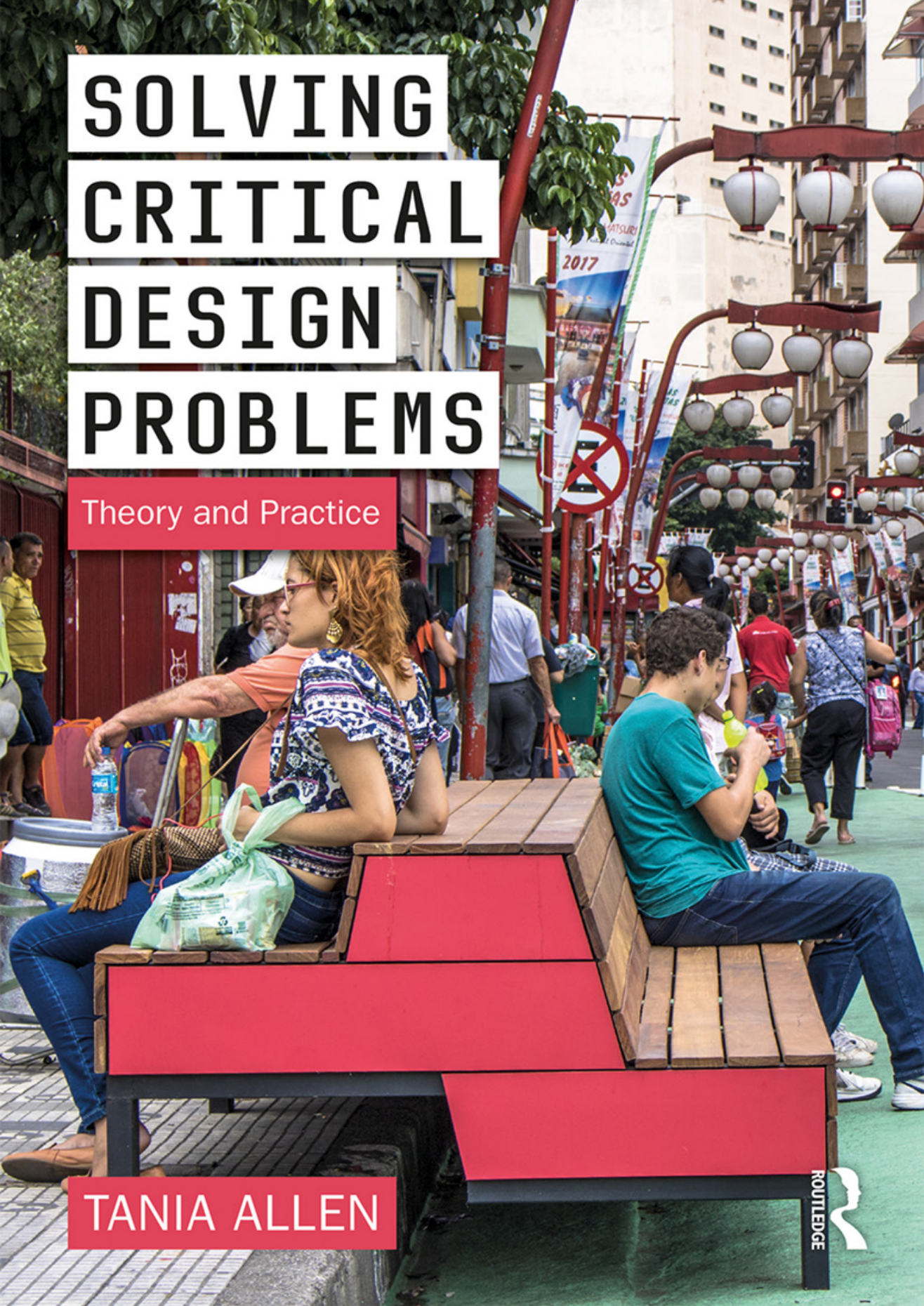
SOLVING
CRITICAL
DESIGN
PROBLEMS
Theory and Practice
TANIA ALLEN
ROUTLEDGE

Solving Critical Design Problems

Solving Critical Design Problems demonstrates both how design is increasingly used to solve large, complex, modern-day problems and, as a result, how the role of the designer continues to develop in response. With 13 case studies from various fields, including program and product design, Tania Allen shows how types of design thinking, such as systems thinking, metaphorical thinking, and empathy, can be used together with methods, such as brainstorming, design fiction, and prototyping. This book helps you find ways out of your design problems by giving you other ways to look at your ideas, so that your designs make sense in their setting.

