EXPANDING AND DEEPENING OUR PALETTE OF INTERACTION

A tool for translating and articulating

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A thesis submitted to the School of Design, Carnegie Mellon University, for the degree of Master of Design in Communication Planning and Information Design

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Abstract

The range of digital interactions we see in our devices today falls short of its potential to create more nuanced and dynamic interactions. By unlocking our notions of how interaction design elements (described as the building blocks of interaction design) can be used, designers could create richer multi-sensory experiences that more thoroughly explore what digital experiences can be. For example, how a designer could create a thoughtful auditory or haptic experience that supports—or is independent of—the visual interface. This thesis attempts to reimagine designer's approach to translating digital interactions across experiences with an experiment in prompting reflection-in-action. Practitioners are asked to collectively reflect-on and reflect-in through an online design exercise. This method of causing and capturing focused reflectivity has designers describe different ways interaction design elements contribute to intention in experiences. Responses are captured on a website, becoming a survey of interaction elements as contributors help build a 'thesaurus' of what design elements can do. This thesis also describes the sociolinguistic and rhetorical theory that informed the design experiment. The goal of this work is to extend designers' ability to translate design elements into different sensory experiences through engaging with communication theory perspectives.

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A Thesis in parts

"The task of the translator consists in finding the particular intention toward the target language which produces in that language the echo of the original."

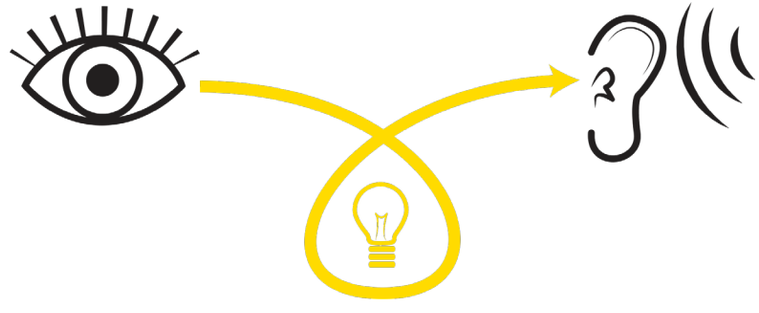
BENJAMIN WALTER

Introduction

an anecdote and an idea

WHEN I consider the things that most influence my design process, my English background stands out: it's the careful and consistent study of story, how things unfold, the dynamics between people, their motivations within a community, and behaviors. It is observing the ways that people communicate even without saying a word. Like design, it seeks to understand how humans interact in the world, but theirs is through the emotional medium of literature and communication rather that artifacts and services. I wanted to study how this perspective could enhance designers' work. Ultimately, my final approach was to use theory from the fields of rhetoric, language, and sociolinguistics and apply them to our understanding of design.

The application of these theories strived to help designers think about unconventional ways an outcome could be accomplished in interaction design while preserving a comparable experience. How, through making better use of all of our senses, one could re-create rich experiences across modalities. My motivation was to help designers practice how to render the nuances design non-visually, instead of merely copying the function of an interaction. In Benjamin Walter's The *Task of a Translator*, he explains that successful translations are ones that carry the intention of the original to a new audience (Walter, 1996). It privileges maintaining the experience over, for example, a word-for-word translation of a story. He makes the important distinction between what is meant and the way of meaning it. So, two languages might have the same word for 'bread' (German's *brot* and French's *pain*), but the force of its meaning is different when used in those languages. A truly poetic translation roots out the meaning so that both the original and the translation are equals even if details of the story are different. I endeavoured to expand designer's palette of interaction by deepening their perceptions of how design elements create meaning.



The project

DeSForM 2015 paper

"We address design challenges, theories and practices tied to the design of interactive experiences mediated by technology-affected artefacts. We explore this issue by three main lines of application: dynamic and smart tangible artefacts, multisensory virtualization of product experience, wise digital interactive experiences and services. The three topics of this year are mainly focused on the exploration of the cognitive and interactive processes activated by design artefacts, in which the technological component – intended in a broad sense – is employed by the designer as a mediator to enrich and enhance the experience of reality and information at different levels. We aim to discuss possibilities, limits and constraints of designing intriguing experiences with technology-affected artefacts (either tangible, virtual, or intangible), and to explore the balance between aesthetics, ethics, meaning and emotions in design." (DeSForM, 2015)

DESFORM 2015 CONFERENCE DESCRIPTION (DESFORM2015.POLIMI.IT)

The following paper summarizes my thesis project. It was submitted and accepted to the ninth international conference on D*esign and Semantics of Form and Movement: DesForM 2015: Aesthetics of Interaction: Dynamic, Multisensory, Wise*. This paper was double-blind reviewed and I will be expected to present this paper in Milan, Italy on October 13-17th 2015.

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Applied APA citation
Omitted abstract and acknowledgements (both shown previously)

"Expanding the Palette of Digital Interaction"

1 INTRODUCTION: A DISPARITY IN EXPERIENCE

In practice, many interaction designers still rely heavily on visual cues in the bulk of their work. Design is rapidly outgrowing its visual-focused tradition as we are called upon to create thoughtful experiences that account for all the senses (Haverkamp, 2012). Today, there are few technological barriers for creating multi-sensory experiences as well crafted as the visual ones on our devices. It is now becoming feasible that designers will regularly work on projects with no screens at all, with small screens (like wearables), or with immersive technology (like designing for the Oculus or "4D theaters"). But the path to creating artful non-visual interaction design experiences is not well-trodden.

This gap was brought to my attention recently when I was learning how to design for accessibility. Part of the training included a day-in-the-life video of a vision-impaired woman. Meant to help viewers understand the day-to-day context that blind people live in, it included activities like finding a misplaced set of keys to using public transport to running an errand. When the woman demonstrated how she uses her smart phone, I was struck by the clumsiness of the interaction. It had been a perfect opportunity for interaction design to serve, but the actual experience was noticeably undeveloped. The device's interaction with her was crude at best and, when compared to the careful visual details of the interface that she couldn't see, it was barely functional (it could not even recognize her name when she said it). The time that went into marrying the typography, the speed of screen transitions, and colors of a screen to develop the brand's identity was lost to her as an electronic voice haltingly dictated the page's content. What if accessibility went beyond transferring mere functionality and focused on translating the complete beauty of an experience?

Enhancing these currently marginalized moments—like creating an auditory experience *independent of* or *interwoven with* the other

modalities—benefits visually-impaired and sighted users alike. For instance, designers could reposition how haptic feedback is typically used from a subordinate experience (turning on vibrate 'just in case' we can not hear our phone ring) to a primary role in order to translate an experience to a screenless wearable. Digital designs that are made to be more nuanced, multi-sensory, and sincerely adaptable could make experiences truly inclusive.

Researchers like Erik Stolterman point towards a more dynamic device landscape with new interaction design challenges, but mainstream digital interaction today feels constrained by our tradition of designing static, two-dimensional pieces (Stolterman, Jung, Will, Martin, 2013). When companies like Google and IBM release extensive design style guides prescribing design patterns, those patterns waterfall into conventions and can constrain perceptions of what is possible. Designer and engineer Bret Victor vented his frustration that interaction designers are following the same approach to interface and device interaction over and over again. He challenges us to design with the future in mind: instead of continually designing interactions between fingertips and glass, he points to the rich market of already existing assets, like research in haptic technology and tangible interfaces (Victor, 2011).

But how do professional designers continue evolving the way they use interactions in order to design for the future? Presumably they are attending interaction design conferences, reading books like Dan Saffer's *Microinteractions* or Jon Kolko's *Exposing the Magic of Design*, or even using creativity tools like Synectics or John Lockton's "Design with Intent Toolkit." This project offers another professional development opportunity through an interactive challenge aiming to deepen designer's impressions of interactions. This exercise is informed by research on the benefits of reflection-in-action and from rhetorical and sociolinguistic perspectives of communication patterns. This online activity functions becomes both a method for inciting and capturing the more tacit knowledge of designers.

Participants will have the opportunity to engage with their profession on a more personal level as they co-create definitions of use, catalogued on the website's wiki-like database.

The scope of this project was to examine screen-based interaction techniques (as opposed to rather than industrial design, for example), though examples of physical interactions (those between device and person) are given to aid understanding. In digital interactions reimagining what is possible is an interesting problem: devoid of form, it is completely up to the designer to create experience. Like words for a writer, the designer creates experience in the minds of its user through the skillful blending of interaction elements.

2 REFLECTION IN THE DESIGN PRACTICE

This investigation acknowledges the work of scholars like Jonas Löwengren and Erik Stolterman for building a relationship between reflection and interaction design (Löwengren, Stolterman 2004). Influenced by Donald Schön, these researchers elevate the conscious articulation of designers' knowledge as a compliment to learning-by-making activities. Schön's work on action-oriented knowledge introduced a formal study on reflection for professionals. The two primary ways for accessing knowledge are reflection-*on*-action (revisiting the decision-making process of past activities) and reflection-*in*-action (the spontaneous reflection that occurs in the midst of interaction) (Löwengren, Stolterman 2004; Schön, 1983; Yanow, Tsoukas, 2009). A more critical questioning—or *practical reflectivity*—of designers' work helps shake up "taken-for-granted assumptions" and re-open broader possibilities (Forlizzi, 2000; Yanow, Tsoukas, 2009). The exercise attempts to tap into the value of reflection-in-action. This is not a new activity, but an experiment with creating it. Going through a reflective exercise and articulating one's thoughts on more abstract qualities of

interaction design may help shape new designers' critical eyes, like how explaining the elements of typography helps students be more discerning of typography they encounter in the future. Articulation of these ideas (talking or writing about them) commits attention to these ideas, solidifying previously unconscious knowledge. Already practicing designers have the opportunity to empower their design process by being more conscious of the improvisation they already do. Articulated reflection changes from a descriptive activity into a chance for designers to continue advancing their understanding of design. This learning is an intrinsic outcome of being a reflective designer: "To reflect means that you use your critical mind to examine your role as a designer; it requires you to examine the purpose, outcomes, and benefits of doing design in different ways, and using different methods, tools, guidelines, or theories" (Löwgren & Stolterman, 2004).

