motion designers by introducing motion design terminology to the UX/UI domain. The development of such a system can set the stage for the adoption of new design principles and best practices that address the ever-evolving landscape of digital products, ultimately benefiting both the industry and end-users alike.

The focus on microinteractions can encourage innovation in user interface design. The detailed breakdown of component groups, motion functions, and principles offers designers a rich resource for exploring new ways to engage users. This can lead to the development of more nuanced and sophisticated interaction patterns, pushing the boundaries of current UI design practices which can also lead to improved user experience. Well-designed microinteractions can significantly enhance the usability and accessibility of digital products, making them more intuitive and enjoyable to use. This improved user experience is crucial for the success and adoption of digital applications and platforms.

10.1 Broader Impacts

This study has the potential to influence the development of future design systems and methodologies to standardize and group microinteractions. Highlighting the significance of detailed motion design, it can inspire more comprehensive and nuanced design languages in major platforms, leading to richer and more cohesive design ecosystems. This study also sets a precedent for future research in UX/UI design. By systematically categorizing and analyzing microinteractions, it opens new avenues for academic inquiry and practical experimentation, fostering a deeper understanding of interaction design's impact on user behavior and experience.

Aside from research, this study has the potential to make an impact on the outlook of the design industry. This study can help foster a culture of developing motion design in an organization by showcasing the effectiveness and intent of microinteractions. Future work can build upon this and explore how microinteractions can play an important role in various interfaces. Advanced interaction techniques, such as those involving augmented reality, virtual reality, and voice user interfaces, are ripe for exploration in the context of microinteractions. Additionally, future work can also explore how microinteractions can contribute to emotional responses other than user delight. Understanding how subtle design elements impact user mood and decision-making can lead to more empathetic and user-centric designs.

10.2 Future Work

Future research can delve into the behavioral impacts of microinteractions on users. This includes how different types of microinteractions affect user engagement, retention, and overall satisfaction with digital products. Investigating how microinteractions can be standardized across various platforms while maintaining their unique functionalities and user experiences would be another important direction that this study can preclude.

10.3 Limitations

This research focused primarily on touch-enabled mobile applications, which may not fully encompass other platforms. The design system terminologies used to create component groups might not seamlessly translate to desktop environments with different interaction modalities. Interaction states such as hover are not present within this system as they are not a part of the touchscreen interaction language. Future research should consider developing a system that caters to multiple platforms, from desktops to mobile devices. Additionally, the microinteractions featured in the system, primarily sourced from Dribbble, may not accurately represent real-world applications.

APPENDIX A. INTERVIEW PROTOCOLS

As an initial step in the process, I will be interviewing subject matter experts in the field of animation for digital devices to gain information on the current state of knowledge in the animation field. **A semi-structured interview** will be carried out to determine the current state of knowledge in the field of animation. Questions will be asked about:

- Experience in the field (how long they have been in the industry and how did they get here)
- The process they go through (Design Workflow)
- Changes seen with the advent of newer technologies over time
- Talk about current classification databases and their method of classification
- How they would build a new classification system intended for novice and expert users

With the information obtained from the interview(s), I can build a body of knowledge on what experts in the field are experienced. This would be used to guide the building of the classification system and help understand what all elements are present while animating and what elements to consider when incorporating it into a new classification system.

APPENDIX B. USABILITY TESTING PROTOCOL

Initial Screening

Participants will be presented with the acknowledgment form to sign. The form will ask for consent to participate in the study, and they are okay with the data being published. No personal identifiers will be collected.

Participants will be asked to fill in their current status as students or professionals. Participants will also be asked about their current position title and workplace.

Participants will be asked about their experiences, how long they have been in the design industry, and their level of proficiency in User Experience Design ranging from Novice (0-1yr), Intermediate(1-3yr), Experienced(3+yrs). They will then be asked to rate their experiences with Motion design ranging from No Experience, Novice, Intermediate, Experienced. Experience includes professional only

Usability Testing

Participants will be given a version of the designed classification system. They will be given 10-15 minutes to look through the system and go through it. The platform will be hosted on https://www.gitbook.com/

Once the participants have spent time going through the system, they will be asked a set of questionnaires to determine its usability.

Once the participants have gone through the system, a set of semi-structured questions will be asked to gauge the participants understanding of the system

1. Does the system make sense in its layout?
2. Do you think the system is functional?
3. Did you learn anything from looking at the system?
4. Would the system make it more likely for you to integrate micro-interactions into your workflow? How and/or why?

Lastly, the participants will be presented with a System Usability Scale survey to fill. This scale will classify the ease of use of the system

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