Solving Critical Design Problems encourages a design approach that challenges assumptions and allows designers to take on a more critical and creative role. With over 100 images, this book will appeal to students in design studios, industrial and product design, as well as landscape and urban design.

Tania Allen is an Associate Professor of Art and Design and Design Studies at North Carolina State University in Raleigh, North Carolina, USA.

"This book is written from the perspective of an individual who has studied, practiced, and taught design. It is the interaction of these experiences that cause her to adopt a Socratic underpinning to the act of design. She inspires the reader to consider the act of design in the context of questions that stimulate thoughts of culture and place to enrich the utilitarian aspects of a design project. This approach opens the path toward inter and transdisciplinary approaches defining the act of design as a means to pose a way of seeing design as a rhetorical activity. It is this connection between the realization of artifacts and the role of design in the definition of culture that distinguishes this book. There is real substance in this monograph for the experienced design professional and it serves as an inside insight for those who are new to the design activity. It is worthy to be required reading in the classroom and is a must read for those who are seeking to understand the design culture."

Marvin J. Malecha, FAIA, DPACSA
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Solving Critical Design Problems

Theory and Practice

Tania Allen

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To Todd, Owen and Calvin: Who always make me want to be better.

Contents

Foreword

Normally I am wary of another book on design thinking. It has become a subject of continuing debate including much advocacy and considerable derision. It seems to me that this is true because so many of the authors are not writing from the intensely personal position of being an active designer. There is a kind of voyeurism at work that manifests itself when design thinking is posited as another liberal arts position. So much of the literature impresses me as written by individuals looking in to a story written by others. This text is different. Associate Professor Tania Allen understands as an active practitioner that a designer must think "expansively and narrowly: broadly and deeply: generatively and selectively; and to operate both as insiders and outsiders." She understands the connection between need and experience and further incorporates the intimate connection between theory and practice in her observations. For Tania, design is a metacognitive activity that not only asks what is the best design for an artifact, but also if there is a need for the artifact at all. She sees design as a malleable experience that matches ethical and moral questions with a predilection for action. Because of her experience, she urges the reader to consider challenging themselves to think about his or her work differently, looking beyond the traditional sources of inspiration to a rich and exhilarating set of disciplines. Her strategy in this text is to explore four distinct paradigms; design and usability, design and technology, design and sustainability, and design and morality. Through these four paradigms, she encourages the reader to accept the patterns of each that will impact the others. It is the critical interrelationship between them that characterizes design thought.

So strong is the connection between self-identity and process that when Frank Gehry was asked to explain how he begins teaching a studio, he noted that he asks the students to design their own signature. This exercise underlines the importance of understanding that there is no right or wrong regarding the outcome beyond the preference of the individual. His identification of his work with his signature is a powerful example of the relationship between design of a project or experience with the design of self that is always underway.

Several years ago, following the completion of the Whitney Museum of American Art in New York, Renzo Piano (2015), the building's architect, was interviewed by an NPR

reporter for a whimsical summer story about spending time on the beach during the month of August with his grandchildren. What was intended to be a public interest story became profound as he articulated the lessons of building a sandcastle. He addressed the necessity of understanding the properties of water and the ebb and flow of the waves, and the resultant impact on the design of the castle. He further wondered about what it meant to design a castle at the water's edge and he reflected that he was able to observe 1,000 years of erosion in an afternoon. In the process, the entire experience became a wonderful adventure to get to know his grandchildren and for them to get to know him. But for him, his focus on a life of design caused him to draw deep lessons from the experience. The sandcastle had become something more than playful diversion. Just as with any of his buildings, the sandcastle became an exploration of self. Like the signature project of Frank Gehry, Renzo Piano had found a way for the intense self-reflection that should be a part of everyone's search for renewal that time away affords.