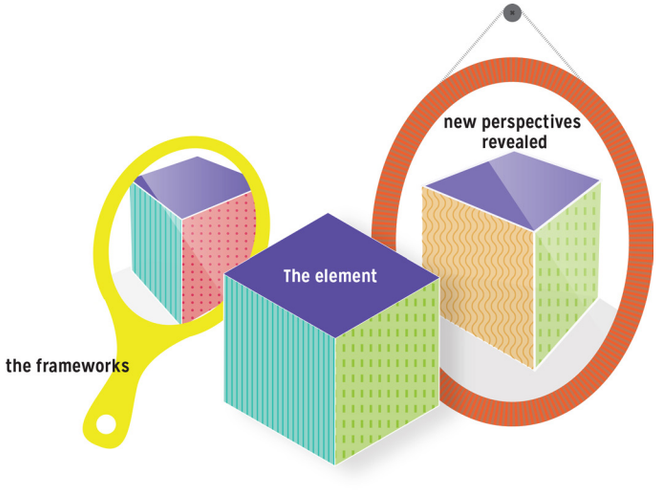


Fig. 1. Illustration of concept: the reflection caused by the framework-based prompts help reveal already available possibilities of an element that might otherwise remain hidden

These ideas are supported by Albert Linderman's work on drawing out tacit or less apparent expert knowledge through articulating past activities ("sense-making") in order to surface new insights on one's work (Linderman, Baker, Bosacker, 2011) (Figure 1). He worked with top business executives to capture some of their tacit knowledge before they left a company. He found that expression of actions (i.e. verbalizing) caused participants to re-live the activity and reveal surprising reflection-*in* moments. These reflection-in moments are arguably more accurate accounts of tacit knowledge (Yanow, Tsoukas, 2009). Having improvisational opportunities to study one's profession may help designers create innovative experiences independent of science and technology (Steffen, 2010).

3 AN INTERACTION DESIGN EXPERIMENT AS INTERVENTION

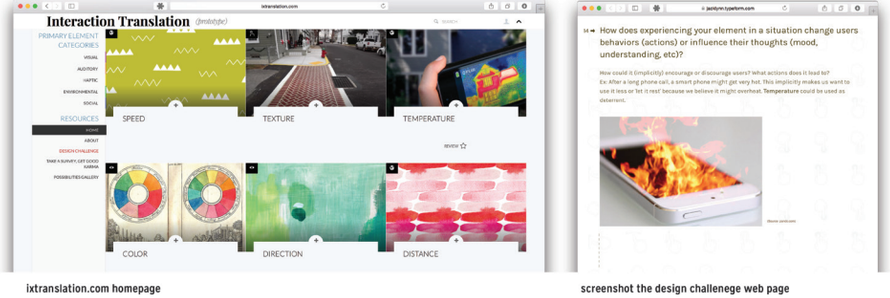
This project centers around describing interaction design elements on an in-progress online website: ixtranslation.com (Figure 2). For the purposes of this paper, *interaction design elements* are defined broadly as the atomic qualities of interaction that can be manipulated and combined to create interactions (Table 1). This is similar to how words and sentences are arranged to create a story. For instance, in graphic design: typography, scale, color, and position might be used to create document hierarchy. In digital interaction: animation, transitions, timing, sounds, vibration, and sequence might be manipulated to create a new experience.

INTERACTION DESIGN ELEMENT EXAMPLES WITH A FOCUSED ON SCREEN-BASED INTERACTION RESOURCES

Visual	Auditory	Haptic	Movement	Contextual
Typography Color/Saturation Scale Weight Transparency Graphics Media/Video White space Expectations	Volume Speed Pitch Direction Distance Timbre Timing "earcons" (short, associated sound)	Vibration Orientation Physical movement of device Texture Proximity Weight Where on the body it interacts with	Animations Transitions - scrolling - direction - in/out - expand/collapse - reveal/hide - application of physics	Location (of user/device) Ambient sound Environment data (temperature, time) Speed of device (GPS) Data on previous activities Information on other users (location, previous interactions) Social account information User's planned calendar

Table 1. Examples of interaction elements.

An initial prototype has been built using WordPress that provides users with collaborative wiki-like functions like font-end entry submission, editing, and commenting. Entries for elements include 1) the name of the element, 2) a general definition, 3) common examples of it in use, and 4) responses to how it is or can be used in interaction design based on different frameworks (to be explained in more detail later).



ixtranslation.com homepage

screenshot the design challenege web page

Fig. 2. Screenshots of the ixtranslation.com homepage and design challenge web page

Participants are encouraged to respond to the element using six different frameworks: *informational*, *orientational*, *feedback*, *metaphorical*, *indexical*, and *performative* (Table 2). It is preferred that visitors will interact with the framework implicitly by submitting an entry through

a design exercise (called a 'design challenge' on the website), however they may also learn about the frameworks by reading about them on the website. This exercise questions participants on the subject of each of the frameworks. Table 2 shows how the prompts are communicated to discover the perspective of the frameworks, but that the participant needs no prior knowledge of them to respond. These responses are then published on the website (after some moderation) as an entry so that, ultimately, participating in the design experiment helps build new entries in a growing library of interaction elements.

HIDDEN FROM USERS		VISIBLE TO USER	
Category	**Definition**	**Example prompts**	**Example element: Temperature**
Informational	Literal; What is shown is what is meant	How could/is the element informative? At the most basic level, when is this element used to provide purely functional information?	A thermometer measures temperature; the unit of measurement it outputs is purely informational.
Orientational	Provides wayfinding information for user through a process or a screen	How is/could this element be used to direct the user within the screen, system, or activity? Is the element used for wayfinding or tell you where you are in a system?	Thermal vision creates literal maps based on temperature
Feedback	Response to action by user or device	How could/does this element provide feedback on user interaction? What would it happen to this element is used to respond to user input?	We might put a hand over an old toaster after turning it on to feel if it's warming up or not
Metaphorical	Representing one thing in terms of another; often used to enhance understanding	How does this element represent or borrow from real life in order to enhance understanding by users? What metaphors does this element use?	Something 'hot' can be a metaphor for something popular Digital temperature might be displayed like a mercury thermometer
Indexical	Making use of identity and expectations between sender-receiver	How can/does the element help reveal knowledge about a system, brand, or actor? How might using this element tell you something about the identity of the device (its brand, etc)?	If a weather app portrays a happy sun versus a sad storm cloud, a person learns that the brand believes that sunshine is more desirable than rain
Performative	Eliciting of action based on shared understanding of a situation	How does experiencing your element in a situation change users behaviors (actions) or influence their thoughts (mood, understanding, etc)? How could it (implicitly) encourage or discourage users? What actions does it lead to?	A warm bus seat might deter someone from sitting on it because they might associate it with being recently used

Table 2. Overview of evaluative framework applied to each element of interaction on the wiki and how they were presented to users

The six sections of entries are intended to help reveal new possibilities of elements that a designer hasn't considered before. The act of articulating these possibilities through writing encourages participants to express, in concrete terms, how elements can be used to create experiences. In other words, participants are forced to solidify their thoughts rather than letting half-ideas float away undefined, and are therefore more likely to remember them. The exercise is most rewarding when participants go through each prompt to think about an element from different perspectives. To explain the activity more concretely, imagine the element—normally something like 'color' or 'tempo'—is instead a paper cup in your hand. You are asked what it is for. Your first answer is that the cup is a tool for containing liquid you intend to drink. But with each additional question your mind finds other possibilities: you recall that it could help you build a sand castle, you could wedge it under a table leg to sturdy a wobbly table, you could write a message to a friend on the surface, or you could cut it up and make something new. The framework-based prompts also help prod your preconceptions of an element to reveal new facets of use.

The design challenge instructions communicate to participants (and it is true) that there are no 'right' or 'wrong' responses, just the goal of stretching their assumptions of design elements. Table 3 provides a condensed version of a participant's (a design professional) response to the design activity. It is clear that he is thinking intentionally about the element and it's use.

The website began as a way to systematically define elements, but this thought experiment became a key benefit of the system. Participating transforms *narrative* experiences (which "force us shift to thinking about and formalizing in language what we are doing and experiencing") into cognitive ones as our assumptions or attitudes are questioned (Forlizzi, 2000). While it is true that designers do not typically work without the context of their projects, this does not invalidate the kind of creative

ENTRY CREATED FROM PARTICIPANT OF THE INTERACTION DESIGN CHALLENGE (CONDENSED)

Definition	Motion is any movement or change in position or time (wikipedia)
Answers 1-6	· **Informational:** "Motion is naturally highly informative, if used with thought & intent. Very few successful motions exists on their own. This element is used to connect sequence through structure; highlight elements and dim others through zooms; relay a mood or feeling through embodiment. It is a design element that is 4D in that it uses time as a variable." · **Orientational:** "Because motion is an "in-between" design element, it is difficult to pinpoint "A" example. One approach is to see motion's role; it acts as a bridge. It is a mechanism for feedback that needs to connect a user action with a task the user is trying to accomplish. Because the user is often trying to accomplish a multitude of tasks with limited input options…motion, is very important in making the experience feel connected and seamless." · **Feedback:** "Motion can be invariably used for many, if not almost every digital interaction. However an element unique to screen based interactions might be in ability to give contextual feedback to user actions and commands." · **Metaphorical:** "Motion uses a lot of natural physics; action and reaction. Some examples are elements that are overlaid upon one another have shadows (3D), elements that are in the distance fade (proximity)." · **Indexical:** "The beauty and great challenge of motion is that it is inherently intuitive. But let me clarify. Motion is intuitive to judge whether or not it is working, but it is not as intuitive to create interactions. This is often because 1. interactions need work across demographics. 2. but every demographic and culture is different. 3. because we experience a large part of motion intuitively, it is difficult to clearly identify and articulate the entirety of what constitutes the motion and effect you are trying to design/achieve." · **Performative:** "An unintuitive, unnecessary, repetitive, redundant motion or transition can be very distracting, annoying, and even downright painful to use an app or interaction. This often appears in PowerPoint presentations or even a PowerPoint alternative called Prezi."

Table 3. An example of a participant's response to the interaction design challenge (does not include the picture examples they provided).

thinking that comes from discussing an element in isolation. Designer and researcher William Gaver talks about how a certain ambiguity of context can elicit a more open outlook of what is possible (Gaver, 2003). It might cause designers to question their assumptions and think of new functions. For example, there was a participant who was discussing the element of 'scale' in the design exercise. She recognized how it is used in graphic design to show quantity or importance. She had even considered how scale is used to create grandeur in architecture, like in old cathedrals. She drew a blank, however, when thinking of ways that scale could be used to provide feedback (feedback is when a system responds to a user input, like a button changing color when you hover over it) (Saffer, 2013). Still pondering 'scale' later than night, and, having done some handiwork over the weekend, she remembered searching for just the right size screwdriver in order fix a shelf. She realized that

screwdrivers use scale (size) in order to allow or prevent users from committing certain actions. Here, she had continued strengthening her understanding of scale even after completing the exercise and discovered previously buried ways the element could be used in future digital interactions to provide feedback.

