

care through design

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It is necessary to understand history, and he who understands history knows how to find continuity between that which was, that which is, and that which will be.

Le Corbusier, Architect (1887-1965)

preface

In our current paradigm, there is a dichotomy between how we live and the notion of sustainment. This condition poses a critical challenge for design. If we have created this state of affairs, how can we shift our thinking to enable us to redress this situation of unsustainability?

It is estimated that our world's population will increase from the present 7.2 billion to approximately 8-11 billion by 2050. So you can imagine what this will lead to – increased human activity, higher supply and demand for materials, and related social and environmental implications. Imagine if like the world population of humans, we were also able to estimate the world population of things. In some sense it might help us visualize the asymmetry between us and the things that surround us. And if we keep adding to these already staggering numbers of people and things, what kinds of limits and boundaries are we crossing along the way? And aren't we as designers implicated in such transgressions of limits?

As a designer, I am interested in making a positive impact, and I therefore began to think about the notion of care, of limits and what this could mean for design. All things and people need to recognize and respect these limits. Our lives are temporally bound and configured around the limits of the place, space and the time in which we live. To design with care is to design with time in mind.

Humans are always in the presence of and surrounded by nonhumans. Our lives today are shaped by things and the services they provide. However, the centrality of materiality in society comes with a number of significant drawbacks. Things are over-abundant in our everyday lives; they have longevity greater than our

own; and they have ever decreasing use-lives. Things are constantly evolving. New products and services are designed each day to meet new needs using new technologies to support or create new practices. According to Peter-Paul Verbeek, “when technologies are used, they help to shape the context in which they fulfill their function, they help to shape human actions and perceptions, and create new practice and ways of living” (Verbeek 2008: 301).

With increasing expectations around convenience and efficiency, it is imperative for us as designers to reflect on what is gained or lost in the process. How do we value the things around us now, and how will we live in the future?



prologue

She rang the bell repeatedly with great enthusiasm grabbing the attention of everyone in the room.

“Weeeee fixed it!” she hollered.

Her face was beaming with joy, having saved another object from the all too common place where things go to linger, die, and pollute this beautiful planet – the landfill.

No doubt a cause for celebration!

This café is no ordinary café. This magical place is where things come to life once more. Blenders, food processors, toasters, mixers, bags, clothes, radios, etc. are given a second chance to live as productive members of the community together with their human counterparts. The café has vibrancy in its atmosphere. Sounds of chatter fill the room. It is a gathering place made up of volunteer repairers with various skill-sets, local residents looking to have their things repaired and the café owners and staff with a vision of wanting to see things done differently by filling a gap within our consuming culture.

The room itself was small with rows of long tables and chairs, a simple reception desk and seating area near the entry and in the back-room a couple of tables to accommodate pizza boxes and paper plates that the coordinator ordered to feed the bellies of all who came. Not too far away is a small storage space for parts that can be utilized if needed during a repair.

A hostess sits near the entry to welcome the visitors. With her computer at hand and to the right a printer, she guides visitors through the check-in process reminding everyone who comes in to sign in and have a seat.

“I will be with you shortly,” she says.

She handles things on a first come, first served basis. There are quite a number of people here. It is an eclectic mix of generations mingling and solving problems together. Their faces have a spark that, in a sense, expresses their level of engagement at the task at hand. It is beautiful to see the interactions between people, and between people and their things.



Fig. 1.0 Mother and child's toy globe and laptop

A mother and child sit patiently in the waiting area. They are up next. The mother has brought with her a toy globe and a laptop, which she doesn't think can be repaired but brings it in anyway. This is her first time coming to one of these events. She has been meaning to for a long time but with her four year-old child, life has a way of keeping her busy! But, she is thrilled to have finally made it, she thinks of all the other things at home that are neglected and need care. For now, they will continue to be stored in a dark closet until such time their turn should come.

Each table represents an expertise of the repair volunteers. A seamstress sits with her sewing machine, fabric and sewing kit on one table. Another table is devoted to repairing products like game consoles, laptops, etc. And yet another table caters to radios and clocks. And more tables still that had other areas of expertise at hand.

A couple stands at a nearby table. They have brought in a toaster and a blender, and are assigned to a volunteer repairer with the repair skills for these items. It is obvious that he loves to tinker and get under the hood, so-to-speak. He has a positive energy about him and is eager to help fix the blender. On the table are various tools to assist him in his analysis.

"I see what the problem is," he said.

The repairer had an idea but he'll need a specific tool which he doesn't have. Luckily, the community center where the event was taking place had a well-stocked equipment room for use at anyone's disposal. He uses a machine to sand off part of the plastic with the hope of solving the problem. After returning back to the table, he tested the blender and it worked! The couple was so happy. And so was he.

Yet another opportunity for celebration!

Various people walk in with their broken things and leave with them rejuvenated. There is a sense of excitement, creativity, hope and care in this repair café that is impossible not to notice. It is an inspiring place, and one that can change the future of our planet by enabling us to think about our everyday things and the kinds of activities that could be designed to alter the course of how we shape the world around us.

Repair Cafe at Hacker Dojo
Mountain View, California
July 2014

Care, as a primordial structural totality, lies 'before' every factual 'attitude' and 'situation' of Dasein, and it does so existentially *a priori*; this means that it always lies in them. So this phenomenon by no means express a priority of the 'practical' attitude over the theoretical. When we ascertain something present-at-hand by merely beholding it, this activity has the character of care just as much as does a 'political action' or taking a rest and enjoying oneself. 'Theory' and 'practice' are possibilities of Being for an entity whose Being must be defined as "care".

Martin Heidegger, German Philosopher (1889-1976)
Being and Time, 1962: 238

Care is a process: it does not have clear boundaries. It is open-ended. This is not a matter of size; it does not mean that a care process is larger, more encompassing, than the devices and activities that are a part of it. Instead, it is a matter of time. For care is not a (small or large) product that changes hands, but a matter of various hands working together (over time) towards a result. Care is not a transaction in which something is exchanged (a product against a price); but an interaction in which the action goes back and forth (in an ongoing process).

Annemarie Mol, Ethnographer and Philosopher
The Logic of Care, 2008: 68

Chapter 1

introduction



perspectives and case studies

The design of objects can offer a powerful way of seeing the world.

– Deyan Sudjic, *The Language of Things*, 2009

At each moment, the world is a geography of objects.

– Graham Harman, *Tool-Being*, 2002

It was evident at the very beginning as I started reading about things, that my journey into their world would become deeply engaging. The more I read, the more I was drawn into the world of things. I started to become aware of, overwhelmed with and unsettled by the volume of stuff with which we live. To examine things is to get a glimpse into our material world, our social world, and the interconnections between the two. And for my examination, I took a somewhat unorthodox approach in learning about things. Here, I will share some of the insights that emerged from the research and the lessons I have learnt along the way.

In his book *Making Things Public: Atmospheres of Democracy*, Bruno Latour suggests that we go from matters-of-fact (objects) to matters-of-concern (things). While facts may exist regardless of context, concerns are always situated within specific contexts. Very often, the concerns that we face in our lives bring people together; these concerns bind us as a public. According to Latour, each object gathers around itself a “different assembly of relevant parties” (2005:15). And very often conditions created by technologies, networks, interfaces, etc are the ones that make things public. We often take the everyday objects that surround us--like teacups, computers, smartwatches, etc--as fact. But if we start thinking of them more carefully as things that gather people’s memories, that express our sense of value, that ritualize our social practices, and are manufactured for our use, they start to become matters-of-concern.

In the following paragraphs, I have gathered a few of my personal learnings...

Complex Systems

In my time at the university, the courses I have taken have helped me understand what it takes to keep humans supplied with a steady stream of things. My course on supply chain management, for example, threw me into a world of complex logistics and linkages between a wide array of global systems. I learnt about the management, coordination, decision-making, tracking, and controlling of people and goods to ensure that the demands of our global consumer class are met. In addition, we analyzed production and service industries from the perspective of activities and practices, cross-collaboration, design, efficiency and time, information systems, strategies, supply and demand, and forecasting through data analysis. These insights brought to light the multiple layers of complexity surrounding things. The supply chain world became a lesson about the relationships, interconnectedness, communications and interactions that we need to take into consideration in order to design for multiple variables within complex systems.

Authenticity, Practices and Invisibility

During my second year, I took courses on acting and figure drawing taught by faculty in the School of Drama. While walking through the hallways in this school I sensed a different sort of energy in the air, a different kind of creative environment. One can hear actors reciting scenes, singing voices and pianos playing in the background. The hallways is full of theatrical sets, costumes, and props of all sorts—objects are critical for performances. I didn't realize that this too would be a lesson about objects.

Acting. In my acting class, we used acting methodologies written by legendary actress and teacher Uta Hagen in her book *Respect for Acting* (1973). These were exercises on understanding behaviors and creating authenticity. We were asked to reenact two minutes from our everyday lives and act out three different types of entrances as part of the methods described by Hagen as “object exercises”. We had to think about our character, our state of mind, our language and tone of voice, the environmental context, interactions between people, things and our surroundings along with all the objects needed to make the scene realistic, believable and authentic. We don't often recognize the things in our lives that

we've come to depend on. Our behaviors, movements, and who we are at that particular moment in time are affected by the objects in our proximity. By observing my own behavior and the behaviors enacted by each of my classmates, I gained a better sense of the central role that objects play with utter invisibility in our everyday routines.

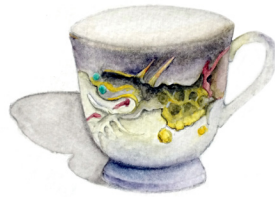
Figure Drawing. The figure drawing class was a study of human anatomy and of form. Clothes are things, and an unclothed human figure strangely emphasizes the presence of things through their absence. And as I was drawing, I couldn't help but hear my thesis advisor's voice saying that we are always “bethinged” or “we are always with things.” And that statement seemed starkly true in this context.

Making

Another class led me to an embodied experience of shaping things. In this course on 3D prototyping, I learned the process of prototyping physical objects using raw materials and intimidating machine tools. In spite of my fear of these machines, I discovered the joy of making and the engagement that comes along with it. I was able to process raw material, shape it, sand it, and finish it. It was in this class, that I learnt about another aspect of materiality that dealt with craft—or the process involved in making physical things. The crafted object has a different set of values, meanings, and sense of care associated with it compared to a mass produced good. And the process of making foregrounded this difference.

In order to illustrate some of the key concepts and themes that have emerged from examining the philosophies of things and of care, I have selected six objects as case studies for a brief discussion in the following pages.

the memory in a teacup



The teacup has a long history of rituals that makes it an interesting object to study but also a popular reference for scholars and designers such as Jonathan Chapman, Richard Brendon, Yoshio Taniguchi, and Cameron Tonkinwise to name a few. This is my contribution to the ongoing narrative of teacups.

The Daughter of a Merchant Marine

We grew up not seeing much of our father because of his job as a merchant marine. He traveled all over the world—Canada, Middle East, United Kingdom, Europe, Africa, USA, and all over Asia. In fact, you name the country and he was there. In the 1940s and 50s, he traveled to Japan. Every time he came back home from Japan, he brought these beautiful porcelain tea sets decorated with dragons of stunning colors. It would always be a complete set—teapots, cream and sugar containers, small cups and saucers. The small teacups were very unusual and sought after by collectors. An image of a woman at the bottom was made visible if the teacup was held up against the light. I treasure that whole set, not because of its value, but because it's the only souvenir I have from my father. I want to hand it down to one of my children with the hope that they'll take care of it.