Every project is defined by aspects of a story to be communicated through metaphor, interpretation, and demonstration. It is given further definition by the system that must be addressed through relevant information, application, and analysis. Between story and system, the playfulness of iteration is found to be measured by each. This is true whether it is a signature, a sandcastle, a skyscraper, or a human experience. Each of these elements are found throughout Associate Professor Tania Allen's text. Her ability to unwrap them to discover their essence is a valuable aspect of this text.

Ultimately, the individual who is a creative spirit comes to realize the discipline of the design process defines them not only as artists, creative thinkers, and design professionals, but also as people. It is no exaggeration to observe that for the creative spirit, design thought is as much a search for self as it is for new places and products. From project to project, users and user experience, defining project-based learning is an amazing tool to understand one's self. This is the source of the cutting-edge ideas that flow forward from such an awareness. This deep understanding of self is a prerequisite for design. Tania Allen approaches this through her assertion of user experience defined by knowledge, affordances, and schemas. Through this, she approaches the subject that has come to be known as human-centered design. The focus on knowing the human experience is further explored by her connection between usability as a cultural experience articulated by signs, symbols, and codes. Her assertion that "by designing objects, technologies and systems, we are in fact designing cultures of the future," is precisely the intention of design inquiry. The exploration in design research envisioned by Associate Professor Allen is a precise guide for the imperative to foster an evidence-based process in design thought. For too long this has been an evident weakness among design professionals. The iterative process that has long characterized the work of creative individuals has too often depended on a "do it, and do it again" experience with little or no recording of lessons learned. This has the unintended outcome of producing little to share and no measures by which the success of a project may be assessed. Tania Allen has provided in this text the beginning points of research from which the appropriate questions may be asked. Perhaps most importantly, she connects the process of discovery with the excitement of the creative experience. Her exploration of the impacts of new tools and technologies on thought and project development is an insightful embracing of our new

reality. It is a further demonstration of the inclusive mentality she has already articulated earlier in the text. Supporting the evidence-based foundation of design thought are a series of case studies that explore a series of design ideas from sustainability to urban design. These case studies are the substantive articulation of the four paradigms.

I have long believed that the design thinking experience is perhaps the most gregarious of theoretical pursuits. The networks and patterns of ideas and people forces the creative individual out of the cocoon too long associated with creative individuals. Certainly, there are examples of the creative genius who is antisocial. But, it is more likely that you will find the most creative among us to be individuals who are fully citizens of the world. The best designers by their very nature are storytellers. Early on in their explorations they storyboard ideas to represent the narrative that accompanies their ideas. These storyboards represent the images that are fully drawn to engage the client as a user and participant in the dream. When Walt Disney sought the financial support to build Disneyland, he brought with him a pencil drawing of a vision. His story connected with the potential lenders so strongly that the related risks were downplayed by the vision of an incredible individual. Today as we look at the work of individuals such as Frank Gehry, Renzo Piano, Charles and Ray Eames, Steve Jobs, and even Elon Musk, we are studying masters of the story. The story is supported by the necessity of utility but it is the basis upon which the play of the creative process begins.

Tania closes her text with a discussion of the moral dimensions of design. She incorporates gaming and crowdsourcing in her discourse, raising the questions of the ultimate intention of the design process as a toll for the empowerment of the individual. No stronger case can be made for a design education. Her description of a course syllabus framed on the experiences of Hurricane Maria including: understanding what happened, thinking about utopia, making in times of catharsis, and reflection and critique, describes perfectly the challenge of a designer to think expansively and narrowly: broadly and deeply: generatively and selectively; and to operate both as insiders and outsiders. The sources and references that inform her position are a rich collection of opinions and perspective that only further emphasize the inclusive nature of her message.

For me, design is a way of structuring life. It is a manifestation of our best angels. This text is a guide for the journey to discover those angels.