While this website collects descriptions of design elements, the project does not seek to be a conclusive document on interaction design. It serves as an intervention between designers and the stale design patterns they might fall victim to in regular practice. This could be especially helpful for design students who may not be as practiced at (or comfortable with) challenging design patterns. The website also showcases of the collective knowledge of the design profession as it evolves: its members discussing a growing number of elements (or resources) that they can manipulate. The resulting repository of elements and definitions can also help inspire designers when they are feeling stuck. For instance, one participant was working within design constraint and she used the website as a reference of tools she could manipulate. She wanted to alter a shape to communicate different things, but had exhausted several transformations already. When she browsed the collection, she found an element she had not thought of applying yet (transparency) and employed it in her final project.

Professions peripheral to design, like engineering or project management, could also be served with this system. These other professionals do not intend to immerse themselves in design (and therefore never acquiring knowledge-by-doing), but will still have the opportunity to learn about the complexity of refining elements into thoughtful interactions by reading entries on the website. Overall, this online collection has the potential to create distributed knowledge among design practitioners, students, academics, and, inter-disciplinary team members (Borchers, 2001).

Despite impressive work testing the boundaries of rich interaction design in industrial design (Djajadingingrat, Wensveen, Frens, Overbeek, 2004; Kyffin, Feijs, Djajadiningrat, 2005) and full-body interactions of both sound & visuals within the HCI department at Carnegie Mellon University Harrison, 2015), there still exists an innovation gap between recognizing the potential for new interaction techniques and actually using the elements available in new ways, especially for new or student designers. Professionals who contribute to the collection can re-evaluate the tools of their craft and discover different ways for creating more thoughtful interactions. The result is collaborative thesaurus of different ways design elements can be manipulated across modalities.

4 INFLUENTIAL THEORY: COMMUNICATION PATTERNS AND INTERACTION DESIGN

At the heart of this design experiment is developing sensitivity to the intent of an experience in order to richly translate it. Humans are most practiced at judging intention through our social interactions. Like researchers have discovered before, this paper accepts that there are comparable patterns of communication between human-computer interactions as the conventions we see in human-to-human interactions. When we understand human-computer interaction as socially constructed, it can benefit from the same conventions gleaned from communication among humans. For example, Wendy Ju's work, *The Design of Implicit Interactions* (2015), uses linguistics, sociological, and ethnographic perspectives as a way of designing more nuanced interaction (Ju, 2015). A better understanding of these theories will bring more maturity to the practice of design, especially when applying non-visual elements, which have a younger tradition in digital interaction. The design challenge helps participants engage with this theory, learning by experiencing the ideas inspired by it.

Scholars like Richard Buchanan and Klaus Krippendorff have described the relationship between design and rhetoric (Buchanan, 1985; Krippendorff, 2006). Buchanan's work establishing a connection between rhetoric and design provides a significant foundation for evaluating the non-verbal communicative aspects of design. By accepting that designed objects (industrial, two-dimensional, virtual, etc.) exhibit a persuasive force—influencing actions, creating values, and shaping individuals and communities—we open them up to a rhetorical understanding (Buchanan, 1985). Krippendorff proposes looking at design through a linguistic lens in order to bring about "new ways of conceptualizing the world and new practices." (Krippendorff, 2006). This "languaging" of interaction design elements provides a model for how elements can be used to create an experience.

It's important to distinguish that this project does not focus on the grammar or syntax side of linguistics when applying this perspective to design. Work has been done describing the semantics aspects of design, like Krippendorff applying a semantic foundation to design Krippendorff, 2006, Kress & van Leeuwen describing rhetorical force of visuals (Kress, Leeuwen, 2005), and, less directly, in Steffen's work with describing the history of design semantics and its role in product innovation (Steffen, 2010). Designers may use a semantic, or literal, understanding of elements at our disposal to broaden their view and a more pragmatic view (how things are actually used) to deepen their perspective. Evaluating interaction design on how it is actually used and what affect it has on people is more appropriate when translating experiences. It accounts for things like behavior, culture, and preference in interaction design. The linguistic study itself has progressed from focusing on the literal definitions of words to one more interested in language-in-use, context, and social relationships. By examining how people use elements within design's language, we address more ways they can transform independently from the designer's original intentions (Redström, 2008). A simple example is that the element of *vibration*, used as a notification on

phones. It's designed to be another way of receiving alerts even though the phone is on silent mode. But, as any user knows: it is not silent. Students can too-often be found using the low noise from the vibration as a socially acceptable way to let their phones quietly ring in class. There is a curious unspoken agreement where most people courteously ignore the noise because they believe that the owner intended for the vibration not to be heard, only felt.

These rhetorical and sociolinguistic theories touch participants the most in the last three of the frameworks: *metaphorical*, *indexical*, and *performative*. Again, participants were prompted to describe in the elements using these and three other frameworks.

METAPHORICAL INTERACTIONS. At its most basic level, metaphor is a way of representing one thing in terms of another. These metaphors transfer a complex or unfamiliar image to a more straightforward one to ease interpretation. Much of interaction design deals with metaphor, a well-studied area in rhetoric. As Lakoff & Johnson explore, metaphors can either be *representational* or *structural* (Engelhardt, 2002; Lakoff, Johnson, 1980). In *representational* metaphors, what is presented is based on a real-world experience. For example, some digital calendars are designed to look like physical calendars, from creating shadows to animating page turns. There are also culturally created symbolic relationships like slowing down or speeding up being represented by a picture of a tortoise and a hare, respectively. These symbols are more meaningful for people who know of the story of the "Tortoise and the Hare." A *structural* metaphor refers more deeply to how we understand a concept and therefore perform it Lakoff, Johnson, 1980). For instance, there is an underlying structural understanding that 'good' is represented as 'up' and 'bad' is represented by 'down.' Evidence we think this way is rooted in speech: "I was feeling *down* yesterday, but my spirits are *up* today." These kinds of culturally embedded metaphors are present in the way we design interactions. Positive interactions are rewarded with a

high tone while negative ones (like loosing in a video game) result in a tone lower in pitch. Apple's Time Machine application (a hard drive back up and restoration service) includes another structural metaphor where time is physical and directional: we typically move forward for the future and backwards for the past. Giving time a dimension, the application, it creates a time-ordered stream of one's window/document in a physical space (Figure 3).

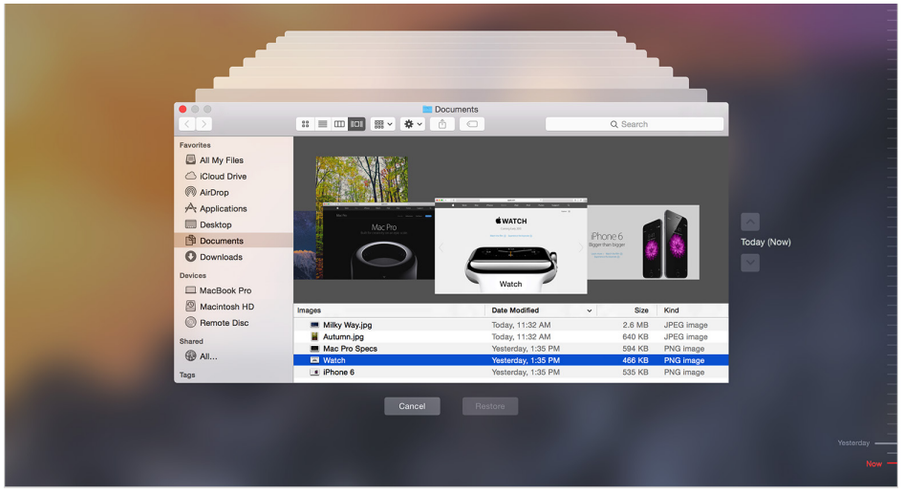


Fig. 3. Apple Time Machine user interface (UI) (via support.apple.com).

Although the UI actually moves forward to access past versions of documents, users can mirror their mental models of the movement through time and understand what is happening. More closely aligning our digital interactions to the structural metaphors we live by could help us create interactions that are easier for new users to adopt.

INDEXICAL INTERACTIONS. Knowledge about identity is expressed in interactions through our indexing, or the construction of values or positions through social interactions (Bourdieu, 1991; Bucholtz, Hall, 2005; Goffman, 1959). When applications like Facebook reorganize its layout, giving priority to a newsfeed as "Home" rather than our profile page, we may interpret this as Facebook valuing staying up-to-date with our network's activity more than contributing content ourselves.

This framework explicitly considers design to be for and part of social interactions where actions are interpreted as meaningful. It touches on interpreting interactions *between:* between user and device, user and user, and user and the world. The work by J.L. Austin connected language and action by exploring our ability to understand the deeper intention (*illuctionary force*) behind a speaker's literal (*locutionary*) actions, whether verbally or non-verbally communicated. Austin explains that exchanges and actions are influenced by predetermined agreements among groups on what an appropriate response is within a rhetorical (recognizable) situation (Austin, 1975; Winograd, Flores, 1986). In other words, a successful linguistic exchange happens someone responses in an expected way to another person (Austin, 1975).

These expectations can be directed by designers like creating an identity for the device or brand. For instance, MailChimp (an email marketing service provider) has been celebrated for its style guide that explains the voice & tone of their brand's messaging. This guide explicitly asks their designers to consider the user's feelings per action in order to craft an appropriate content (MailChimp, 2015). It also provides tips and examples of a MailChimp-approved response. When these stylistic choices are thoughtfully used across a service, like MailChimp, they have the ability to create a personality for the brand that is recognizable and influential for a user.

PERFORMATIVE INTERACTION. Performative interactions are socially-constructed forces, which exhibit a power over the user's actions, emotions, or behavior (Austin, 1975, Fairclough, 1992, Winograd, Flores, 1986). They are understood gestures (*illuctionary forces*) that lead the receiver towards expected actions or performances (*perlocutionary*

actions) (Austin, 1975). In sociolinguistics, it is not only words themselves, but also the recognized situations that determine the exchange between a speaker and receiver (Austin, 1975, Bucholtz, Hall, 2005, Fairclough, 1992, Goffman, 1959). This takes into account the identity of the speaker, their relationship to the receiver, where they are, the props they might use, and the quality of performance they give.

Performative interactions are related to *triggers* in Fogg's Behavior Models on persuasive interaction (the trigger of a behavior); however, it is more implicit, like a nudge that considers more of the context and the performer's role in the persuasion (Fogg, 2009). These implicitly persuasive interactions encourage a user's behavior based on conventions or cultural norms. In language, when someone asks, "Is there any salt?" it is understood in context that the speaker is requesting salt, not voicing his curiosity to know if salt exists in the world. In interaction design, when a user is typing in a text field and it expands, the system has invited him to write more. If it remained a small text box that does not expand, the user is apt to write less because the structure makes it seem inappropriate.