A story such as this captures the meanings that get embedded into things typical of heirloom quality; these are cherished artifacts. Rich with memories and symbolism, this teacup represents the kind of object that is valued for what it represents rather than for its instrumental use. The particularity of this teacup consists of raised, tactile dragon motifs embellished with delicate hand-painted details. A lithophane image of a geisha girl can be seen at the base of the teacup when back-lit through the thin, translucent porcelain. This is a delicate, nearly weightless thing that communicates its fragility in its appearance and when held

in the hand. It is an example of an object that affords care. As with most cases, cherished things typically go unused and sit in closets and display cases. We fear of mishandling them, as if, should they fall and break, the memories embedded in them would fade and disappear as well. A closer examination of the teacup reveals the craft of the maker along with the time and careful effort that went into making it. These qualities together emerge from its materiality.

“One of the characteristics of things is that they so often change – or are changed – long after they have been created, taking on meanings that could never have been imagined at the onset” (MacGregor, 2011: 30). That is the case with this teacup.

the gift of a durable laptop



The low cost XO laptops first launched in remote regions in Peru where income inequality and poverty were high and educational opportunities low. The laptops were designed with durability and repair in mind. They were waterproof, ruggedized to withstand impact, and devoid of moving parts to make them easier to maintain. In addition, they were designed to be repairable by the children themselves. Internet access would be made available through partnership with existing programs and the laptops would come pre-loaded with books, music, games and software. Much of the marketing emphasized the rugged and indestructible features of the XO laptop and demonstrated by OLPC project leaders by purposely dropping them during presentations.

However, ethnographic research in schools in Paraguay revealed that in spite of all the features built into the XO laptop they did tend to break down. Either the screens broke, the adaptors stopped functioning, or the slowness frustrated the children. The environmental contexts where the children lived also led to more damage when dropped on the rough unpaved ground. Observations revealed that the “designers’ intentions to plan or divert such outcomes can often be rendered ineffective without accounting for the specific material, economic and cultural infrastructures that are at play in use” (Rosner and Ames, 2014: 327). In studies conducted by scholars (Rosner and Ames, 2014; Jackson, 2011), the criticality of understanding the comprehensive nature of the situated context emerges clearly.

The XO laptop case study shows that technological solutions need to account for the sociality of things. Because things are embedded into social systems, several factors need to be taken into consideration during the design process.

The emphasis on durability was another cause of concern. It enabled behaviors that were not beneficial to the way the object was perceived and valued. Had the narrative communicated responsibility and care, the children may have behaved differently towards it.

Technological artifacts are often deployed in situations without complete understanding of the situated context in which they are expected to perform. In such situations, if things are not considered as components of larger, complex networks and designed to perform within those systems, they may fail. It is therefore critical to take into account the agency of things as it unfolds in networks and not in isolation.

the curious case of a luxury wearable



The much anticipated Apple Watch has finally made its appearance in stores. After having lived on tech blogs, magazines, newspapers and rumor mills, it has entered, in tangible form, in all its materiality. Though wrist-worn watches and digital devices are by no means new, the Apple Watch has created significant buzz. The wristwatch has existed since the late 1800s, but this new manifestation of this product is no more simply a functional device that tells time. The Apple Watch is expected to change the way we buy things, get into our cars, communicate with others, interact with maps, and so on. Interestingly, it does not change anything about what a watch fundamentally does—how we read and tell time.

Riley is a young tech savvy student in his early 20s, who recently acquired the Apple Watch. This is not his first smartwatch—he has owned and used the Pebble and the Metawatch Strata before. After almost a month of using the Apple Watch, he described it as “clean, responsive, and natural”. But he added that it felt like a first generation product due to some speed issues and other “finicky” behaviors. There were things he liked about his two prior wearables but this to him was definitely more “natural” to use. The sensor in the Apple Watch can recognize when it’s on the wrist or not, and therefore it does not buzz around the table like his previous smartwatches did.

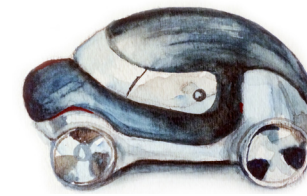
He also described it as “responsive” for the fact that if he’s looking at his phone, it doesn’t notify him on his wrist... it responds appropriately because it is in communication with other devices. He elaborated on the “natural” aspect of the Apple Watch in reference to the notification features and the specific way the watch communicates. To him, the subtlety of the tactile notifications in

the form of small taps on the wrist made the watch feel more natural. Riley generally uses the Apple Watch for reading notifications like snippets of data from stocks, weather, and calendar. When he uses the payment feature, the watch immediately alerts him of his spending, ensuring that it is a legitimate purchase. Because the watch has more “robust data”, he found himself glancing at it more frequently than he did with his other smartwatches. The watch also has some fun features like animations of jellyfish on the screens which he finds “goofy and kinda fun” but “it doesn’t change the way I look at time”.

As a functional device, the Apple Watch is a high-tech object— indeed, a computer strapped to the wrist. It is a smart device capable of performing a variety of functions that a traditional watch does not. The Maps feature requires the user to learn the protocol of different types of tapping behaviors of the watch. For example, if one needs to make a left turn while using Maps, the Watch taps the user’s wrist six times and if one needs to turn right it generates two series of four taps. The watch also adjusts its speed depending on whether a person is driving or walking, so that directional notifications either occur earlier or later depending on the form of travel. It is clear that the device is shaping its behaviors in response to the behaviors of the user in a form of reciprocity of action.

The most expensive of the Apple Watches is priced at \$12,000 and the least expensive one at \$349. As the prices change, so do the materials of which it is made—rose gold, stainless steel, aluminum, leather, plastic. Riley liked the aluminum and the surprising smooth, microfiber feel of the plastic band though he’s unsure about how it is supposed to be cleaned since it’s not a standard

the morality of a driverless car



plastic. The gold watch with sapphire glass has its own unique set of material meanings compared to the aluminum and plastic one. Riley did not find the Special Edition too practical. “If it is a piece of electronics, it’s eventually going to die. It’s not like a classic timepiece that you can just go get it fixed. Circuits and stuff you just throw away once they are dead so maybe if they... I don’t know, replace the inners and keep the outer casing... but that seems kind of silly”. Riley raises an important question about the longevity of the device. It is clear that the short life of the electronic circuitry within the watch poses a unique problem. A well made Swiss watch for which someone might have paid a significant amount of money does not pose this problem. A Rolex watch, for example, is a device with a significant lifespan and is often considered to be an heirloom object that is passed down from generation to generation. However, will this be the case for the Apple Watch? How will the electronics survive the rapid pace of technological improvements and lifestyle changes? And how will the material manifestation handle and react to those changes?

When asked if this new device had changed his routine in any way, Riley responded, “No, I don’t think so.”

It may not be too far out into the future, it is predicted, that we might have autonomous, driverless cars cruising our highways and streets. According to the New York Times, Tesla, Audi, and Cadillac are introducing these vehicles in less than a year, while Mercedes-Benz and Infinity already have cars on the market with features that help them stay within lane lines. And while these cars are expected to outperform humans in many ways. “Driverless cars may never be perfect but they won’t make the kind of routine miscalculations and mistakes that human drivers make all the time. They won’t be drunk, tired or distracted.” (Kalra, 2015). However, should there be a situation in which driverless Car A does get into an accident with Car B, who is to be blamed? And if Car B is also a driverless car, what happens in a court of law, and how does insurance handle it?

“Can”, as Kroes and Verbeek ask in *The Moral Status of Technical Artefacts*, “material things be considered moral agents, and if so, to what extent?” The simplest of things we live with exercise agency on account of their presence in our lives, and in that process influence our behaviors. Technical artifacts, it is often argued, play a larger role in shaping our routines. In these situations, humans and nonhumans together exhibit a reciprocal relation. A driverless car takes this notion to an even higher level by skewing agency towards itself. A product that can operate with limited assistance of human agency therefore takes on a greater share of the morality delegated to it by design and technology. As autonomous things start displaying not only higher levels of agency, but agency that is generally retained by humans, questions of ethics become more difficult to handle. We will need new technical regulations, governmental policies, and social practices to deal with things that seem to have minds of their own.

close encounters with a gauze



One can begin to learn a lot about care by spending continuous 24-hour stretches of time for several days at the hospital room. This is precisely what occurred not too long ago, when my Mom was in the hospital, under continuous care and monitoring from injuries sustained by an automobile accident. In these moments temporality and time have a very strong presence. A chart on the wall identified her care team with a care plan that involved neurology, wound care, pain control, and comfort and safety. Her care involved a triad of people, things and an environment to support that care.

Elaine Scarry's book, *The Body in Pain*, argues for the "recognition that a made object is a projection of the human body" (2008: 281). She explains, "when the woven gauze of a bandage is placed over an open wound, it is immediately apparent that its delicate fibers mime and substitute for the missing skin" (Scarry, 1985: 281-82). An open wound left uncovered is an invitation for infection. Furthermore, a fresh open wound is vulnerable to pain even by the gentle breeze of natural air or from an air-conditioned room. However, what happens at the interface of the wound between human skin and the nonhuman gauze is important to examine. Over a short period of time, as the wound starts the slow healing process and as the moisture of the gauze ceases to exist, it fuses with human skin, almost becoming one with it. When this hybridity of skin and gauze, natural and artificial, human and nonhuman occurs, it becomes a source of significant pain and distress especially when it comes time to remove the dressing, clean the wound with the stinging sprays of Bacitracin, and replace it with fresh sterile gauze. Nurses continually told us that the Xeroform protective dressing they were using was non-adhering, it was clearly not true in this case. Despite seeing that the gauze did stick to the wound, it wasn't until several painful wound care cleanings, a surgical procedure, and our persistent

communication to find an alternative or an approach to maintain its moistness, did nurses finally consider a different approach to dress her wound. Sometimes the intentions of providing comfort and safety can prove ineffective due to specific surrounding circumstances in the service of care, the varying skills, techniques and responsiveness of care providers, and the person who is receiving care. The patient by now has developed a fear of being touched and hesitates to trust her constantly changing care team. There is a conflict between the material being of the gauze, the social interactions between the people involved, and the natural skin of the human being under care. This needs to be examined in order to understand what it means to provide good care.

"Technologies do more than is expected of them. What is more: they also change expectations" (Mol, 2008: 157). Mol suggests that both people and technologies behave in unpredictable ways, and perhaps the way to work with them is to make them context-specific. "Care is not a matter of implementing knowledge and technology, but of experimenting with them" (Mol, 2008: 176). In addition, medical care practitioners need to remember that the treatment of care is being administered to a human being who has nerves that feel, a mind that thinks and knows, and a voice that needs to be heard so that the care being provided is appropriate for that particular person and situation. However, very often as patients "we are treated as objects and made passive" (Mol, 2008: 35). And as objects, we are subjected to treatment by a series of technologies. Mol suggests that in processes of care, facts should not be treated as being neutral or valueless, but as things of value. What might seem to be factual information to a care provider, may in fact be life-changing for a patient, and therefore of immense value. Understanding both the human and nonhuman perspective together is critical in the process of the delivery of care.

the replacement of humans by caring nonhumans



In recent news on CNN, a retailer in Japan piloted a robotic greeter at a high-end department store temporarily replacing the human greeter. The robot, designed to have the appearance and movement of a real person, served to deliver information to shoppers upon entering the store. There are countless examples of such humanized robots designed to look and act like people. The Henna-na Hotel (meaning “strange hotel”) in Nagasaki, Japan will be partially staffed by robots working as receptionists, cleaning staff, waiters, and cloakroom attendants. Technological artifacts, it seems, will not only replace humans in retail and hospitality settings in the near future but are likely to become companions for our aging population. These are care robots, and by some accounts, they are inevitable in our future. “The initiative to create such robots stems from the foreseen lack of resources and healthcare personnel to provide a high standard of care in the near future” (Wynberghe, 2011: 408).