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Preface

Before starting graduate school in 2008, I had never heard the term design thinking. I had been working with non-profits and cultural organizations in Boston and more and more had been wrestling with just how to tackle the large-scale problems that they faced with communicating their mission, and with turning interest into action. In my very first graduate studio with Meredith Davis, I read Nigel Cross's (2007) *Designerly Ways of Knowing* as part of a group project on explaining design thinking as a tool for innovative teaching and learning. The idea that designers had distinct ways of problem-solving, and that visualization and translation were critical components of dealing with complexity and ill-formed problems was a revolutionary insight. I went on to teach design thinking with Marvin J. Malecha and then on my own. And through that experience, I developed an approach and perspective to design thinking that emphasized criticality through research, observation, and testing. Many of the ideas in this book are gathered from lectures, assignments, and projects I have given inside and outside of the classroom, and also part of a larger interest in how design is at its core a social activity and has a social impact.

I would like to thank all of the people who directly or indirectly have contributed to the ideas in this book. To Meredith Davis, Denise Crisp, and Scott Townsend who were pivotal guides in my graduate career and helped cultivate my interest in design research. To Marvin J. Malecha who was an unparalleled mentor, and supported me fully in my own interpretation and expansion of design thinking principles and methods to include more critical research. To all of my colleagues—especially Sara Queen, Kathleen Rieder, and Brooke Chornyak—who are constantly challenging me to think about my own work in a more critical way. And finally to my family; my father who as a scientist and historian is always balancing truth with meaning; and my mother who's creativity and support keep pushing me forward. To David and Larry (my other parents) who are always there offering welcoming words of guidance. And finally to my sister Carin and her family—Danny, Anna, and Evan—who always, always make me laugh.

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1 Introduction

Defining the drivers of design theory and practice

This book is both a celebration of design and a challenge to think about it differently. We are in a moment where design is center stage. Magazines are challenging us to "think like a designer" and championing design and innovation as the savior of our troubles. From a technological perspective, this is an exciting time to be a designer because we have the ability to speculate, knowing that our speculations will be a reality—not in 100 years, but in ten. Our wildest, craziest inventions are possible—it's just a matter of time. But there is also immense pressure on design to solve many of the problems that have been created in the last 100 years—everything from better infrastructural strategies to handle our ever-increasing city populations to how to better manage the personal debt that affects individuals and economies. Design is championed for being able to get us out of the mess that we are in environmentally, technically, and economically by developing products and environments that are cleaner, easier to manufacture and affordable for a wider range of users. This is a lot for the field to support, especially if we want to do it conscientiously. It is especially difficult considering design as a field is relatively young. Our history of self-reflection is short and we are still in the midst of defining a comprehensive and succinct set of theories and methods that drive it.

The strength of design thinking is that it forces designers to think expansively and narrowly; broadly and deeply; generatively and selectively; and to operate as both insiders and outsiders. One of the main attributes of any good designer is the ability to understand first-hand what potential users might need, and identify problems within a current situation. Designers operate as insiders by using strategies that invoke empathy. By simultaneously operating as outsiders, designers keep their minds open to new ideas from the world around them, while also identifying patterns of behavior that design can respond to. As a teacher of design thinking myself, I see the potential and the excitement that it has for helping students make connections and prompt insights that would not have emerged without it and to make proposals for those insights that move the idea beyond a philosophy and into a realm that is action and change oriented. The literature on design thinking is vast, from Bryan Lawson's *How Designers Think* (1991) and Nigel Cross's *Designerly Ways of Knowing* (2007), to Tom Kelley's *The Art of Innovation* (2001), Tim Brown's *Change by Design* (2009), and more recently Marc Stickdorn and Jakob Schneider's *This Is Service*

Design Thinking: Basics, Tools, Cases (2012). The books are but a sliver of the mountain of literature that promises design thinking will transform businesses, strategies, and products to be innovative, and highly sought after. Missing from these promises is a larger connection and critical consideration of how, when, and why to innovate. Considerations that, if entertained, might be answered with the decision not to design at all. Rather than ask, "How can we design the next best ballpoint pen?" this book hopes to get designers and students to ask, "Do we need another ballpoint pen? Where is the writing device that I design today going to be in ten years? How does the act of writing improve communication? What are future ways to capture, record, and access information?"