Adding these three perspectives to the design process can help professionals approach their 'interaction vocabulary' differently and understand the nature of creating more human interactions.

5 CONCLUSION

The design exercise presented in this paper is a creativity tool based in theory made to help deepen our sense of design elements and, as a result, expand our palette of what is possible. It uses articulated reflectivity to engage with one's practice and one's curiosity. The exercise is a less didactic way to continue learning different facets of experience creation and, since the entries are published, captures that insight for others. As a public project, it could come to represent the joint definitions

of interaction design elements from scholars, students, and seasoned practitioners alike. Löwengren & Stolterman see the potential of reflecting-in and reflecting-on practice as source of creating the product of knowledge for the entire practice: "Design theory can be seen as knowledge that can liberate the designer from preconceived notions and conceptions of how the design process can and should be performed," (Löwgren, Stolterman, 2004).

With dynamic, multi-sensory, and wise devices among us, there should be a commitment to creating thoughtful interactions across senses. As our devices and the way we use them changes, it is urgent that designers rethink how digital interactions are constructed in order to convey implicit intentions as well as function. The range of interactions in typical devices does not adequately represent what is possible.

Communication perspectives from rhetoric and sociolinguistics studies can help us reimagine 'how' and 'for what' interaction elements are used. These disciplines offer insight on how intention is transferred from a speaker to a receiver indirectly. Experimenting within these theories allows designers to critically examine how elements create an experience and speculate on how other elements could enhance or adopt the same communicative qualities. For example, if a visual element helps convey a sense of security, how could an auditory or haptic element perform the same function. Working with these theories through the design exercise may allow designers to more readily see innovation opportunities and finally give substance to marginalized digital experiences.

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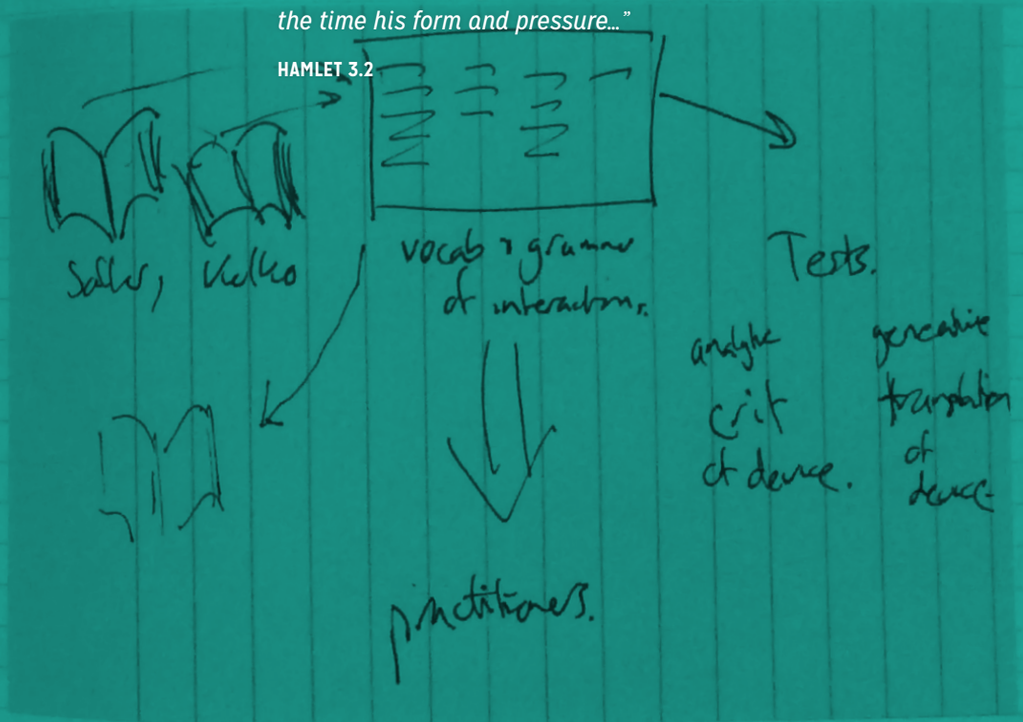
Appendix A:

Additional literature

"Be not too tame neither, but let your own discretion be your tutor: suit the action to the word, the word to the action; with this special o'erstep not the modesty of nature: for any thing so overdone is from the purpose of playing, whose end, both at the first and now, was and is, to hold, as 'twere, the mirror up to nature; to show virtue her own feature, scorn her own image, and the very age and body of the time his form and pressure..."

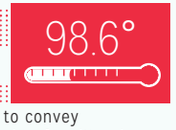
HAMLET 3.2



Design and language studies

Richard Buchanan has described design rhetorically, citing "[its] persuasion comes through arguments presented in things rather than words; they present ideas in manipulation of the materials and processes of nature, not language" (p. 7). His work helped open up a way for design to be studied from a communication perspective. The following was some of the additional readings that helped shape my final frameworks. This is an expansion upon the literature review already mentioned.

The Frameworks: redux



INFORMATIONAL

Elements that are used to convey information can be thought of as literal interactions: what is shown is what is meant and is informative for the user.

METAPHORICAL

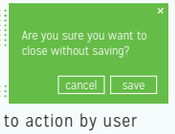
Elements are metaphorical when they make us understand one thing in the terms of another.

ORIENTATIONAL

Way-finding elements in digital interactions provide orientational assistance to users, informing them where they are in a system, page, or process. Orientation can also include directions in the physical world.

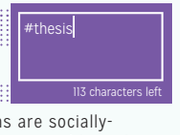
INDEXICAL

Indexical interactions reveal social knowledge. For example, during social interactions our position on something (its value, how to define it, etc.) is revealed through actions.



FEEDBACK

Feedback is a response to action by user input or the device. Common occasions are: confirming an action, announcing that a process has started/ended/is ongoing, drawing attention to errors, etc.



PERFORMATIVE

Performative interactions are socially-constructed illuctionary actions (through performance or words), which exhibit a force on the user's actions, emotions, or behavior.

DESIGN AS SOCIAL. Johann Redström states that "designing a technical object is also typically entails designing, or prescribing it's use" (2008, p. 411). Hi work investigates what 'use' means for designers. He makes distinctions between intended use, actual use, and the relationship between. He is interested in designs that require user participation (to customize them, for example) so that, in some cases, the artifact shows the handiwork of both the designer and the user (p. 410-411). He gives personal computers of as an instance where a product is created and delivered to a person, who then modifies it so much so that eventually the computer is a dramatically different product. Not just through the physical wear, but the structural components of it through customization, new software, etc. I used this cognitive exploration of how we understand 'use' in relation to language studies' own shift in thinking from literal definitions (semantics) to the way that language is actually used, like Austin's Speech Acts (1975). I was interested in describing not what was happening , but in discovering what could happen.

Bruno Latour also discussed the inherent behavior of artifacts to engage with us (1992). He states that artifacts replace humans and stand in for our values. His famous example is how a door butler reflects a society's desire for a closed door. A door butler that doesn't react how we'd like it to, isn't just dysfunctional, it's rude. Artifacts have influence over how we act in the world. Like, within Margaret Morrison, the left side door (the one without the wheelchair mechanics) is easier to open so people who use the building often are more apt to funnel through that door. Using this perspective helps designers consider the (moral) implications of their work as they develop products that interact with the world as an entity itself that should follow the same conventions.

DESIGN PATTERNS. Christopher Alexander's work defining patterns in urban design influenced the practice of recognizing patterns in design (1977). HCI researcher and designer, Jan O. Borchers, describes pattern language as "a proven solution to a recurring design problem" (2000,

p.1). Flushing out these patterns gives designers more authority as their knowledge becomes more explicit. This helps other disciplines recognize and understand the design practice through a common language. Dagmar Steffen also makes an important point how design is as instrumental part of innovation for creating the semantics (or patterns) of an artifact (2010). For instance, he gives the example of the radio failing when it was first released in the 1920s because it was missing the "characteristic nature" for people understand and use the technology (p. 5). It wasn't until a few years later when industrial designers were able to craft the product that dominant patterns began to develop (signs) that made radios understandable and easy to use.

Sociolinguistic theoretical foundation

In reaction to the way linguistics was being studied in the past by theorists like Saussure, the literature I surveyed had a different emphasis, valuing things like language in use, context, and social relationships over dry definitions. For example, overall, the authors I read were much more interested in the sender-receiver dynamic of how people use language as actions ('sender'/'speaker' is used broadly to cover both verbal and non-verbal communication). The authors focused on different issues within the relationship between language and society, language and power, and language and identity. This is a different approach from the more literal languaging of design seen before, like Krippendorff's *Semantics of Design* (2006), Kress & Van Leeuwen's *Reading Images: The Grammar of Visual Design* (2006), and Engelhart's *The Language of Graphics* (2002).

SOCIAL. Austin (1975) and Fairclough (1992) both consider context necessary for understanding and interpreting meaning. For example, Austin makes distinctions about the success of Speech Acts based on shared understanding of cultural norms. In order for felicity conditions to be 'happy' both parties must be aware of the conventions of the situation and participate correctly. By Austin's definition, *illucutionary acts* are when the speaker's words have a certain conventional force that communicates the speaker's intentions. Like, when a priest pronounces a couple 'married' at wedding ceremony they become married at his words. The couple is physically the same as moments before, but now the entire group recognizes them as different. This is because the priest is acknowledged as the official that can marry people, the couple has performed their consent, and participants interpret it as a state-changing ceremony. The speaker has delivered a message (sometimes not explicitly stated) and the audience, knowing the conventions, will perform the *perlocutionary act* that the speaker elicited. Fairclough builds of Austin's work, defining discourse itself as "language used as a form of social practice" (1992, p. 63). Fairclough creates a framework for analyzing discourse: how language creates social identities, social relationships between people, and systems of knowledge and conventions among

groups. This social aspect of language could help designers see how the conventions among people could be applied to human-computer interactions to create more intuitive interactions, something that researchers like Wendy Ju have pointed to. This helps us see how meaning is created through actions or how to create interactions more closely related to how we understand each other in conversations.

IDENTITY. Bucholtz & Halls describe how identity is express through social discourse through their work re-defining identity as a product of language that occurs during "social positioning of self and other" (2005, p. 585-586). Previously, they explain that identity was thought of as fixed qualities held in a person's mind, but the authors found a more malleable and mobile form of where identity is "a discursive construct that emerges in interaction" (Bucholtz & Halls, 2005, p. 587). By this they mean that our identity manifests itself in social actions, especially language, where we position ourselves in relation to socially recognized groups. Authors like Kang & Chen (2014) and Charland (1987), explored how language creates narrative that people use to align or dis-align themselves with, uncovering their values. For instance, Kang & Chen explain that stancetaking involves positioning oneself "with respect to specific beliefs, values, and ideologies" (2014, p. 206). Charland discusses how the presence of a narrative by default creates a distinction that otherwise would not exist, providing the opportunity for 'hailing and interpellation'—for people to find themselves identified in a narrative (p. 138).