A Disney movie called *Big Hero 6* and a recent documentary called *Alice Cares* involves such robots. Baymax, the robot in *Big Hero 6*, was designed to look non-threatening and huggable. This robot could be activated to provide care upon signs of pain, and deactivated when the patient utters the phrase “I am satisfied with my care”. In the documentary, Alice provides companionship and physical therapy, expresses emotion and make moral choices. She is not designed to look real to avoid associations to humans, and to minimize confusion. Alice, who has the face of an eight year old girl, is only able to move her head, eyes, and mouth. In some sense, she too needs to be cared for. And so, the reciprocal nature and symmetry of human and nonhuman agency comes into play here. Do we need to demonstrate care for our robots so that they may in turn care for us? And if that is the case, what does this mean for the future of human-thing

as well as human-human relationships? “Technology is seductive when what it offers meets our human vulnerabilities” (Turkle, 2011: 30). In many cases, it is our population of older adults that is the most vulnerable and therefore most in need of care. And therefore, carebots are expected to have widespread application in healthcare, especially for the aging population.

“Beyond the embedding of values and/or norms, once the robot enters a network it will alter the distribution of responsibilities and roles within the network as well as the manner in which the practice takes place” (Wynberghe, 2011: 412). Therefore, it is critical to ask what happens as humans are replaced by robots to perform specific functions typically performed by family members, relatives, friends, nurses, and healthcare professionals? The agency of these nonhuman carebots will mold our practices with other humans. “Technologies help to shape the quality of our lives and, more importantly, they help to shape our moral actions and decisions” (Verbeek, 2008: 302). According to the New York Times, “maybe we should be worried about outsourcing morality to robots as easily as we’ve outsourced so many other forms of human labor” (Henig, 2015).

The relationship between morality, technology, and humanity is critical to think through because it will play an important role in how practices of care will unfold in the future.

the model: three lenses of care

In order to understand and follow the idea of care through design, I have structured some of my thinking around three lenses—the material, the social and the natural. This structure is inspired by Heidegger’s notion of the threefold, which he explains in the context of temporality and a pattern that can be found in the seminal book *Being and Time*. The matter of concern here is that our material, social and natural worlds are at odds with each other and it is their collision that is leading to problems of a global scale.

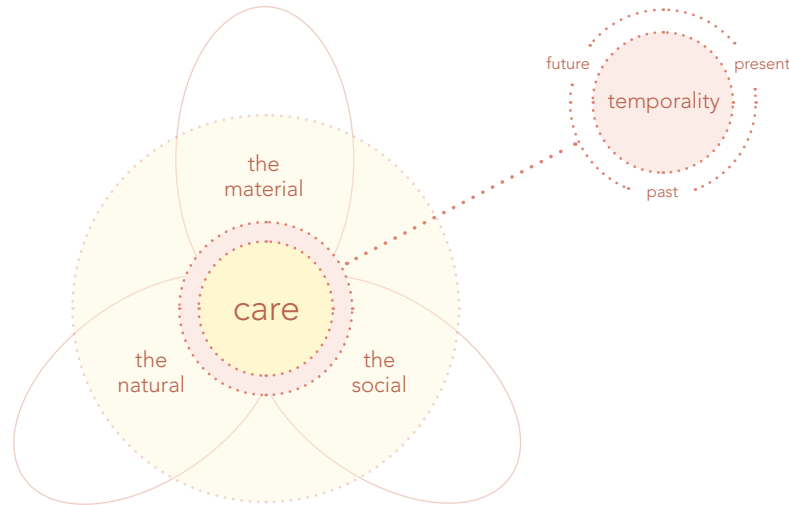


Fig. 1.1 Three Lenses of Care + Dimensions of Temporality

The Material. We live our lives each day in the midst of things, and all our experiences are shaped as well as mediated by their presence. For designers, who are actively involved in the production of these things, materiality is a critical concept to understand. What does the material world mean, how does it affect us as people, and what are the effects on our environment?

The Social. The second lens that is critical for designers to be aware of and attuned to is the social. The relationships among people define what society is and what it means to be social. The interactions that we have with each other and with all that is nonhuman, and the social practices in which we engage are the things that make us human.

The Natural. The third lens refers to our environment, which can best be described as the natural. This includes all that is not primarily shaped by human intention. And while the distinction between what is natural and what is not is difficult to clearly distinguish, in this case, it refers to the resources present on the planet on which we rely for survival.

These three lenses offer me a unique perspective on the topic of care through design.

Temporality. In his writing, Heidegger explains the structure of care as a unity among the three dimensions of temporality—the past, present, and the future. Temporality is considered the meaning of care. It is also important to note that the three dimensions are not seen in linear terms. In addition, Heidegger also explains the idea of finitude, which refers back to the notion of limits, and completes the structure of care.

The following chapters in this thesis document are largely prompted by my wish to begin to think about care in design, and I am convinced that things must be central to our attempts in doing so. My aim is to lay the foundation for developing a sensitivity towards thinking with things as a mode of inquiry for designing the kinds of interactions that opens up new possibilities beneficial to both humans, nonhumans and the broader world.



a shift in thinking towards the nonhuman

What is a thing? The question is quite old. What remains ever new about it is merely that it must be asked again and again.

– Martin Heidegger, *What is a Thing?* 1967: 1

My inclination in the beginning was to focus on the human due to my education and experience in human-centered design. Shifting my thinking more towards things however, required some getting used to, and I had to reframe my way of thinking. Over time, I became more materially attuned and I can now oscillate between the two perspectives. Being more aware of materiality has helped me gain a better understanding of relations, behaviors and interactions. It also feels like a more balanced way of looking at the world around me.

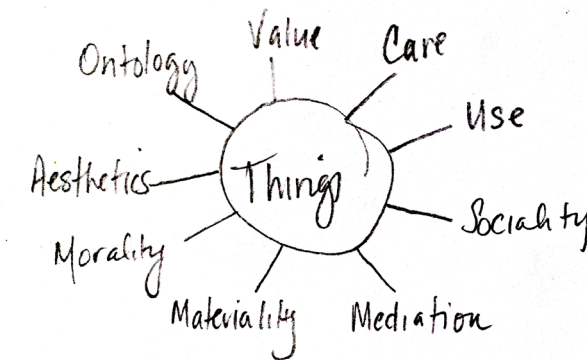
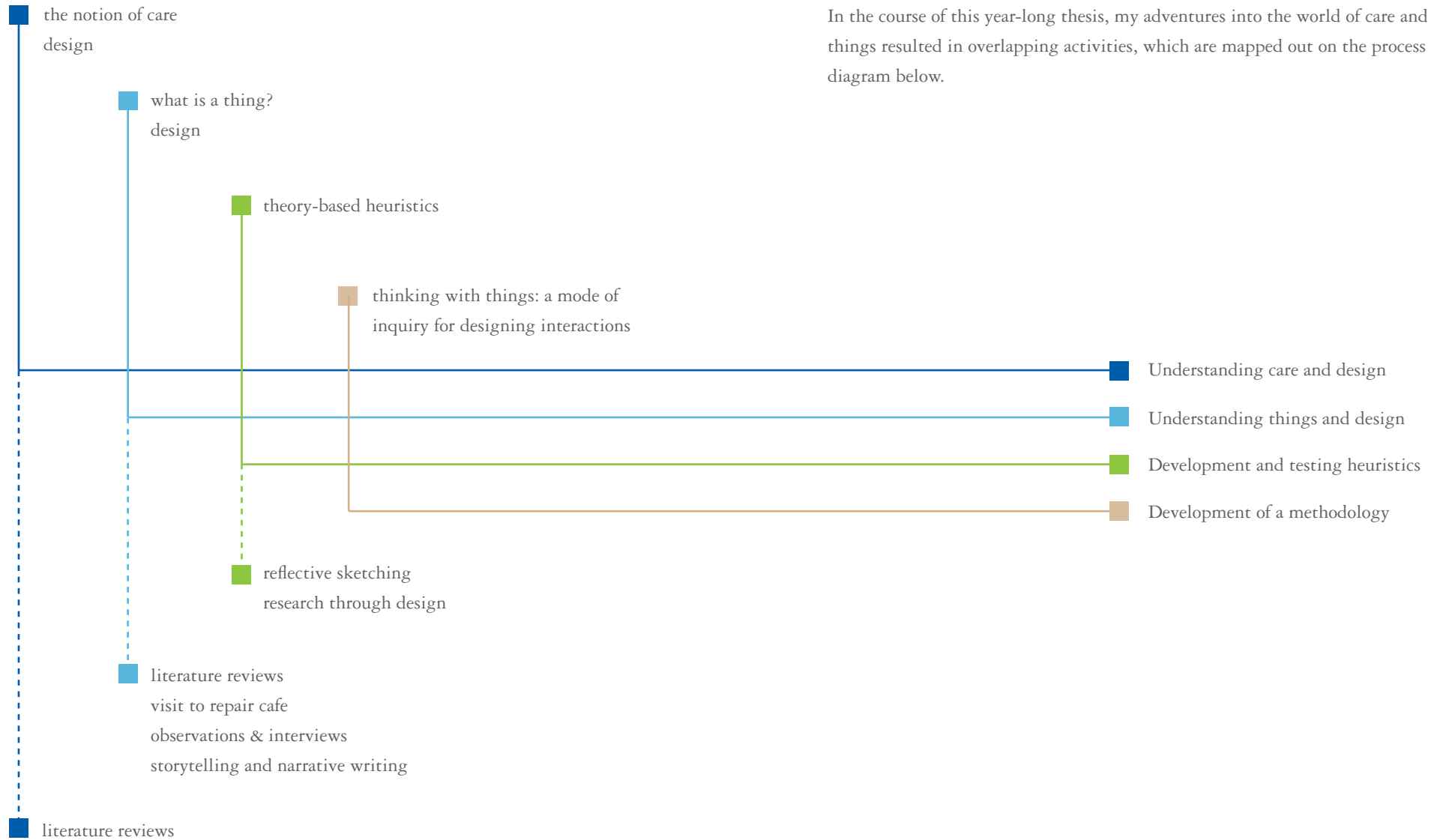


Fig. 1.2 The Multiple Dimensions of Things

Through the process of literature review and concept diagramming, I became aware of certain patterns developing with the information I had gathered. This also helped me generate questions to think about as I moved away from being purely human-centric and starting to include nonhuman points of view as well. The theories and the conceptual maps helped me generate keywords and make sense of the complexity of this information.

the process

In the course of this year-long thesis, my adventures into the world of care and things resulted in overlapping activities, which are mapped out on the process diagram below.



The kinds of things we are apt to see as
“mere” technological entities become much
more interesting and problematic if we
begin to observe how broadly they
are involved in conditions of social and
moral life.