These questions necessitate a look at design that spans disciplinary boundaries and attempts to find commonalities. As the world becomes more integrated, so too does design. We cannot design an apartment building without considering how people will get there and the changes to traffic that might occur as a result. The design of a fitness app must wrangle with the different platforms that people will use to access it. The design of a water bottle cannot ignore what will differentiate its brand from other water bottle brands. Part of the reason this is true is that design is, and must be, of a moment. In other words, design will always be context-specific—responding to the needs and wants of a population, situation, or geography that is current and contemporary. In his 2008 article *Towards Relational Design* Andrew Blauvelt, curator at the Walker Art Center in Minneapolis, argued "I believe we are in the third major phase of modern design history: an era of relationally-based, contextually-specific design." If this is true (and I believe that it is) then a more integrative and cross-disciplinary look at what is driving all aspects of design is necessary.

Design as a rhetorical activity

The phase of design focused on relationships and context that Blauvelt proposes also hints at another important context for design—that it is a rhetorical device. The way that designers operate and the ultimate goal of design is to improve a given situation. This could be as simple as improving a drinking experience or as complex as helping users be in charge of their own healthcare. But in both of these cases, the behavior of the user changes, because they are able to travel with their beverage, or become experts and agents of their own healthcare agenda. This behavior, in turn, changes the way that they think about their world and their life—in both minuscule and pivotal ways. If designers understand and acknowledge this perspective, how might that affect the way that they approach design research, theory, and practice? That is a key question this book seeks to approach. It suggests a paradigm shift that John Thackara (2005) argues is critical to designing in a complex world and which focuses on a shift away from substitution and towards reduction.

We could easily transition from an acknowledgment of the rhetorical power of design to how this power might save the world. There are a lot of people who claim that if we just design better and differently, we can get ourselves out of all of the messes we are currently facing. I do not argue that design can't or shouldn't address current and pressing problems in our world. I also do not argue that designers aren't in a unique position to see a problem and come up with viable and innovative solutions to those problems. The issue

is more that the literature and practice of "design for good" re-focuses energy away from root causes and towards band-aid solutions. In the same way that much of the debate in medicine centers on whether to treat the symptom or the disease, so too I would argue are the potential issues that arise when design is focused in a similar manner. For instance, the design of a straw with a built-in filter that would allow people in Sub-Saharan Africa to drink from local water sources (like a river) that might be otherwise undrinkable, fills an immediate need for people to get clean water. The danger lies when these types of solutions mask or numb us to underlying root issues, such as infrastructural, economic, and developmental inequality.

The concepts introduced in this book showcase a particular theoretical perspective. Primarily, that design should emphasize relationships, systems, and experiences over artifacts, objects, and consumption. But it also acknowledges a diversity of perspectives and counter-perspectives that ask the designer reading it to be critical, and rethink what is presented in a way that is situation-specific. Even though there are many methods within the pages of this book, methods situated within one section are not meant to only be applied to that section. It is meant to provoke critical and creative thinking, but not dictate a single way to approach a design problem. In writing this book, it became clearer to me how much crossover there are between the different theories as there are distinctions among them. In some ways, this book is suggesting a malleable taxonomy. One that sets up a system of classification in which the drivers become organizing principles, but the theories in practice might ultimately be evidence of multiple paradigms and perspectives.

I would argue these commonalities are driven (or should be) by a perspective on design action that puts people and values at the center. These are ethical considerations—for designers and users. Critical consideration for how design might affect (and encourage) an understanding of the world and each other—and by extension how we treat each—should be predominant. A consideration of how design interventions might encourage a new type of perspective or behavior must be considered earlier on in the design process. We can no longer wait and see what happens. We cannot make assumptions that design will always improve a given situation. And we must make a distinction between improvement of a current situation that is equally balanced with a critical consideration of projections for future impact. That is the ultimate aim of this book—to expand the perspective of the designer through theories, methods, and case studies and to show examples from inside and outside of design that are driving the way that designers consider their roles and the scope of design projects. I hope that this book will challenge some of the main assumptions of design and designers—namely, that design must always produce something new.