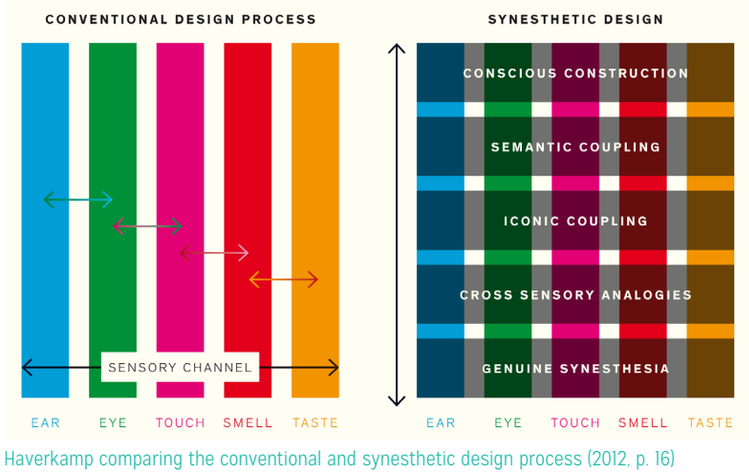
This was an interesting viewpoint to bring to interaction design. Actions and appearances on our devices can be a tool for expressing the identity of the product (or the designer behind it). It makes use of how

we naturally read into the presence of an element as it having some significance. For instance, we might view the animated bounces of a website as part of its personality. Or, if a button wiggles and pulsates, we read it as more important than other buttons as a call-to-action. What an application chooses to show and hide speaks to what the designer thought was most important for the user to notice.

POWER. Bourdieu compares competence in language to the ability to participate in a linguistic market where a command of language gives speakers a symbolic power (1991). One way we see this happen is in the creation of formal and informal speech though education in school. Those that can speak formally gain the authority and privilege within the society. Having sway and in this market means knowing apply different styles of discourse to your advantage. For instance, there is a social understanding between a politician and his audience of what is expected in a speech. His decision to be more or less formal affects the audience differently. Speaking informally in a town hall meeting might give the politician a positive impression because he seems more relatable, whereas speaking informally to a foreign audience might make him seem disrespectful. Beyond language, it is worthwhile to see how interaction designers can navigate between the expected (formal) patterns that might be established by large companies and developing their own style in order in order to sway interactions. Bourdieu and Goffman's (1959) work on performance describe the variety of ways communicating skillfully can gives you great influence (1959). Designers considering how they craft a multi-sensory design language with the same skill as our current visual language better accounts for a complete user experience.

Multi-sensory & implicit design

I explored the literature around creating multi-sensory experiences that are as sophisticated as our human-to-human interactions. This is different from merely creating systems that account for non-visual senses, something that has been technically possible for a long time, but creating experiences that better coordinate all of our senses. Haverkamp argues for creating more synesthetic interactions that strategically engage the senses according to the need of the product features (2012). Developing skills for creating a immersive activities is important because "sensory experience with one modality involuntarily triggers percepts in another" (Power, 2007, p. 6). We see these sensory exchange happens like when we see something disgusting and it makes our skin crawl. Or, in Power's more tangible example, when see a hairbrush, we can vividly imagine what it would feel like if we put it in our mouth. Understanding and accounting for this could help designers create better products according to their goals.



Haverkamp comparing the conventional and synesthetic design process (2012, p. 16)

In 1989, William Gaver was arguing that our use of sound was extremely limited and didn't represent the elegant manipulations that we experience in real life (p. 69). Today, we still don't see that richness of non-visual senses. Designers could, for example, make the best use of the qualities of sound to better enunciate the information that would be clumsy if displayed graphically, plus, creating a more robust system for sound design could enhance the experience for visually impaired users (p. 72). Gaver explored the qualities of 'everyday listening,' or, how we can interpret the qualities of sound that we hear in our daily lives, even if we couldn't determine measurements like pitch and timbre. For instance, all the information we might glean from a closing door: the material of the door, its size or weight, the size of the room it is shutting out, and perhaps how old or new the mechanics are. He proposed this beautiful idea of giving these sound properties to our digital interaction design in order to give us a more dimensional experience. We could create genres of auditory icons so that, perhaps, all text files on our computers always sound wooden (p. 76).

ATTRIBUTES OF EVERYDAY LISTENING

	Perceptual Attributes	Effects on Soundwaves
MATERIALS	Restoring Force (e.g. hardness, tension)	Overall frequency
	Density	Frequency
	Damping	Frequency dependent amplitude functions of partials; frequency
	Homogeneity	Complex effects on spectrum and amplitude function
CONFIGURATION	Shape	Spectral pattern, frequency
	Size	bandwidth, frequency
	Resonating Cavities	Changes in amplitudes of partials; may be primary determinant of sound quality
INTERACTION	Type (e.g. hitting, scraping	Overall amplitude function, spectrum
	Force	Bandwidth, amplitude

William Gaver (1989, p. 74)

Wendy Ju describes how being sensitive to communication cues when designing could help create implicit interactions (2015). These interactions assume that people can be critical of artifacts in order to create more socially dynamic interactions. These demand less of our attention constantly and instead enter our awareness only when they are wanted to because they are conscious to our social cues. Dan Saffer's also described how the small details of interactions, 'microinteractions,' help develop a quality experience overall (2013). These are the details that can bring personality and life to a design. Using the analogy of conversations, these would be the qualities of a person that make them friendly or helpful that make you want to talk with them again.

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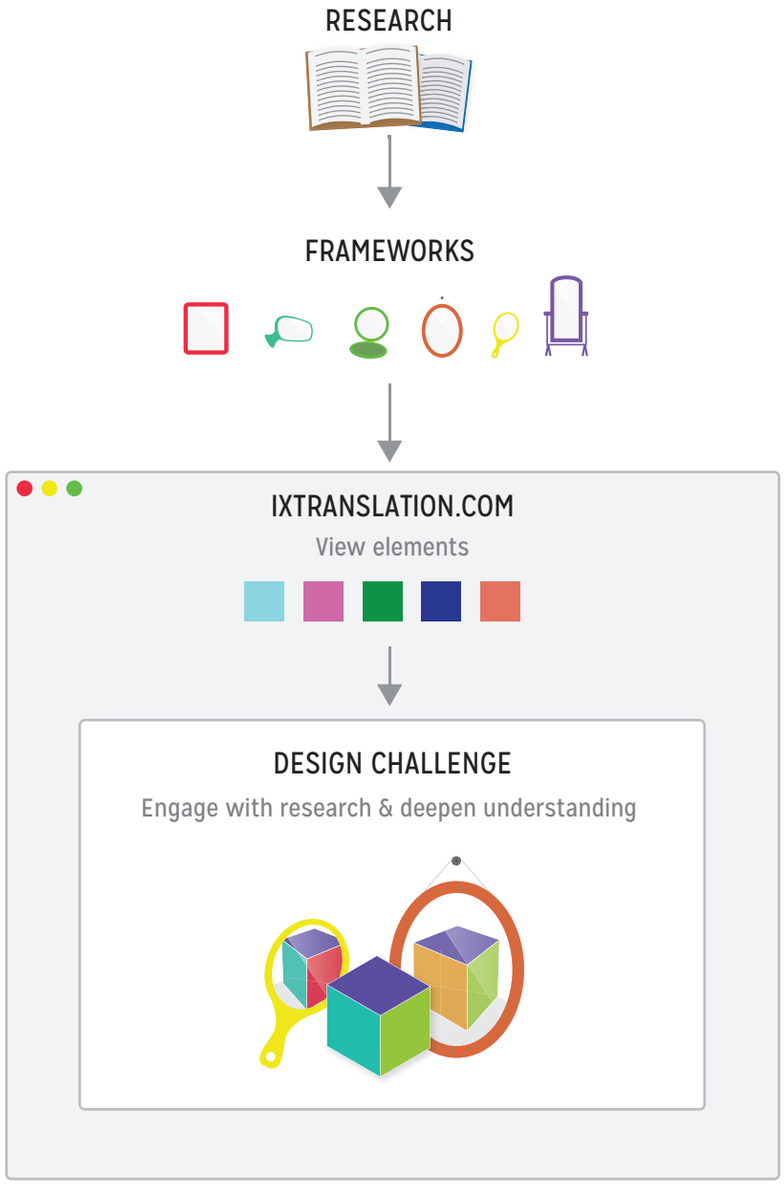
Appendix B:

Detailed research process

"I would personally hesitate to add on, because if I did the wrong thing and then that was in the encyclopedia article... suddenly I'm misinforming a generation."

PARTICIPANT FEEDBACK



MY thesis project unfolded with a life of its own. I had an idea of what I wanted to say and an interest in almost everything I read. It wasn't until after I came back from my summer internship and began my Language & Culture class that my idea began to form around a purpose. In designing for accessibility (and by proxy, multi-modal experiences), I found a way to test the influence of a language perspective. I became interested in how to authentically translate elements in order to create synonymous experiences among the senses. Designers readily recognize that visual elements like scale, weight, color, and typography of text are manipulated to create hierarchy. So, how could qualities like volume, pitch, direction, and/or timing create hierarchy for an auditory experience?

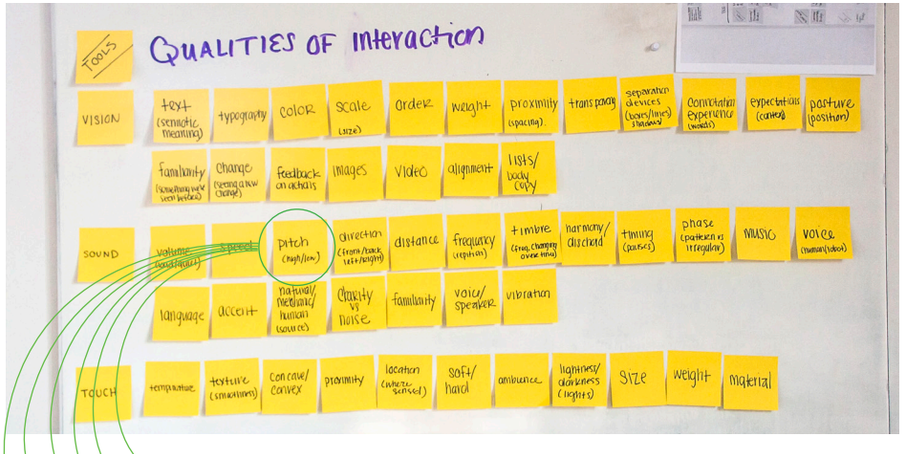
In visual design we have a strong vocabulary for critically evaluating our work. We can teach a new student about 'typographic voice,' pointing out how the shape of a font's individual letters work together to create a personality. I'm sure musicians (or sound designers) have the same ability to consider the quality of sound produced by each instrument, but designers' lack of exposure to non-visual mediums in regular practice prohibits them from using sound as dynamically in their work.