Langdon Winner, Political Theorist
The Whale and the Reactor, 1986: 27

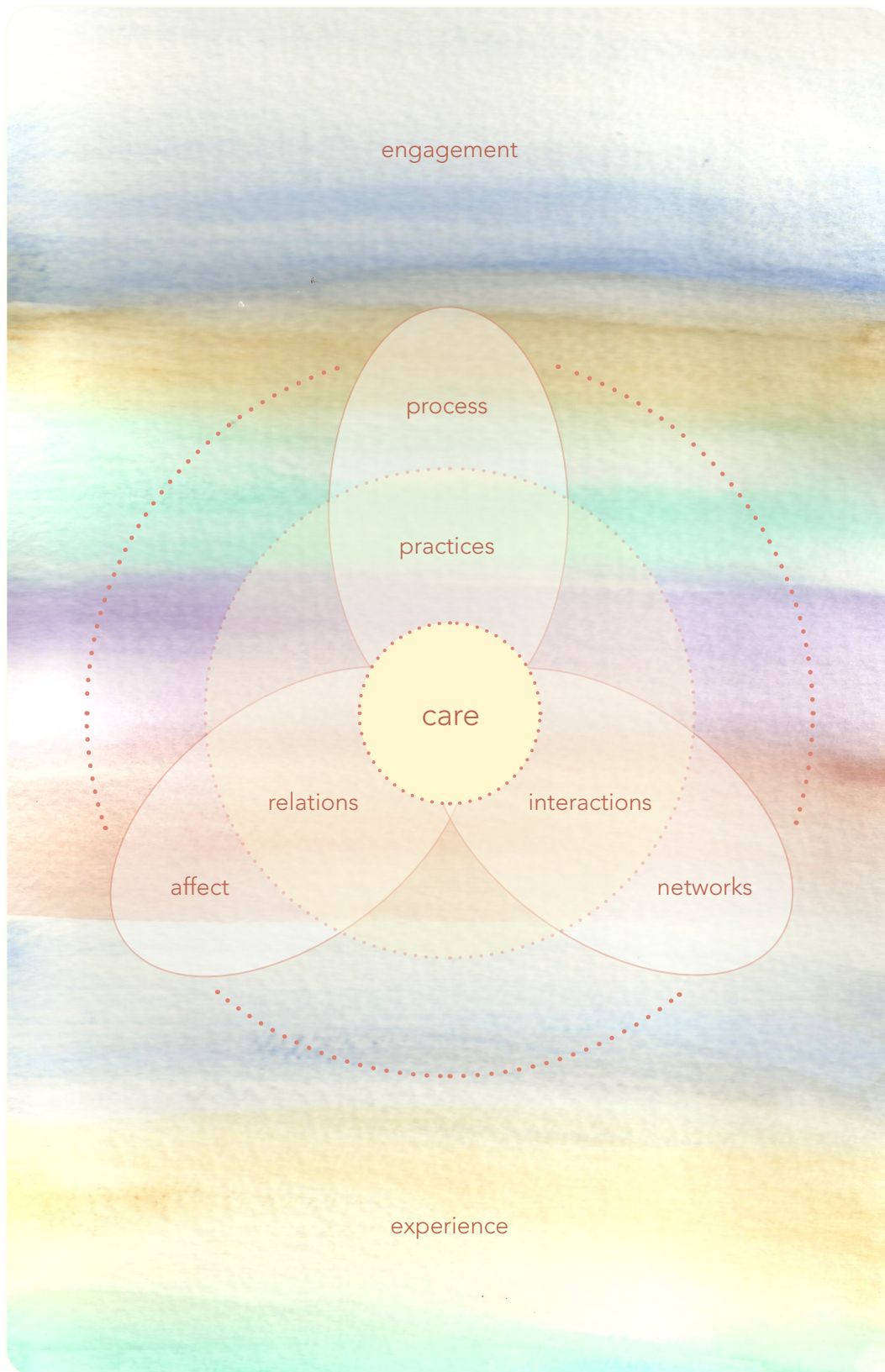
care: a brief introduction

Care guides and directs the detail of our passage through the everydayness of our life in the actuality of our circumstances. More than this – it is care that takes self into the world (as being ‘thrown’ here) with an intense interest in its fate.

– Tony Fry, *Remakings: Ecology, Design, Philosophy*, 1994: 126

Humanity is confronting a series of challenges of a global scale as we progress towards the third decade of the 21st century. Problems of climate change, social injustice, economic upheaval, and cultural instabilities have been unfolding in many areas across the world. The threats to good food, clean water, breathable air, renewable energy and other resources are real, and there is a sense of urgency in determining how to address these unique concerns of our time. It is critical that we seek new ways of thinking, seeing and acting and develop new approaches, methods, and practices to address such concerns. In order to do that, we need to clearly see and understand the nature of the problems we are facing. It was Albert Einstein, who said “theory determines what we observe”. In other words, it is important to draw from various disciplinary perspectives and establish a robust theoretical foundation so as to enable clear comprehension of situations being studied.

This literature review is an attempt to examine the literature on care from a broad perspective. Care is multifaceted in nature, and scholarship in this area of inquiry exists in a variety of disciplines. Through the notion of care, we can begin to reflect on the kinds of things we take for granted, the ways in which we think of the world around us, and the ecosystem in which we live our everyday lives. More specifically, care can enable us to understand our practices and processes, our relations and affect, and our interactions within networks of social systems.



To begin this inquiry, let us first define what care means through multiple disciplines and scholarly perspectives. Scholars from the disciplines of anthropology, economics, ethics, geography, philosophy, science and technology studies, sociology, and urban studies have examined the concept of care. But despite this growing interest in the idea of care, there is need for greater attention to understanding the implications of care (Mol et al, 2010; Tronto 2013; Puig de la Bellacasa, 2011).

“All in all, care is central to daily life.” And in spite of this, the concept of care has not been examined widely in academic scholarship. There has been an increase in critical writing on care in recent years, and most of the work started with nursing theory, soon to be followed by anthropology, sociology, philosophy and others (Mol et al, 2010). This thesis is an attempt to examine the literature in care, identify concepts that connect care to design, and hope to build a better understanding of the intersection between the two areas of study.

For political theorist Joan Tronto, care has two key aspects to it. “First, care implies a reaching out to something other than the self: it is neither self-referring nor self-absorbing. Second, care implicitly suggests that it will lead to some type of action” (Tronto, 1993: 103). Inherent to the notion of care, therefore, is the idea that it is relational and necessitates a “reaching out” beyond one’s self. In addition, care involves concern as well as action; it is critical that the self engaged in care acts upon it. On a general level, Tronto’s work on care can be summarized to these basic ideas.

- (1) Care is a form of interaction that includes humans, objects, and the environment.
- (2) Care is not to be taken as only between two people or individualistic.
- (3) Care is cultural and therefore care practices will vary among different cultures.
- (4) Care is a continuous process.

Tronto further explains that while care is something we are involved in frequently, not all human engagement with others can be described as a form

of care. “We can recognize care when a practice is aimed at maintaining, continuing, or repairing the world” (Tronto, 1993: 103). It is critical to recognize the specific type of engagement—one that better the world—that qualifies as the practice of care.

For Heidegger, “Being-in-the-world is essentially care” (1962: 237). But the notion of care goes beyond what we typically imagine the word to mean. “From this signification every tendency of Being which one might have in mind ontically, such as worry [Besorgnis] or carefreeness [Sorglosigkeit], is ruled out” (Heidegger, 1962: 237). From this point of view, care is a structural notion that is deeply tied to the nature of Being and to existence. In other words, it is to be understood in an “ontological-existential manner” and *a priori* or before experience. Howarth explains care as “our fundamental relation with, among other things, and our environment (1996: 4). Tony Fry elaborates by saying, “care adds up to a sum of concern expended in order to survive, as such it forms part of the structure of being” (1994: 97). Heidegger’s care is intriguing because it makes us think about our existence as human beings and what that means in our everyday social world.

Dutch ethnographer and philosopher Annemarie Mol approaches care as an adaptive interaction and process. Mol outlines several elements that are at play within the practice of care—scale, temporality, collectiveness, and reciprocity. Care unfolds over time, and it does so in a collective fashion when ‘multiple hands work together’ towards the accomplishment of a common goal. She makes it clear that care is not necessarily about the exchange value of a transaction; instead, it is about interaction (Mol, 2008: 68). In an interesting study of the application of care beyond healthcare, Frank Heuts and Annemarie Mol turn their attention to tomatoes. They ask, what is a good tomato? The authors are less interested in responding to that question with a definitive answer, and more interested in knowing how ideas of care and value emerge for tomato growers, sellers, cooks, consumers and others involved. They discover that “the ‘assessment’ part and the ‘improvement’ part of dealing with tomatoes slide over into each other” (Heuts and Mol 2013: 130). The subtle but critical difference as well as overlap between valuing and caring is evident in two questions: what

makes good tomatoes, and what makes tomatoes good? In other words, the care that goes into making good tomatoes is just as important as understanding the value that makes tomatoes good. Valuing is inherent to caring—it is “ongoing, adaptive, tinkering and open ended” (Heuts and Mol, 2013: 130).

The term ‘care’ suggests enduring work that seeks improvement but does not necessarily succeed. It also implies that the object of improvement should not be overpowered, but respected. Respect does not depend on leaving things and situations as they are. Instead it is a matter of calling on strengths and tinkering with weaknesses (Heuts and Mol, 2013: 141). These notions of respect and tinkering are critical to Mol’s notion of care. There is an attention to continuous improvement through tinkering but also an immense respect that is inherent to a valued object. Mol also highlights an interesting aspect of care that is very often overlooked—the non-verbal.

Care, after all, is not necessarily verbal. It may involve putting a hand on an arm at just the right moment, or jointly drinking hot chocolate while chatting about nothing in particular. A noisy machine in the corner of the room may give care, and a computer can be good at it, too. And while your cows may respond to the tone of your voice when you talk, they don’t much mind what it is that you are saying” (Mol et al, 2010: 10).

Nonverbal forms of care which could be behavioral, gestural, visual, etc. are just as important as expressing care through words.

Feminist scholar of science and technology studies Maria Puig de la Bellacasa presents an additional dimension to Bruno Latour’s concept of matters-of-concern, by introducing the idea of matters-of-care. She explains “concern and care can mean similar things – both come from the Latin *cura*. But they also express different things. So care does not replace concern at the heart of the politics of things; it does something else” (Puig de la Bellacasa, 2011: 89). While concern refers to worrying about something and expressing thoughtfulness about it, care represents a deeper sense of attachment as well as commitment. There is an issue of quality and value that is being expressed

in the shift from concern to care. For Puig de la Bellacasa, to care refers more specifically to “material doing”; there is an action-oriented inclination in use of the word care that is less evident in the word concern (2011:91).

From a historical and feminist perspective, the labor involved in caring has been delegated to women, slaves, servants, and other minorities (Tronto, 1993; Tierney 1993: 16). This is the kind of invisible and often unpaid labor that is seen in such everyday activities as household cleaning, child and elderly care, etc. (Puig de la Bellacasa 2011; Mol, Moser, Pols 2010; Tronto 1993). And because this labor is often devalued and invisible, there is a sense of asymmetry and neglect in the practice. There is also vulnerability, dependency and fragility that is rendered visible through the act of caring.