Design as an integrative activity

This consideration of design practice and focus—how designers understand and respond to the "wicked problems" that are at the core of the design process—encourages a need for more and better theories that looks across disciplinary boundaries to see what is transferable and applicable. But many would agree that theory is commonly viewed as an antagonist to the activity and practice of design—and that it can serve as an obstacle to "getting things

done" (Margolin and Buchanan, 1995, x). Written over 20 years ago, Victor Margolin and Richard Buchanan (1995) identified this issue as:

> One of the anomalies of twentieth-century culture, particularly academic culture . . . [is the] excessive separation between theory and practice, between the words and symbols used to understand important subjects and the concrete actions of individuals and groups who employ personal or formal knowledge to accomplish practical purposes.
>
> (1995, x)

The aim of this book is to identify theoretical perspectives that guide how designers approach practice—not separating theory from practice, but rather exploring and identifying how they are integrated. Design does not, and cannot, operate on philosophy and theory alone. Without the connection between the design concept, the artifact, and the user, design does not exist. So any book on theory must include strategies and methods for applying that theory to a real-world design experience. There are many excellent books on design theory and practice in existence. In many cases, they focus on one theory with many examples of its practice, or on theory in general. What I hope this book will add to the discourse *and* to the practice is the ability for designers to begin to intrinsically link the theory (what) with tools and methods (how) to their overall practice (why). I also hope this book can serve as a type of toolkit to provoke new ways of defining design problems.

One of the ways that designers can challenge themselves to think about their work differently is to look outside of design to ways that other disciplines research, evaluate, and interpret their work. But much of the evaluation of design has been dictated by those outside of design practice—and in doing so, the focus has leaned to the artifacts that are a result of design practice, rather than the practice itself. In *The Idea of Design*, Buchanan and Margolin (1996) call for design to be recognized as a liberal art because of its integrative nature. They suggest an important need to broaden the discussion of design evaluation to include that which is focused on the human experience, but also to connect design philosophy and practice (x). This call is in part a response to the recognition of design's focus on "wicked" problems, and a necessary shift in motivation from what we (as designers) *can* do, to what we *should* do. As architectural practice dips into urbanism and visual communication; and as graphic design expands into strategies that involve spaces, places, and environments, the ability for designers to see across disciplines to find patterns and commonalities as well as differences is increasingly critical. By looking at design through its technology, usability, morality, sustainability, and cultural context and impacts, designers focus on how design shapes, and is shaped by, the human experience. But there is a larger motivation at play here, and that is in the building of design as a discipline. In *Time for Change: Building a Design Discipline*, design educator Sharon Poggenpohl (2009) argues "that design practice and education are changing, particularly in relation to . . . research and collaboration. If design is to develop as a discipline, it must necessarily develop further based on these themes" (1). At the center of this development, Poggenpohl continues, is the transformation of the tacit knowledge that designers traditionally employ, to explicit knowledge that is a core asset to cross-disciplinary communication and collaboration.

> This is the shortcoming that makes design appear elusive, special, inarticulate, and even unknowable. As long as designers consider themselves to be first and foremost aesthetic finishers of ideas that are well advanced in the development process, they will be trapped by the tacit and unable to provide a clear explanation. (5)

Since Poggenpohl's call, design discourse has been increasingly focused on building this explicit, critical knowledge. Designers are no longer comfortable or willing to be the "aesthetic finishers" that Poggenpohl aptly names. This book argues that we are at a critical moment in time, where the cross-disciplinary nature of design necessitates a common perspective on the main themes and drivers of design thinking and practice.