In the end, my background research fed into the design challenge so that people who completed the exercise ended up learning about the perspective through an activity. It became a less didactic way for them to learn the different perspective and deepen their understand of the nature of interactions.

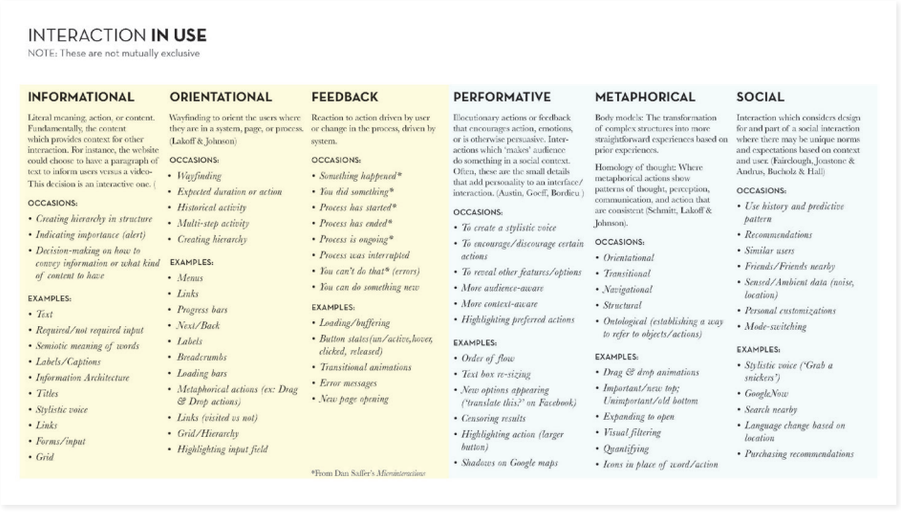
Exploration

As an exercise just to help myself think differently, I started to catalogue the qualities of interaction that can possibly be manipulated. I was trying to think about how experiences are built up and how each element contributes something to the final product. In order get a range of qualities, I listed them by how they could be sensed: through sight, sound, touch, and environmental knowledge. I also grouped these interactions in terms of how they are used by designers: like lines can be used stylistically or as separation devices. I started with some of the basic Gestalt principles, but then found myself incorporating some of the language theory I was getting from my coursework. This was the beginning of the six frameworks I would eventually build.

How I began thinking about the kinds of questions I could ask about interaction elements:



- What kind of **information** does pitch provide?
- How can pitch be used to **orient** a user?
- How can pitch provide **feedback**?
- How does pitch cause us to **react**?
- What **metaphors** use pitch?
- How does pitch **show contextual knowledge**?



INTERACTION **IN USE**

NOTE: These are not mutually exclusive

INFORMATIONAL

Literal meaning, action, or content. Fundamentally, the content which provides context for other interaction. For instance, the website could choose to have a paragraph of text to inform users versus a video. This decision is an interactive one. (

OCCASIONS:

- *Creating hierarchy in structure*
- *Indicating importance (alert)*
- *Decision-making on how to convey information or what kind of content to have*

EXAMPLES:

- *Text*
- *Required/not required input*
- *Semiotic meaning of words*
- *Labels/Captions*
- *Information Architecture*
- *Titles*
- *Stylistic voice*
- *Links*
- *Forms/input*
- *Grid*

ORIENTATIONAL

Wayfinding to orient the users where they are in a system, page, or process. (Lakoff & Johnson)

OCCASIONS:

- *Wayfinding*
- *Expected duration or action*
- *Historical activity*
- *Multi-step activity*
- *Creating hierarchy*

EXAMPLES:

- *Menus*
- *Links*
- *Progress bars*
- *Next/Back*
- *Labels*
- *Breadcrumbs*
- *Loading bars*
- *Metaphorical actions (ex: Drag & Drop actions)*
- *Links (visited vs not)*
- *Grid/Hierarchy*
- *Highlighting input field*

FEEDBACK

Reaction to action driven by user or change in the process, driven by system.

OCCASIONS:

- *Something happened**
- *You did something**
- *Process has started**
- *Process has ended**
- *Process is ongoing**
- *Process was interrupted*
- *You can't do that* (errors)*
- *You can do something new*

EXAMPLES:

- *Loading/buffering*
- *Button states(un/active,hover, clicked, released)*
- *Transitional animations*
- *Error messages*
- *New page opening*

*From Dan Saffer's *Microinteractions*

PERFORMATIVE

Illocutionary actions or feedback that encourages action, emotions, or is otherwise persuasive. Interactions which 'makes' audience do something in a social context. Often, these are the small details that add personality to an interface/interaction. (Austin, Goeff, Bordieu)

OCCASIONS:

- *To create a stylistic voice*
- *To encourage/discourage certain actions*
- *To reveal other features/options*
- *More audience-aware*
- *More context-aware*
- *Highlighting preferred actions*

EXAMPLES:

- *Order of flow*
- *Text box re-sizing*
- *New options appearing ('translate this?' on Facebook)*
- *Censoring results*
- *Highlighting action (larger button)*
- *Shadows on Google maps*

METAPHORICAL

Body models: The transformation of complex structures into more straightforward experiences based on prior experiences.

Homology of thought: Where metaphorical actions show patterns of thought, perception, communication, and actions that are consistent (Schmitt, Lakoff & Johnson).

OCCASIONS:

- *Orientational*
- *Transitional*
- *Navigational*
- *Structural*
- *Ontological (establishing a way to refer to objects/actions)*

EXAMPLES:

- *Drag & drop animations*
- *Important/new top; Unimportant/old bottom*
- *Expanding to open*
- *Visual filtering*
- *Quantifying*
- *Icons in place of word/action*

SOCIAL

Interaction which considers design for and part of a social interaction where there may be unique norms and expectations based on context and user. (Fairclough, Joostone & Andrus, Bucholz & Hall)

OCCASIONS:

- *Use history and predictive pattern*
- *Recommendations*
- *Similar users*
- *Friends/Friends nearby*
- *Sensed/Ambient data (noise, location)*
- *Personal customizations*
- *Mode-switching*

EXAMPLES:

- *Stylistic voice ('Grab a snickers')*
- *GoogleNow*
- *Search nearby*
- *Language change based on location*
- *Purchasing recommendations*

Digital version of the categories I made, trying to figure out how to define groups of elements.

TOOLS FOR INTERACTION **DESIGNER** VS **USER**

VISION

Text (semiotic meaning)
Typography
Color/Saturation
Scale (size)
Order
Weight
Proximity (spacing)
Transparency/Layering
Separation devices (boxes/lines/shadows)
Change (seeing action/feedback)
Images
Video
Alignment
Headings/Lists/Paragraphs
Light
Ratio of space
Connotation (experience)
Expectation (context)
Familiarity (used before)

SOUND

Volume
"Earcons"
Speed
Talking to device
Pitch (high/low)
Direction (front/back, left/right)
Distance
Frequency (repetition)
Timbre (key, changing over time)
Harmony/discord
Timing/pause
Phase (patterned or irreg)
Music
Source (human, robot/digital)
Language
Accent
Clarity/noise
Familiarity

TOUCH/HAPTIC

Vibration
Orientation
Movement (ie: sticking)
Temperature
Texture
Concave/convex (bumps)
Proximity
Location (where on the body it's sensed)
Soft/Hard
Size
Weight
Material

MOVEMENT

Transitions
Animations
Direction of movement
In/Out
Expand/Collapse
Speed
Velocity
Re-Attention
Re-Change
Entrance/Exit
Feedback
Reveal/Hide
Scroll
Movement (ie: sticking)

CONTEXT

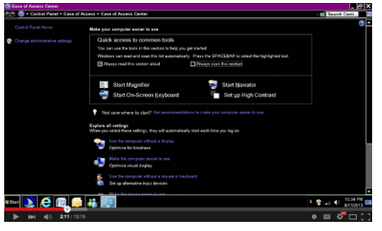
Location
Temperature
Who is nearby
Speed (the device is moving)
Previous experience
Cultural meaning
Personal patterns
Patterns of typical use
Language preferences
Social information (connected to other accounts)
How you've used other devices (ie, phones, tablet)
Ambient sound (microphone)
Device (date/technology)

Early exercise trying to figure out which elements are tools that are driven by designers versus elements that are driven by the users.

Along side this, I researched best practices for digital interactions from Web Accessibility Initiative (www.w3.org/WAI), read the accessibility pages for Apple, Google, installed a screen reader on my browser and phone, and watched YouTube videos about vision impairment. This included different accessibility products used for devices today, like JAWS screen reader and TapTapSee (an app that interprets objects you take a picture of on your cell phone), and what daily life is like for someone with vision impairment (I highly recommend watching TommyXP's channel where he humorously answers questions about what it's like being blind). I was also informally reading about different accessibility products that were coming out. Like, Microsoft's incredible Independence Day project, which creates a 3D soundscape for people to walk through a city using a special headset that sits in front of the ears. Basically, my mind was atwitter with different emerging possibilities of design I was discovering.

Early work tracking some of the insights from my accessibility research.

YouTuber TommyXP showing viewers what it's like when he gets lost

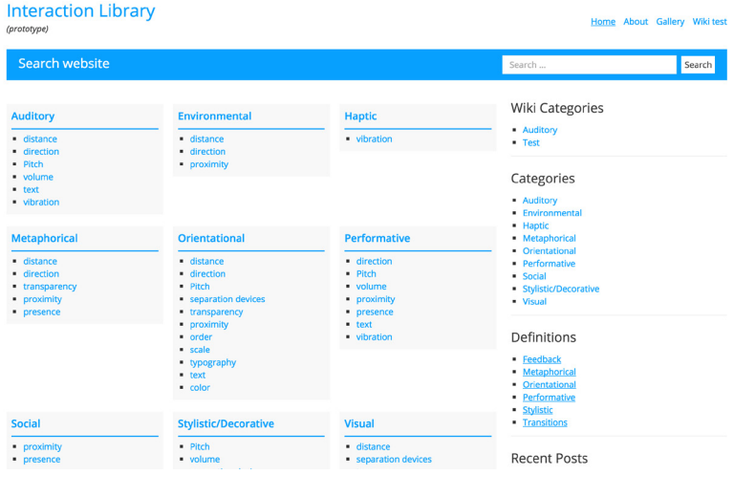


YouTuber Blind InspirationCast showing viewers how to set up JAWS screen reader

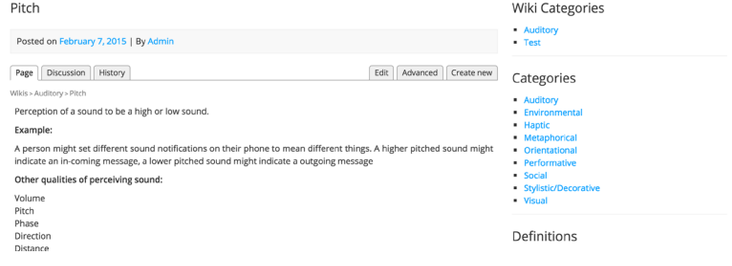
"Lorm" glove from Germany's Design Research Lab (design-research-lab.org) to help deaf and blind people communicate with others by signing lorm into their hands.