These scholarly perspectives on care provides a starting point for conversations around care in design and how “knowing and thinking with care” (Puig de la Bellacasa, 2012: 198) can begin to find its way into the practice and process of design. According to Peter Jones, “design has not yet taken a clear stand in the matter of care” (Jones, 2013: xvii). There is a significant emphasis on the notion of empathy, especially in human-centered design. The fundamental goal of user-centered design research is to encourage designers to develop empathy for the people for whom they are designing new products and services. To Jones, empathy is “temporary caring”, and a deeper focus on care might generate new approaches as well as tools for design. Jones is suggesting that designers should take an active role in incorporating the practice of care into the way they think of their own work.

In the twentieth century, care and technology seems to reside at two ends of the spectrum. “Care had to do with warmth and love while technology, by contrast, was cold and rational. Care was nourishing, technology was instrumental. Care overflowed and was impossible to calculate, technology was effective and efficient. Care was a gift, technology made interventions. Much of the resistance to squeezing care into technological frameworks is informed by this line of thought” (Mol, 2010:14). Mol suggests that care and technology should be framed together instead of viewing them as polar opposites. In view of the

changing landscape of design and the dominance of technological solutions to address complex social and environmental issues without consideration of the socially embedded nature of things, scholars such as Peter-Paul Verbeek, Don Ihde, Bruno Latour and Albert Borgmann, to name a few, highlight the mediating capacity of technological artifacts that “would not easily appear in descriptions that foreground the success of the technology” (Puig de la Bellacasa 2011: 93). For example, “[Lucy] Suchman’s work asks question such as: ‘what kind of social relations are assumed to be desirable, ... whose interests are represented and whose labours are erased’. Who or what is or is not counted or assembled here and why” (Puig de la Bellacasa 2011: 93)? These are important questions to ask as our constantly evolving landscape grows in population and as technologies continue to be more and more embedded in our everyday lives.

engagement in the labors of care

The transactions that surround things are invested with the properties of social relations.

– Arjun Appadurai, *The Thing Itself*, 2006: 15

Care involves the active engagement of humans, and therefore it involves various forms of labor. There are three important configurations to consider while thinking of the labor involved in the practice of care: care for people, care for things, and care for the world.

The practice of care involves several actors. It is therefore imperative that the study of care includes attention to the relationship between humans and nonhumans. Sociologist and philosopher Bruno Latour has proposed a “principle of symmetry” suggesting that in order to grasp what is happening in society, there should be no distinction made between humans and nonhumans—they should be treated with symmetry. In this section, I present the notions of engagement, agency, and perception as they apply to the three configurations of care that involve people, things and the world.

Engagement has been defined as a “phenomenon that develops in the complex transactions between people, physico-spatial surroundings, socio-cultural practices, and technologies” (Dalsgaard and Dindler, 2009: 1). This definition of engagement points to the variety of contexts involved, actors engaged and socio-cultural activities that unfold over between time and space. Philosopher of technology Albert Borgmann too explains engagement as “a specific form of contact between humans and their world” (Verbeek, 2002). This contact has intentionality, it involves interaction, and in that process it shapes our engagement with the world. But there are specific forms of engaged labor that care necessitates. According to Mol et al, “engaging in care... is infused with experience and expertise and depends on subtle skills that may be adapted and

improved along the way when they are attended to and when there is room for experimentation (Mol, Moser, and Pols, 2010:14). What is critical to note here is that care is a skilled, dynamic practice that involves change and adaptation, an idea also proposed by Heuts and Mol (2013). Care evolves over time as so does the skill and labor associated with it.

Design philosopher Tony Fry raises an interesting notion about “craft, as *care*” in the sense that “it has a major part to play in the establishment of the conditions of an artificial nature for the survival of the denaturalized. The denaturalized, of course, includes us and almost all of that upon which we depend” (2004: 98). This new “reconfigured view of craft” ties to the notion of value and ethics – a “creation of means and marks of care and caring” (Fry, 2004: 99). While Fry refers to craft as care, it is also possible to imagine care as craft. The practice of care is a form of craft; it involves skill, it is interactive, and it has the potential of engaging the entire actor-network.

The caring process is comprised of four phases, with a greater emphasis placed on “responsiveness” (Tronto, 1993). Though this perspective is explicitly human-centered, I present it as a point of entry to enable one to think about what the process entails in a more general sense.

Phase 1: Caring about involves an awareness of another person’s needs for care.
Phase 2: Taking care of is a process in which responsibility is assumed and preparations are made to respond to these needs.
Phase 3: Care-giving involves physical work by individuals and organizations.
Phase 4: Care-receiving requires collaboration of the recipient.

- Joan Tronto, 1993: 105-108

These four phases of care clarify the type of engagement that this practice requires—awareness, skill, responsibility, labor and collaboration.

Care for People

My approach in thinking about the care for people is atypical; it is not exemplified through stories of patients in healthcare environments. Instead, I

have adopted an approach that I hope will open up new ways of thinking about care and design, and also offer some insights on the role of perception and interpretation in what we experience through our senses.

Central to the notion of engagement and care is physical presence and action. As Tronto (1993) lists above, Phase 1 involves the act of perceiving or becoming aware of the needs of another, and Phase 2 refers to the preparation made to react to those needs. The perception and action possibilities as determined by the specific context and situation correlate to the notion of affordance developed by American psychologist James Gibson. The concept of affordance essentially refers to the types of actions that any thing inspires on account of its presence and meaning to the observer. However, it is important to recognize that an “affordance is not entirely a function of the object; it has a behavioral component that depends upon people and their condition/state of being. For instance, the more tired someone is, the more objects appear chair-like; in such cases even a box or a window ledge or the floor can serve as a chair” (Boradkar 2010: 236). Affordances therefore refer to meaning (what someone can do with something), and it is clear that these meanings are relational, because they depend on the things (the objects) as well as on the observers (the subjects). “Affordances are both objective and persisting and, at the same time, subjective, because they relate to the species or individual for whom something is afforded” (Gibson, 1982: 234, 237). This relationality also refers to a dualism and a reciprocal relation between the object and the subject—there can be no meaning without the presence of both. In *The Meaning of Things*, Costall explains the meaning of affordance through the wonderful narrative of a little girl in a quote from Georges Henri Luquet.

One small girl I knew always described objects according to their role, not their name. A chair was “for sitting on”, a plate “for eating on”, and so on. One day, in the hope of catching her out, I showed her a slug and asked her what it was for. I was feeling completely sheepish when she said that it was for squashing (Luquet 1913:134).

Issues of objectivity and subjectivity are clearly visible in the wonderful story of the little girl. The slug’s affordance might be squashability for the girl, but that

may not be the case for other subjects. This notion of affordance can be extended beyond things to humans as well. Humans have agency, which we exercise through action, but we also have affordances.

In Thomas Tierney's book, *The Value of Convenience: A Genealogy of Technical Culture*, he defines the modern meaning of convenience as the "quality of being personally convenient; ease or absence of trouble in use or action; material advantage or absence of disadvantage; commodity, personal comfort; saving of trouble" (Tierney, 1993: 39). He claims that the move towards convenience was due to changes in attitude towards the human body and the perception of pain and discomfort. "The demands of the body are no longer thought of as requiring careful planning and attention" (Tierney, 1993: 36). Instead, Tierney says, we perceive them as inconveniences that impose on our time. We want quick solutions to our inconvenience, which Tierney argues is mitigated through technology. Many of the ways things care for people is to ease the burdens of our everyday life through the services that they provide. Scholars who have written about the human body in correlation to technology and design provide an interesting perspective on the notion of experiences. In examining the human body-technology relations, Philosopher of technology Don Ihde creates two distinctions of human bodies, and refers to them as "body one" and "body two". The first is a sensing body and the second is formed by cultural forces. Andrew Feenberg, yet another philosopher of technology, extends Ihde's work to include the "dependent body" (body 3) and the "extended body" (body four).

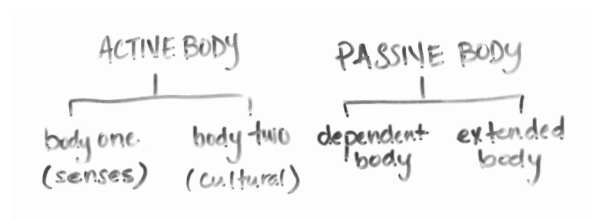


Fig. 1.3 Four Dimensions of the Human Body

These four together represent ideas of "activity and passivity" with the latter being Feenberg's contribution. "The extended body, then, is not only the body that acts through a technical mediation, but also a body that signifies itself

through mediation" (Feenberg, 2003:3). To illustrate this, Feenberg describes it below using a medical scenario:

We bring our body to the doctor to be poked at and examined. We ... know to whom our pains belongs. Inside our dependent body, we attend to unexpected sensations we have solicited. Our time horizon shrinks as we no longer control or plan the next sensation, yet we remain exquisitely alert. This is peculiar passivity since we have set the stage for our own inaction and can at any moment reverse the situation and take control again. In a modern context, it is also a highly technologized experience: we are operated on by a whole panoply of devices.

From the user of tools we become the object of tools. (Feenberg, 2003: 2)

In other words, there are times when we, as human bodies, behave as subjects and at times as objects as well. A surgeon, for instance, as a user of tools and instruments, behaves as an extended body for his patients. However, in situations where the surgeon herself or himself has to undergo surgery at the hands of another, (s)he becomes immediately an object in a "reversal of perspective" (Feenberg, 2003: 2). These dimensions of the body provide an intriguing way of looking at the relational and sensorial elements that are at play, and the labors of care involved in the process. In care practices, the awareness of these four dimensions provides a critical way of thinking about experiences and the various configurations of the human and nonhuman relations within care. Elaine Scarry, who studies the condition of pain, presents an entirely different and equally interesting perspective.

If one imagines one human being seeing another human being in pain, one human being perceiving in another discomfort and in the same moment wishing the other to be relieved of the discomfort, something in that fraction of a second is occurring inside the first person's brain involving the complex action of many neurons that is, importantly, not just a perception of an actuality (the second person's pain) but an alteration of that actuality (for embedded in the perception is the sorrow that it is so, the wish that it were otherwise). Through this interior event must be expressed as a conjunctive duality, "seeing the pain and wishing it gone". (Scarry, 1985: 290)

This instance of “seeing the pain and wishing it gone” brings a human-human relation into focus in a moment of care (Scarry, 1985: 290). In another account she brings to life the nonhuman-human relation in the context of care for people.

The shape of the chair is not the shape of the skeleton, the shape of the body weight, nor even the shape of pain-perceived, but the shape of perceived-pain-wished-gone. The chair is therefore the materialized structure of a perception; it is sentient awareness materialized into a freestanding design (Scarry, 1985: 290).

Whether they reach someone in the extreme conditions of imprisonment or in the benign and ordinary conditions of everyday life, the handkerchief, blanket, and bucket of white paint contain within them the wish of well-being: “Don’t cry; be warm; watch now, in a few minutes even these constricting walls will look more spacious (Scarry, 1985: 292).