Challenging design paradigms

In his book, *The Sciences of the Artificial*, Herbert Simon (1996) defined design as "courses of action aimed at changing existing situations into preferred ones" (111). Through this book, I hope to challenge assumptions about those preferred conditions—what drives the paradigms that inform them, and how methodologies might shift the underlying assumptions. A common theme that will emerge is, how can we, as design students, academics, and practitioners, be rigorous in investigating, understanding, and responding to design problems. Acknowledging that the problems we face as designers are complex, "wicked," messy, and often without any singular solution, how we frame the problem for ourselves, and communicate that framing to our clients and other designers, has a profound effect on how we address them. This book is broken up into four sections that align with what I see as foundational components to design theory and practice: usability, technology, sustainability, and morality. I argue that these drivers, and the needs and contexts associated with them, provide a crucial foundation to examine how designers engage in current and future design practices across disciplines. These drivers also frame four distinct paradigms that designers operate under—from the operational, to the scientific, to the meaningful to the actionable. The sequence of chapters is meant to grow in alignment with these paradigms. Part 1, Design and usability: if a design falls in the forest . . . starts with an understanding of how the concepts and theories of usability contribute to the judgement and "expertise" of the designer. Part 2, Design and technology: not if, but when looks at how technology impacts what it is that designers create as well as how designers push technological boundaries, with specific focus on the impact of technological advancement on production and consumption. It then moves on to look at how usability studies can be expanded beyond the digital world where they are primarily located and utilized and adapted across design disciplines. Part 3, Design and sustainability: killing messengers takes a systematic look at how design understands and responds to issues of sustainability beyond the traditional concepts of environmental sustainability. Addressing such issues as planned obsolescence, this chapter will reconsider the role of design in making the "new." Part 4, Design and morality: do the right thing starts to unpack how design impacts moral judgments on the part of the user and the designer—and what designers can do to understand and evaluate and respond to those outcomes. The organization of the book loosely follows the evolution of design research and insight—from the human scale and need, to what is

feasible from a technological position to how specific design solutions might impact the world—both environmental and on a human scale. Each section follows a similar structure—how these topics are theoretically considered in design; how design research methods can help provoke insights; how design processes can be utilized to more effectively address the problems brought forth; and specific examples of design theories in practice which showcase real-world examples of design projects that are engaging critical theories in the work they are doing. However, it is not intended that these theories, practices, and methods be seen as only developed as a result of that particular driver. For instance, systems thinking is valuable for understanding usability, as well as technology, sustainability, and morality in design. By organizing them according to what I see as large-scale drivers of design theory and practice, the intention is to provide a context through which to explain and exemplify these ideas. Hopefully, it will give a clearer picture of what these ideas mean, and for designers to practice and experiment with.

Gandhi was quoted as saying, "Your beliefs become your thoughts, your thoughts become your words, your words become your actions, your actions become your habits, your habits become your values, your values become your destiny." This book focuses on how our beliefs about design affect not only designers' thoughts, words, etc. but also how they affect the thoughts, beliefs, actions, habits, and values of the people who use them.

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Part 1

Design and usability

If a design falls in the forest . . .

2 Design and usability

From universal to individual experiences

In the introduction to *Design Integrations*, Sharon Poggenpohl (2009) makes a call for the importance of design and designers moving beyond the heritage of craft and towards a more disciplinary perspective. The activity of reflection, Poggenpohl argues, urges the designer to improve not just on the making of things, but also on the impact of that thing on a larger context which could be audience, environmental, material or socio-cultural in nature. It forces the designer to contemplate more than how the object looks and towards how it might be experienced. As we move beyond design as a merely material activity and towards design as an experiential one, the increased focus on the people for whom we are designing is critical. But how we do this is also as critical. The perspective that we take, as designers—whether to lump all people into a single category, or to try to identify the particularities and patterns between individuals experiences—has profound effects on the design solutions that come about. One main assumption driving this chapter is to consider design not as an end goal—something static that a "user" will use (and hopefully love) but to think of it more as an organic set of conditions that human beings will manipulate, change, and transform. In reframing design in such a way, we can start to think of it as truly human centered. Brian Burns, in the book *People Want Toast Not Toasters* (2012) brings up a central point to how we must start thinking about usability. By reframing the experience not as a set of procedures that are understandable, but rather the successfulness of the outcome from that experience, we open up a host of alternative ways to design. To use Burns's example we can think about the design of a toaster as a series of steps that users have to go through to achieve their goal OR we can think about the experience of the goal itself and work backwards from that.

This chapter on usability is one part champion of it, and one part examination of how we might do it better. As we lose more control over the outcome of our design actions, we must adapt and think about usability not as a way to control the user (and make sure they do what we want them to do) but rather think of it as an activity equally as focused on discovering opportunities for new design possibility. What does this mean? It means that rather than thinking of usability and user experience as a way to test the validity of a design, we might learn more, and create better designs if we are focused on the user as extending and manipulating our designs in new and interesting ways. But design has a long