Prototype

I decided to make an online version of my list because it would be faster to add on, transfer, and share. This was the beginning of my idea to create a wiki that would allow anyone to contribute my list interaction elements. Opening this list to the public would help create a more exhaustive list, but their different perspectives would also better represent the multitude of different translations in areas beyond my expertise (like auditory or haptic qualities). My hope was that visitors of the website could read about the project and frameworks and then feel comfortable contributing themselves.



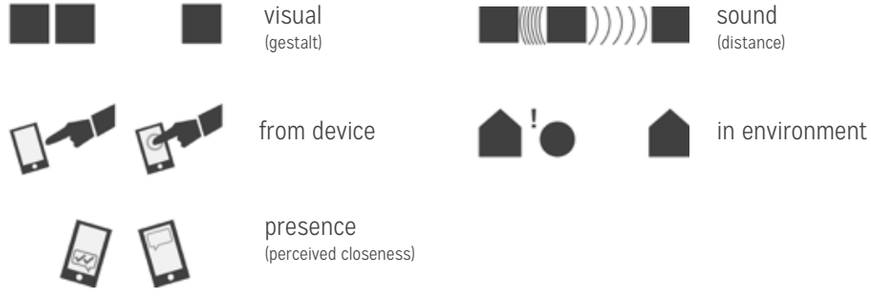
Early prototype of the website homepage



Example entry with wiki functionality

The website began as a way to systematically define elements, but when describing elements my perceptions of elements was entangled as new possibilities emerged. Because I forced myself to describe the elements using each of the different frameworks I created, I found myself thinking about how a traditionally visual element could be translated into haptic or auditory experiences. Going through this exercise of describing the nature of elements frequently make me speculate on more fantastic ways that an element could be used beyond the conventions I normally see. I remember having a particularly strong epiphany when describing 'distance' in sound (the perceived distance of a auditory source). I realized that it was sound's equivalent to "proximity" in visual, gestalt terms. It then led me to think about how distance can be used within a screen, from the device to the user, the user to other devices (like 'friends nearby' information), and the user/device to its context in the world (like GPS information). It forced me to step back and think about the impact manipulating proximity can have. The exercise was also creatively challenging when I tried to provide examples for an element that did not have an obvious use-case.

EXAMPLE: DEFINING 'PROXIMITY'



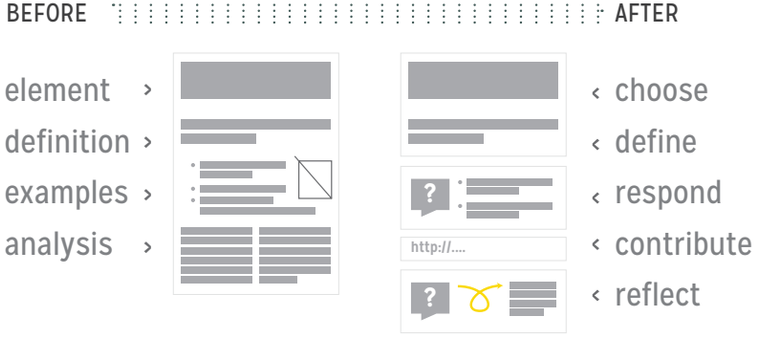
These new ideas or altered perceptions about what I could do with already available design resources became the true benefit attempting to define these interaction elements. Contributing to the wiki had expanded my perceived resources for creating interaction designs and I hope it could provide the same benefit for other designers.

Feedback & testing

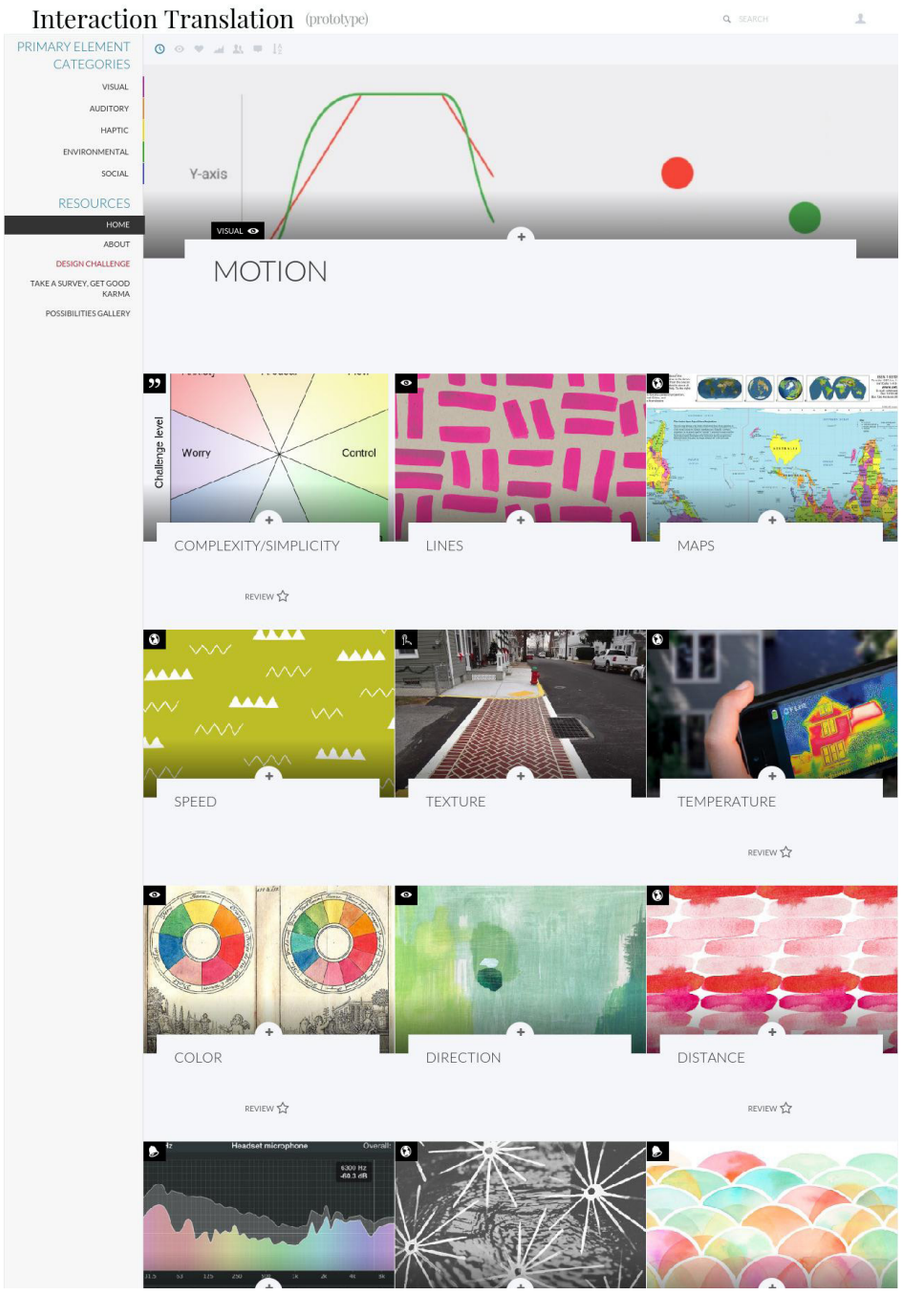
My final version of the wiki had a more visually attractive style while still maintaining the front-end editing and collaboration abilities from traditional wikis. The integrated functionality was programmed by an outside developer, but I set up and customized the website using Wordpress. This was the version I began user testing with. Informal feedback I got right away helped me discover two important issues with my website:

- New users were confused about what was expected of them
- People did not feel like they have enough expertise to contribute (even though it was emphasized that anyone was welcome to participate)

So, my mission was to lower the barrier of participation by breaking up the experience of creating a new entry through a design challenge.



How the design challenge broke up creating a new entry into bite size steps where the subject of each framework was prompted through choice questions.

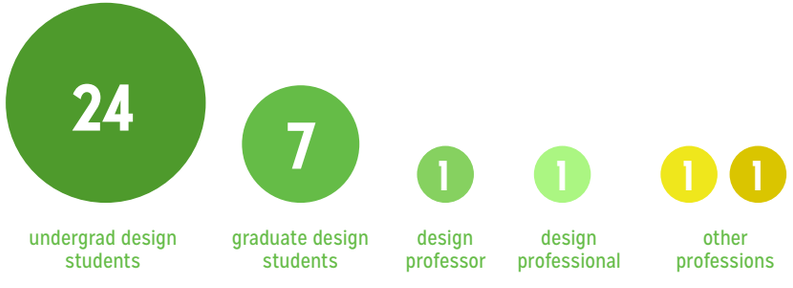


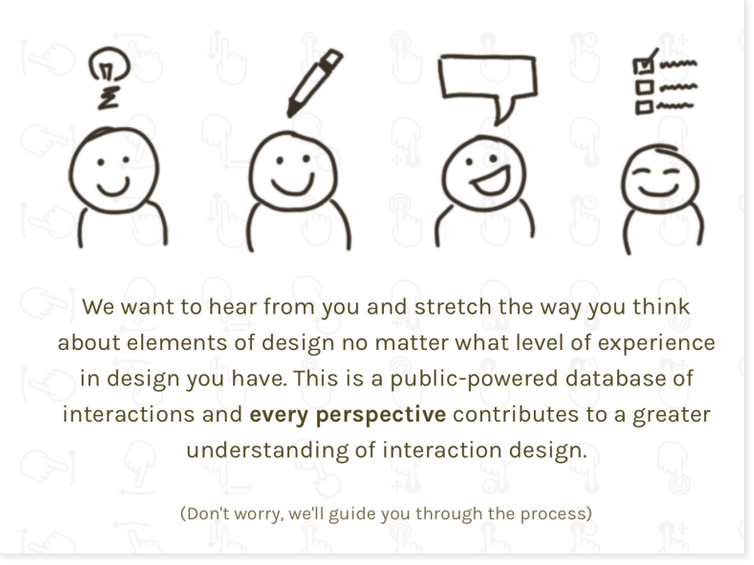
Current version of the website homepage

To date, 35 unique participants have contributed to 30 different entries on the website using the design challenge (described previously). The participants included: graphic design undergraduate students, masters of design students, a visual design professor, a professional interaction designer, and two non-designers of different professions.