Philosopher and design theorist Cameron Tonkinwise connects Scarry’s work on the relation between people and things to design. “The beauty of Scarry’s description is that it explains designing as the process of humanizing things. To design is to put an understanding of human sentience into things; it is to develop things that react with human sensitivity to the frailty (and agility) of humans” (Tonkinwise, 2006: 7). As the notion of affordance is typically employed in relation to things, in some sense, it seems strange to think about it against the backdrop of human relations. But just as affordances are explained as actions inspired by characteristics of physical artifacts, care has the same correlation to affordances and its action possibilities. Tierney’s convenience, Ihde’s active bodies, Feenberg’s passive bodies, and Scarry’s caring things together foreground the ways in which designed things materializes. These three stories highlight ideas critical for design. Notions like engagement, perception, sensory experience, affordances, action possibilities, agency, mediations, relations, and care help to understand interactions in a more intimate manner. And the ways human and things co-shape each other. I hope that a deeper understanding of these concepts lead to the type of sensitivity and attention to detail that is not always visible, but can inform interaction design.

Care for Things

“For at least seventy thousand years, anatomically modern humans, people biologically like us in every way, lived in small mobile groups of ten to thirty people, aggregating from time to time, and sometimes producing wonderful wall paintings and magnificent implements. Their success and mobility were partly possible because they carried very little stuff with them” (Hodder, 2014: 27-28). And the things they made and carried with them were made from organic materials that were easily accessible and remade over and over. The concept of mobility existed then, and it exists in a different form today. With increased global flows of people and things across continents the world has gotten smaller and we seem to be moving faster. The search for greater mobility has changed the way we travel, communicate, make choices, and essentially live our lives. And without realizing it, we have become “entangled” (Hodder, 2012, 2014) with things or the “missing masses” (Latour, 1992) that act as the “extra-force needed to explain how societies hold themselves together” (Tonkinwise, 2006: 6).

“It is because we take things for granted, often not focusing on them, that we fail to notice the characteristics of things. We fail to see that things are connected to and dependent on other things. We do not recognize that they are not inert. And we forget they have temporalities different from ours, until those temporalities intrude in on us, causing us to take action” (Hodder, 2012: 6).

Things are all around us, but we are often blind to their presence. They play a critical role in supporting everyday life, shaping our future, and molding our relations. They reside alongside us in space and time, and their presence needs more recognition than they currently deserve. Scholars in a wide range of disciplines from anthropology, philosophy, cultural studies and design have also expressed similar sentiments. According to sociologist, Arjun Appadurai, “the thing itself” needs to be recognized for what it is in addition to its place in relations to people (Appadurai, 2006). Heidegger reminds us that “the type of entities we first and foremost encounter in our daily life are not natural objects such as oaks and cod, but artefacts or pieces of equipment, such as chairs, forks, shirts, soap, protractors, etc.” (Zahavi, 2012: 154). Since things are central to

our everyday existence, the notion of value is significant in thinking about them in the context of care. How do we come to value or don't value our everyday things? And what are the implications?

According to Prasad Boradkar, "The value attributed to things changes constantly with context, and as social norms and practices, as economic contexts change, as new technologies emerge and as objects move through their life cycle, they gain and lose value" (Boradkar, 2010: 49). Adding to this complexity of the shifting nature of our relations with things, he identifies eleven types of value attributed towards things—aesthetic value, brand value, cultural value, financial/economic value, emotional value, environmental value, historical value, political value, social value, and symbolic value (Boradkar, 2010: 51-52). The complexity and fluidity of the value of things is evident, and this should be taken into context while thinking of care.

Jane Howarth identifies two kinds of human-centered values. The first is "instrumental value" which refers to things that serve as a means to an end and satisfy human wants and needs. These are typically things like "consumables, raw materials, equipment, luxury items, and can be natural or artificial" (Howarth, 1996: 1). The second human-centered value is referred to as "non-instrumental" and these are things that have specific properties that make them enjoyable but might not have specific utilitarian value. We value them for what they are. She also identifies a potential third kind of human-centered value tied to the idea of "replaceability". Things that people cherish, they tend not to replace.

In addition, Howarth makes an interesting point about the use of language in connection to things and how the way in which language is used to describe things is a reflection of our lack of care and disconnect from our environment.

The word 'goods' has arguably lost any value implications; it has become, whether or not preceded by the word 'consumer', a generic name for material objects. We speak of 'replacing', 'throwing away' of 'disposable' items; but with no implication that what we throw away, literally away from us, ends up in another place. 'Waste' becomes a

name for what we throw away. It has lost the implications of wastefulness, wasting things being a bad thing" (Howarth: 1996: 8).

The problem of waste caused by the devaluing of things, affordances of disposability, and the shortening use-lives of things is a significant one, and discussed in a book by philosopher Greg Kennedy titled *The Ontology of Trash: The Disposable and its Problematic Nature* (2007). In an in-depth examination of the things we throw away, Kennedy stresses the significance of care in relation to the problems of waste. Trash results from a "neglect or failure to care for the thing we have valued" (2007: 5). In order to minimize some of these problems with waste, we have to reframe the way we have come to value and care for things. In the following, Kennedy describes the ontology of a thing:

The essential nature of a thing resides in its thinghood, that is, its ability to refer beyond itself to the unifying interdependence of world. But this requires care, and not simply as an abstract ontological referent. It requires practical, manual taking care of the physical being of the thing. "To use" means, first to let a thing be what it is and how it is. To let it be this way requires that the used thing be cared for in its essential nature – we do so by responding to the demands which the used thing makes manifest in the given instance" (Kennedy, 2007, 147).

The issue of unsustainability can be related to that of care, especially in the context of waste. The scripts that are embedded into things play a deciding role in how things are perceived and valued. "In the modern world, we have come to see that we need to use things sustainably and responsibly, to care for things (Hodder, 2014: 33). But if care requires physical engagement or physical interactions and if there is the lack of engaging interaction, how then do we learn to care? How then can we learn to value things?

With the increasing digitalization through electronic devices, the expected dematerialization did not arrive. "We find the paradox that Ezio Manzini has noted that the more involved we are with the immaterial, the more material things accumulate as junk about us" (Tonkinwise, 2004: 4). Therefore, it is critical that we do take care of the things around us. With ownership of material

objects, comes great responsibility. “We often manage to live relatively unaware of the full complexity of what and who provides for us, but we are nevertheless deeply entangled in the vitality of things and the assemblages of their relations” (Hodder, 2014: 21). It is critical that we realize our entanglement with the materiality that surrounds us, because it is when we treat it with care and responsibility that we might be able to progress towards sustainment.

Care for the World

In Verbeek’s mediation theory, he explicitly suggests the need to “blur the boundaries between human and technology to understand the social role of technologies. Humans and technologies cannot be located in separate realms, but need to be understood in their interrelations” (Verbeek, 2015: 218). Mol and other scholars in the philosophy of technology, design studies, anthropology, etc. have expressed these same sentiments. One mechanism by which to do this is interdisciplinary research on the topic. For example, “Don Ihde advocates that philosophers should get involved in technical decisions and design” (Feenberg 2003: 6).

The practice of care also necessitates mediations between people and technological entities, therefore it is important to examine the larger, complex systems in which people and things operate. There is an overabundance of globally manufactured products that already exists in the world, while more are constantly being produced regularly. Each of these things has a certain ecological impact that affect our health and well being. Similarly, the way we live our lives also leaves a footprint on the environment. Things make their way into our world through an extremely complex system that involves multiple forces, histories, materials, energies, places, etc.

Let us take the example of a design process that is followed by Ikea, a corporation whose ubiquitous products are manufactured, bought, used and discarded all over the world. Lisa Margonelli explains Ikea’s design process in five steps, which starts with (1) picking a price, (2) choosing a manufacturer, (3) designing the product, (4) shipping it and (5) selling it (2002: 108-112). It is interesting to note that the process starts, not with user needs as is typically

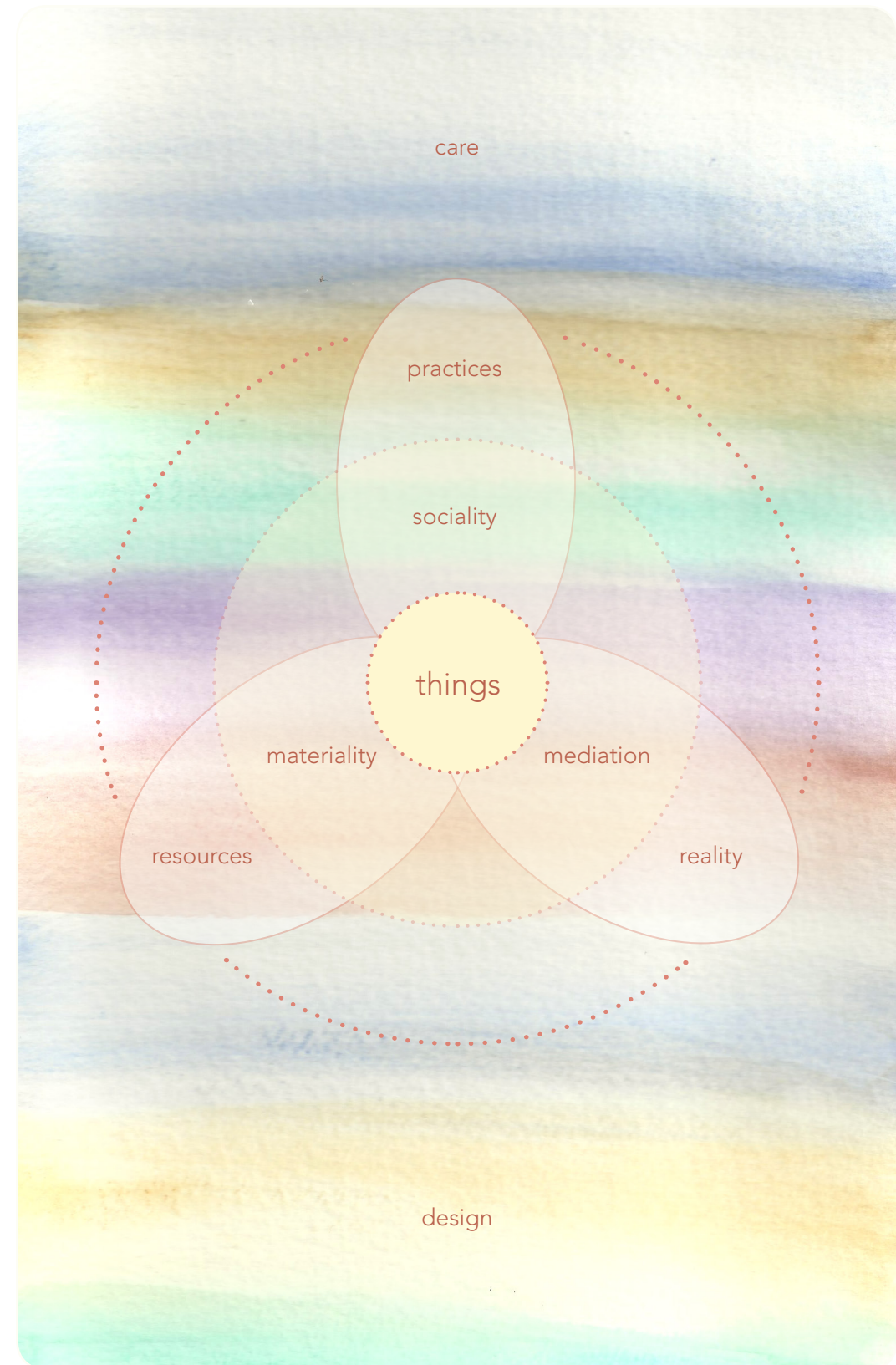
the case in human-centered design, but with a price. A product manager typically sets this by examining consumer trends, existing product gaps and other relevant business issues. This is followed by the selection of a manufacturer who will supply the product. The designer is then selected through an internal competition and the specifications on price, materials, manufacturing etc. are explained. Designs manifest purely at the designers discretion—“The designer is the consumer” (2002: 110). The next step clearly explains Ikea’s emphasis on designing for volume. The product has to be able to fit in large numbers on a pallet so as to maximize capacity utilization in the shipping crates. According to the author, products are often redesigned to maximize quantity. For example, a mug was redesigned to increase the capacity from 864 mugs in a pallet to fit 1,280 mugs, followed by another redesign to increase the capacity to 2,024 mugs. The final step of selling the products revolves around the retail experience. As expected, the price point makes things desirable but in addition, “it doesn’t hurt that getting through one of Ikea’s stores takes a lot of time” (2002: 112).