I interviewed with 10 of the people (two informally) who took the design challenge. I got their impressions of their overall experience and critical feedback on the design of the exercise that I used to make iterative changes. For instance, it started out as a Google survey, then before it was moved to Typeform (a more visually-oriented online survey-building tool). The Typeform format allowed me to break up the experience and provide visual examples for each of the questions. Within the examples and text, I ended up making many revisions to in order to make the examples as easy to understand as possible. Like, in a first version I used different elements for example answers, but users were confused about whether they were supposed to discuss the same element throughout, so I ended up using just the element of 'temperature' throughout (see "Design Challenge Handout" for a condensed version of the prompts and examples).

PARTICIPANT BREAKDOWN





Screenshot of the opening page of the design challenge

DESIGN CHALLENGE HANDOUT · BASIC EXAMPLE (TEMPERATURE)

Choose: What element do you want to talk about? For this exercise, 'elements' are basic building blocks of interaction design
Ex: contrast, weight, speed, lines, light, geographic knowledge, bounce, eye contact, pitch, tempo, softness/hardness, timing, content

Define: How would you define it? What's the basic, dictionary definition?
Temperature is the objective measure of how hot or cold something is

What is the primary way that element is sensed or experienced?
Temperature is primarily reflects environmental knowledge

informational — **How could/is the element informative?**
A thermometer measures temperature. The unit of measurement it outputs is purely informational.

orientational — **How is/could this element be used to direct the user within the screen, system, or activity?**
Thermal visions uses temperature to create literal maps.

feedback — **How could/does this element provide feedback on user interaction? What would it look like if this element is used to respond to user input?**
We associate 'use' with temperature. A crowded room get warm, a device that has been used gets hot....Perhaps a device in the future could indicate the popularity or use by being warmer or cooler artificially.

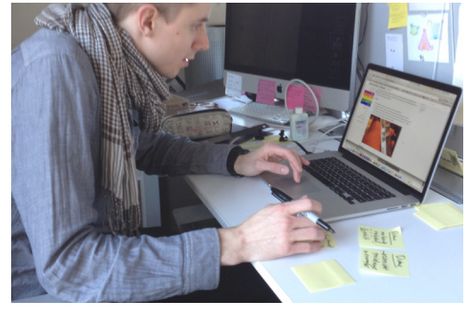
metaphorical — **How does this element represent or borrow from real life products or experiences in order to enhance understanding by users?**
When we say something is 'hot' it's a metaphor to indicate that it's popular or trending. A digital temperature gauge might also be designed to represent a real mercury thermometers.

symbolic — **How can/does the element draw upon cultural or community knowledge in order to be understood? Is the element a symbol that evokes certain emotions or memories based on who you are?**
If someone was from another country, generation, or even another time period, how might that affect their understanding of this element in use?
Ex: Fire & ice is often used as a symbol for temperature. Someone used to Fahrenheit might not understand Celsius temperature readings.

performative — **How does experiencing your element in a situation change users behaviors (actions) or influence their thoughts (mood, understanding, etc)?**
After a long phone call, a smart phone might get very hot. This implicitly makes us want to use it less or 'let it rest' because we believe it might overheat. **Temperature could be used as deterrent.**

NOTE: This was the handout giving during the Spring poster session about the design challenge prompts, "symbolic" framework was changed to "indexical" after feedback. Full questions can be seen at ixtranslation.com

Insights



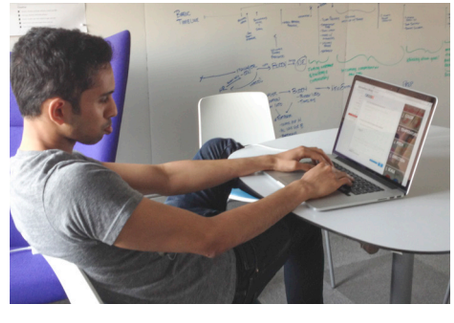
Participants found the experience enjoyable and could imagine it being a helpful tool for the future. After being encouraged to be honest, "fun" came up frequently to describe the challenge. Participants enjoyed being prompted to look elements from different perspectives. Some described it as satisfying, implying that it was challenging, but ultimately rewarding. They especially liked the last three questions (the more abstract prompts based on my literature review) because they felt they were more open to speculate on a new idea, rather than having to find a 'right' answer. When asked when they could see themselves using the exercise again, if ever, they thought it could be prompt to help them get 'unstuck' on a design problem. Three of the participants readily suggested using the database as a resource for inspiration on different elements to use.

ADDITIONAL PARTICIPANT QUOTES

"Those questions were excellent and they definitely made me visualize my [element] in many different ways. I was even inspired to do something with it."

"It was cool! I think it could be really valuable."

"I could see this becoming a regular resource."



LIMITATIONS. Some of the limitations of the system I still see are how to enter the system (besides the design challenge) and how to catalogue elements. In terms of cataloguing, I ended up choosing ways that it could be primarily sensed, but this is problematic when if we start thinking about how an element can be applied multi-modally. For example, with proximity, the same term can be describe multiple scenarios (physical proximity and visual proximity). One participant suggested organizing them by types of solution or emotional qualities, since most people work on specific problems with a goal in mind rather than thinking about isolated element. An interesting suggestion was creating a 'how-to' guide for creating an experience rather than a thesaurus of elements. This might walk visitors though steps like "are you trying to attract or repel people?..." These solutions could be a way of tagging objects.

In terms of addressing the decontextualization, I can see the potential disconnect that comes from examining an element in isolation, however, like I mentioned in my paper, I do believe it can be a helpful exercise. Torn from context, participants have a greater distance between how an element is normally used and might be able to think of new solutions. One way I tried to resolve this was to recontextualize the elements in a gallery of inspiration (called the "possibilities gallery" on the website). This is a space for inspirational speculations on digital interactions. This could be prototypes, fringe products, sketches, or videos of showcasing

Screenshot of possibilities gallery

multi-sensory artifacts. It's a way for visitors to see how the concepts that learned about on the main websites can fit together to create new experiences (and they can contribute themselves). While the gallery is up, I did not do user testing on it.

FUTURE WORK. I will be presenting my research at DeSForM in October. Between now and then, I hope to recruit more participants to use the website and possibly re-design the design challenge. I also plan continue literature on interaction design, reflectivity, and the aesthetics of design.

Appendix C

Design challenge prompts

We want to hear from you and stretch the way you think about elements of design no matter what level of experience in design you have. This is a public-powered database of interactions and every perspective contributes to a greater understanding of interaction design.

(Don't worry, we'll guide you through the process)

Choose: What element do you want to talk about? For this exercise, 'elements' are basic building blocks of interaction design*
Like the 'periodic table of 'design elements' that come together to create experiences.

Ex: shape, weight, location, harmony/discord, status (on/offline, etc), voice, light, tempo, 'taptic', metrics, bounce, measuring eye contact, pitch, softness/hardness, timing, friends nearby data...Think about your senses if you're feeling stuck!

Define: How would you define it?*
What's the basic, dictionary definition?

Ex: temperature is the objective measure of how hot or cold something is

---

What is the primary way that element is sensed or experienced?*
Is it sensed by you? Is it data drawn from the environment or from your social media accounts?

Ex: Temperature is primarily reflects environmental knowledge

A. Sight (visual)
B. Heard (auditory sound)
C. Touch (haptic)
D. Environmental knowledge (ex: temperature/location)
E. Social knowledge (ex: knowledge about friends or your preferences)
F. Type of movement (ex: transitions on a screen)
G. Other

Alright, great work. Now let's get to the hard stuff!

The following prompts are meant to prod you into thinking about the design element you chose in new ways. The more you challenge yourself, the more you'll get out of the design exercise.

Suggested time: 30 minutes.

How else can we think about this element?

We know how the element is typically used, but how could the same experience be translated to another sense to create the same experience? Another context? With what results?

The following six prompts range from familiar and unfamiliar ways of thinking about the element you chose. You are not required to fill out each section, but the exercise is more beneficial if you respond to all of the sections. You are encouraged to be creative and include as many ideas as you'd like.

How could/is the element informative? At the most basic level, when is this element used to provide purely functional information? 1

Ex: A thermometer measures temperature. The unit of measurement it outputs is purely informational.

How is/could this element be used to direct the user within the screen, system, or activity? 2

Is the element used for wayfinding or direction? Or is it used to tell you where you are in a system?(Like a status bar letting you know how far along you are the process)

Ex: Thermal vision uses temperature to create literal maps.

How could/does this element provide feedback on user interaction? What would it look like if this element is used to respond to user input? 3
Letting users know when something has happened; confirming a user did something; announcing that a process has started/ended/is ongoing; and drawing attention to errors

Ex: We associate 'use' with temperature. A crowded room get warm, a device that has been used gets hot....Perhaps a device in the future could indicate the popularity or use by being warmer or cooler artificially.

You're almost there!
Just three more prompts, but they're getting a little bit more abstract.

There are no wrong answers, just have fun!

4

How does this element represent or borrow from real life products or experiences in order to enhance understanding by users?
What metaphors does this element use?

Ex: When we say something is 'hot' it's a metaphor to indicate that it's popular or trending. A digital temperature gauge might also be designed to represent a real mercury thermometers.

5

How can/does the element draw upon cultural or community knowledge in order to be understood? Is the element a symbol that evokes certain emotions or memories based on who you are?
If someone was from another country, generation, or even another time period, how might that affect their understanding of this element in use?

Ex: Fire & ice is often used as a symbol for temperature. Someone used to Fahrenheit might not understand Celsius temperature readings.

6

How does experiencing your element in a situation change users behaviors (actions) or influence their thoughts (mood, understanding, etc)?
How could it (implicitly) encourage or discourage users? What actions does it lead to?

Ex: After a long phone call, a smart phone might get very hot. This implicitly makes us want to use it less or 'let it rest' because we believe it might overheat. Temperature could be used as deterrent.

Phenomenal!

Hopefully this exercise helped you think about a simple element in more dynamic ways. You did great and your responses are appreciated by me and the community! We'll review your response and then expect to see your content published on the wiki soon!

For questions: jacklynn /@/ cmu.edu

(The more the merrier: Feel free to submit another entry or edit entries directly on the website.)