The ecosystem developed by Ikea is an extremely complex one, but one that involves a singular focus: low cost for high volume. One of the interesting things about their process is that Ikea designers appear to be developing solutions not for users but for the pallet. It becomes apparent that humans (the designers) are designing nonhumans (the mugs) for other nonhumans (the pallet) for use by humans (consumers). However, it is also important to think about the ecosystem which the newly designed mug enters once it is in the consumers’ hands and their lives. Tonkinwise elaborates on this:

“Every product exists within artificial ecosystems. There are the infrastructures with which any product must connect (e.g., electricity outlets; water faucets and drains, etc); there are the contiguous products required for most products to function (e.g., a toaster needs bread, and butter and jam, and knives and plates; a printer needs paper and toner and a computer, etc); and then there are the other products that make up the environment in which that product makes sense (e.g., a refrigerator, filled with food, exists in kitchen, a place with the kinds of products and décor that orient us toward it as appropriate for meal preparation)” (Tonkinwise, 2013: 4).

According to Heidegger, “if we were to recognize these two features of our encounter with the world: their particular character and their history, then we would take care of the world, be mindful of it, mind it in the sense of looking after it, as we do with objects we cherish” (Howarth, 1996: 6).

Things emerge from complex systems of social relations, material histories, economic constraints, manufacturing processes, and so on. It is therefore critical to be able to introduce the notion of care in each of these components of the system. But in order to make a more widely manageable and distributed impact, we need to start small by first looking at our everyday practices that contribute to unsustainability. Then we can start designing the kinds of interventions that introduce changes in our lifestyles and enable us to move closer to a more sustainable way of living. Very often solutions to unsustainability only address the symptoms and are typically quick fixes that never get to the underlying cause. “Standing by the vital necessity of care means standing for sustainable and flourishing relations, not merely survivalist or instrumental ones” (Puig de la Bellacasa, 2012: 198). On the other hand, design that supports “sustainable and flourishing relations” among the social, material and natural world can only be one that is inspired through care.



care and design

It is only if we know how to dwell, can we begin to build.

– Martin Heidegger, *Poetry, Language, Thought*, 1971: 157

In identifying concepts that connect care to design, I hope it has become apparent that design activities, processes, and practices need to also be thing-centric in addition to being human-centric. The new challenges that design faces reveal the “new challenges for the notion of care” (Puig de la Bellacasa, 1999). Japanese architect Fumihiko Maki said, “A material acquires materiality only through the cumulative effect of labor, passion, detail and method of construction” (Taniguchi, 1999). And it is the details and method of construction, or the how that needs further reflection. With the growing need for design to evolve and be equipped to handle complex systemic situations, a deeper inquiry into the nature of our material landscape and the notion of care can reveal insights about the intricacy of and interconnectedness between our material and social worlds. How can the notion of care influence a deeper sensitivity in materializing ideas and interactions?

In this section, I have gathered some existing design strategies that have been proposed in addressing certain aspects of unsustainability. I have briefly described some of these below.

Design for Attachment

In the most general sense, attachment is defined as “caring about, being fond of and being miserable if the object of our affect is absent” (Turner and Turner, 2013: 2). One of the main goals in designing for attachment is to understand the behaviors that lead to fast replacement and disposal of digital and non-digital products in order to create better attachment towards the things we own. Material possession, or attachment, “is a multi-faceted property of the relationship between a specific individual or group of individuals and a

specific, material object that an individual has psychologically appropriated, decommodified, and singularized through person-object interaction” (Kleine, Baker 2004:1).

Kleine and Baker identify nine characteristics of attachment: (1) attachment forms with specific material objects, not product categories or brands; (2) attachment possessions must be psychologically appropriated; (3) attachments are self-extensions (4) attachments are decommodified and singularized; (5) attachment requires a personal history between person and possession; (6) attachment has the property of strength; (7) attachment is multi-faceted; (8) attachment is emotionally complex; and (9) attachments evolve over time as the meaning of the self changes.

– Kleine and Baker 2004: 1

These characteristics provide insight to the complexity involved in designing for attachment. Jonathan Chapman, who writes about emotional durability aims to reduce consumption and waste by increasing the durability of relationships between people and their things. Ruth Mugge seeks to create strong attachment to products so that people are “more likely to handle the product with care, to repair it when it breaks down, and to postpone its replacement as long as possible” (Mugge, Schifferstein, and Schoormans, 2006). In the digital realm, Sustainable Interaction Design (SID) is the “exploration of why people keep and care about some things and not others as an issue of sustainable practices to inform the design of interactive digital things” (Jung, Blevins, Bardzell, Pierce, Stolterman, 2011: 59). The goals of their research is to discover possible design principles and design implications to inform the design of heirloom status objects (2011: 59).

Design for Lifetime Optimization

According to Tim Cooper, increasing consumption throughout globally is

leading to shorter product life due to market pressures and loss of sales (2010: 3-4). In addition, products are replaced before ever reaching their end of life. Several scholars have proposed ways to mitigate this pattern through the optimization of the life of the product (Cooper, 2010; van Nes and Cramer, 2005; van Hinte, 1997). However, each of these scholars provides different ways of addressing the situation. Nicole van Nes and Jacqueline Cramer examine the “replacement motivations” of a wide array of people within the product lifecycle. In addition, repairs, upgrades, and modularity are taken into consideration (van Nes, Cramer, 2005: 297). The Eternally Yours Foundation focuses on the psychological life span of a product through three strategies: (1) Aging with dignity, (2) Signs ‘n’ Scripts (3) Sales ‘n’ Services.

For Tim Cooper, he focuses on understanding the life cycle of products through its various stages from birth to end of life. Cooper suggests that measuring the life-spans of products will largely depend on product type and its use patterns such as “duration, frequency and intensity”. A circular economy is said to be a prerequisite for sustainability but may not be sufficient if resource throughput remains high” (Cooper, 2010:13). However, according to Walter Stahel, “A circular economy is about caring ... Caring is a key characteristics of managing stock – caring for keeping up existing values and qualities. Most car owners will credit the manufacturer of their vehicle for its continued reliable functioning, rather than their mechanic who provides maintenance and repair services. A change in popular values and beliefs would multiply by the perception of caring as a pillar of the (circular) economy” (Stahel, 2013: 53). Stahel points out that the care involved in maintaining, repairing, upgrading, cleaning, etc. that play an important role in extending the longevity of things is devalued. However, this needs to be reversed if we are to move towards a circular economy.

Design for Repair

Designing for repair requires a comprehensive look at the social, economical, political, legal, and environmental contexts. While some of the things we use on a daily basis (like cars) are designed for repair and have well-established services to make it convenient, many (like simple domestic appliances) are not. The more electronic components a device has, the more difficult is its

repair. Smartphones that stop working, for example, are rarely repaired—they are replaced. If the entire product is not replaced, components are replaced. It appears that the possibility of repair is designed into some of our products, but not all. According to Graham and Thrift (2007), design and business rarely take into account repair and maintenance as part of design process. “Maintenance and repair is an ongoing process, but it can be designed in many different ways in order to produce many different outcomes and these outcomes can be more or less efficacious: there is, in other words, a politics of repair and maintenance” (Graham and Thrift, 2007: 17).

Creating a system of repair and maintenance therefore needs to be addressed from multiple points of view (political, legal, economic, aesthetic, etc.) and it has to be designed before the product comes into the consumer’s life. We live in a society that relies from economic, social and material perspectives on the constant production and consumption of goods. And in contemporary times, we have reached a situation where not only are we manufacturing a large number of things constantly, but these things are more complex than ever before, and are being made from a larger variety of materials that require more maintenance and repair. Unfortunately, design practice typically focuses its attention on making new things, but rarely does it worry about the things that are already in circulation in the world. This rapid production, use and disposal of products has a significant impact on our natural resources and therefore on the environment.

“Breakdown and repair are not processes that designers can effectively script ahead of time; instead, they emerge in everyday practice. These practices are shaped by material, infrastructural, gendered, political, socioeconomic factors – such as manufacturing limitation, access to repair parts and expertise, and environmental conviction – which designers often did not, and may not have been able to anticipate” (Rosner and Ames, 2014: 319). There is no doubt that designers cannot anticipate every scenario that a consumer may encounter or every situation in which a product might need repair. However, design should take into account all possible failure modes during the design process so that at least some situations can be addressed. “Repair thinking is an exercise in broken world thinking. It asks what happens when we take erosion, breakdown,

and decay, rather than novelty, growth, and progress, as our starting points in thinking through the nature, use, and effects of information technology and new media” (Jackson, 2014: 221). It is clear that Jackson is proposing an entirely new way of thinking about the world, and therefore a new approach to design. The artificial world we have created (of products, buildings, cities, etc.) in the evolution of modernity is at odds with the natural world in which we were born. Jackson and environmental activist Bill McKibben both suggest that we have recreated our planet into something McKibben calls Eearth, that is flooding, burning, and acidifying through our actions. They suggest that we need to scale back, reimagine our priorities, and create a new value system based on principles of sustainability (McKibben, 2011).

In order to design for repair, it is critical for designers to take these factors into account. The authors also discuss the difficulty of repairing electronic products compared to simple mechanical ones, especially in remote or rural areas. “As for the repair of digital technologies (or lack thereof) that was evidenced by our open-code analysis, we see this as a prominent consideration for interaction design. Our analysis suggests that the simple nature of mechanical objects enable repair, though the presence of electronics and computational mechanisms in digital objects add further complexity that make adaptations and resourcefulness difficult” (Maestri and Wakkary, 2011: 88). This is specifically important for interaction design because so much of this discipline relies on and supports the creation of digital artifacts. Designers should take into account the use patterns that may emerge in the context in which products are used.

Design for Product-Service Systems

This strategy aims to generate a shift towards thinking about systems rather than products. A Product-Service System (PSS) indicates a fundamental transformation of thinking in business, suggesting that corporations offer a bundle of products and services instead of only products. A PSS is often defined as a holistic system in which products and services are integrated in response to customer needs. This move towards PSS signals a new type of a value proposition that emphasizes the delivery of functional solutions rather than mere sales of products or services.

introduction

So as not to become meat we must return the jaguar's gaze. But in this encounter we do not remain unchanged. We become something new, a new kind of "we" perhaps, aligned somehow with that predator who regards us as a predator and not, fortunately, as dead meat.

– Eduardo Kohn, Anthropologist, *How Forests Think*, 2013

My goal in this chapter is to devise a series of heuristics from the theoretical examination of things and of care that designers can use. Such heuristics often serve as mechanisms by which to derive and drive practical applications from theoretical concepts. This work is in its early stages of development. Further reframing, organizing, detailing, and testing will be necessary to make it more comprehensive and suitable for design practice.

As discussed before, all things have a materiality, and it is this materiality that we interact with on a daily basis. And although we are dependent on things at the individual, social, local and global levels, our culture is often not critically aware of the significance of materiality in everyday lives of people. We often do not take note of the material presence of things around us; perhaps a deeper attunement to them might “enable the designers to have better insights into the workings of the human-object relationship” (Tsutsumi, 2013: 1). By learning from materiality and the agency of things, designers can develop sensitivities in their process that can then analyze, anticipate for and mediate specific kinds of interactions between people and things. Design theory and practice need to address the following questions. How do people relate to and interact with our material world? How does theory critique materiality? And therefore, what kinds of design heuristics can theory inspire?

Over the past few decades, several design strategies such as slow design, intentional design, product-service systems design, ecodesign, critical design, collaborative consumption, life-cycle assessment, and value-based design have been proposed as means by which to try and mitigate issues of unsustainability and other matters-of-concerns. Although no one idea is a cure all for unsustainability, they all have a few pros and cons. For example, while life-cycle assessment (LCA) is an in-depth, systemic examination of the stages of production, distribution and consumption, it is extremely difficult, time-consuming and expensive to perform accurately. And according to the Eternally Yours Foundation, it overlooks the most fundamental problem: the short use-life of consumer goods.

Designers often take functional and semiotic approaches to the design of things, and these are insufficient to address the issues of unsustainability. In a throwaway culture such as ours, many products are discarded while they remain entirely capable of carrying out their function. It is prevalent that a focus on function does not help. Similarly, an emphasis on semiotics in design often leads to an overemphasis on form and meaning, and that too does not lead to a relations between people and things that sustains over time.

In what follows, I offer some theory-based heuristics derived from the philosophies of things and of care that aim to (1) anticipate for the mediating role of things, (2) understand the temporal nature of nonhumans, (3) provide a means to think with greater equality by foregrounding the symmetry of humans and nonhumans, and (4) enable the emergence of systems-level thinking by seeing the interconnectedness of designed things through the three-fold lenses of care.

material mediation

Design Heuristic: A sensorial material interaction can foreground materiality, and help to enable humans to connect to things as material objects rather than purely as functional, symbolic, or visual artifacts.

Peter-Paul Verbeek suggests that this approach of considering material mediation can help us see the practical implications of the post-phenomenological perspective. For Don Ihde, post-phenomenology refers to an area of the philosophy of technology that examines the relationship between human culture and technology.

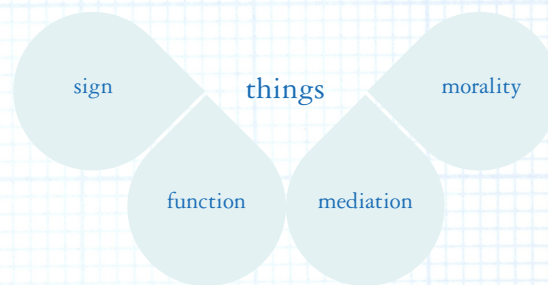


Fig. 1.4 Perspectives on the role of things

This form of mediation occurs at a very sensorial level, at the level of the thing-in-itself, rather than what the thing stands for, or represents, or how it can be interpreted (Verbeek, 2011). His perspective highlights our practical engagements with things and their bodily presence. This engagement occurs when things are used, when there is a sensory interaction and relationship. And this relationship is shaped not only by us, but by the agency that things possess as well. This is important for designers to consider. With this recognition that the relationship between people and things is sensory, and it is co-shaped by both entities, aesthetics takes on new meanings. While in design aesthetics is

often seen as a focus on beauty or style, this perspective suggests that it is a lot more. It is about the sensory relationship between people and the material world. It is important to note that the mediating role things play does not depend upon any specific properties of those things; but it emerges from the context of use in which the things exist in our world. The increasing presence of hybrid (digital and physical) devices in our world, and their role in shaping our experience of the world cannot be denied. The question is, how will design evolve to account for this shift? According to Erik Stolterman and Jung, “with the development of digital technology, the physical qualities of an artifact (e.g., sensorial feelings, visual or tangible shapes, bodily engagement in interaction) are increasingly disappearing, while digital qualities (e.g., functionality, performance, interactivity, connectivity among multiple interactive artifacts working in a system) are rapidly emerging” (2012: 645). In order to maintain our bodily engagement with things, designers need to consider the interface between the digital and the physical and how it is changing rapidly.

Philosopher Ludwig Wittgenstein (1889-1951) says that “when the eyes sees something beautiful, the hand wants to draw it, take photographs of it, or describe it to other people. Sometimes it gives rise to exact replication and other times to resemblances and still other times to things whose connection to the original site of inspiration is unrecognizable” (Scarry, 1999: 8).

Types of Materiality

Expanding on Peter-Paul Verbeek’s notion of material mediation, I identified four types of materiality to include in terms of considerations for design.

Physical: Things, not unlike humans, have a bodily presence. Their physicality is a critical element of their material being, and it is often the first aspect of our encounter with them.

Digital: In the context of the discipline of interaction design, this aspect of materiality—digital materiality—is important to consider. With the large number of digital technologies and devices with which we live, and with the shift from analog to digital, the material implications of this new hybridity have to be accounted for by designers.

Experience: When aesthetics is considered in sensory terms as a relationship between people and things rather than as visual beauty, it becomes more experiential. Focusing on experiences allows us to think more holistically about this relationship.

Aesthetics: As mentioned above, here, aesthetics is a sensory experience and relationship that is co-shaped by people and things. It emphasizes the material presence of things that extends beyond purely visual or interpretive meanings of things.

Temporality & Time: Time is an important consideration in design though it is often overlooked or neglected. Temporality adds another layer that is just as important to take into consideration in terms of thinking about limits and boundaries within the three dimensions of past, present, and future.

Design Considerations

In order to engage aesthetics as an experience of the materiality of objects, the following key ideas and questions will need to be considered in the design process. What is the experience of aesthetics? How does a sensory, aesthetic relation between people and things unfold over time? How can material relations be expressed through sensorial means? Can ergonomics be used beyond pure anthropometrics (measurement of humans) to include the physical relation between people, things and beyond? What kinds of specific interactions can physicality offer? What interactions will be foregrounded or eliminated? How can specific affordances (behavioral and cultural) be cued into artifacts?

Verbeek highlights the importance of designing with the sensorial qualities in

mind. The following describes these sensorial qualities:

(1) Sight

Visuality is often seen as a dominating mode of engagement with the world. Sight can be a key element in creating flourishing aesthetic relations between people, things, and the broader world.

(2) Touch

The nonverbal haptic components of the aesthetic experience are often not considered as critically by designers as they should be. The sense of touch offers a second order of engagement with materiality and with other actors in the network that extends beyond the visual.

(3) Sound

The sounds the emanate from things can be informative or confounding, soothing or annoying, pacifying or alarming, useful or useless. Our hearing can play a critical role in shaping an aesthetic, audio experience. Medical devices that beep and click in hospitals communicate that they are functioning well in caring for patients. This is critical to consider in shaping interactions.

(4) Smell

Our sense of smell connects to memory, familiarity and comfort. Can materials enhance this sensibility by design? While smells can signify discomfort (cheap plastic smells), they can also signal luxury (rich wood smell). In creating holistic, sensorial experiences, this has to be taken into account.

(5) Taste

While this is a sense that is engaged by design primarily in case of the design of food and related materials, it is an important sense to consider.

While these senses are discussed individually, it is critical to point out that they have to be considered holistically in the design process while designing sensorial, aesthetic experience.

use and engagement

Design Heuristic: This section on use and engagement focuses on the human-artifact reciprocity. Through the process of scripting, designers can encourage forms of responsibility for certain aspects of the function of objects. This, in turn, can help foster better relations between people and things that extend beyond more functional use.

Designing for use and engagement is an explicit attempt to create a sensitivity and attunement to materiality, mediation, and the engaging capacity of things. Bruno Latour's ANT argue for an equality of agency between people and things. As digital devices become more ubiquitous in our lives, it is critical to question the nature of our engagement with them. Are our interactions with these devices such that they require our care and attention or is our engagement with the device purely functional? In his analysis of technological devices, Borgmann refers to a technological device as being composed of two key components: the physical object or machinery, and the commodity or the delivery of function. To Borgmann, devices demand minimal engagement with people and merely present the commodity, while things engage people through interactions. For Verbeek too, engaging devices are products that truly involve humans in meaningful ways with the material thing, whereas commodities are mere expressions of function where people have little to no interaction with them.

Design Considerations

Drawing from the theoretical approaches of things in use, the design considerations for this principle include designing the appropriate level of involvement, awareness, salience, and reflectiveness into things. Some of the questions that need to be asked when designing for this form of engagement between people and things include:

Care and Time

- What will the artifact need to communicate?

- What kind of physical care is needed during use? How can the artifact communicate this need?
- How much care and involvement will the thing require?
- How much time will people spend with things?
- What is the situation and context of use? Time and space?
- How involved are the tasks?

Communication

- What affordances are built into these things? Feedforward? Feedback?
- What supporting artifact-human communication and validation is needed? What kinds of feedforward and feedback will the artifact need to communicate?

Practices, Habits, Behaviors

- How will these things impact existing practices and habits?
- What new habits or behaviors should be encouraged? Decisions? Choices?
- How can the experience create life balance and rich interactions?
- What types of individual and shared experiences will these things lead to?
- What interactions will be foregrounded or eliminated?
- What is the quality of the interaction, and has it been thoughtfully considered so as to consider the broader implications?
- Will this require learning new skills and habits, or build upon existing skills?
- What could be some unintended consequences?
- Is this effective in unmaking certain interactions?

Other

- Have the appropriate human factors and ergonomic issues been considered?
- Do these things have the potential for adaptability and appropriation? • Are the things being designed analog and/or digital and how does that

change their use characteristics?

- What are the environmental, social, and cultural implications?

The following properties are ones that designers can take into account during the design process.

- Designs should encourage certain kinds of practices and habits. The nature of these practices will depend upon the product or service.
- Skill/De-skilling: The design encourages new skill development or builds upon existing skills. Be cognizant of what skills are being gained or loss.
- Integration into Everyday Life (Socially and Culturally): The designs assimilate into people's lives without demanding special adjustments or encourages desired behavioral change/sustainable/balance lifestyle.
- Potential for Shared Use: The designs can support the notion of a shared economy. It should be possible to create a possibility of renting or sharing things amongst individuals or social groups.
- Inclusion/Appropriation: Designs could be customizable so that they create/lead to a better sense of 'me'ness.
- Involvement with Others or on a Personal Level: Depending on the nature of the product or service, the designs could encourage others to be involved in the activity or interaction with the product.
- Patterns of Interactions
- Sequencing of Interactions

practices & behaviors

Design Heuristics: A focus on practices and behaviors can guide designers in understanding various system configurations to inform problem framing and direct progress towards more sustainable futures.

As has been discussed earlier, just as humans have agency in managing things, nonhumans too have agency in directing human practices. Our routines, behaviors and lifestyles are, in many ways, shaped by things. Therefore, many practice theorists involved in the study of these issues acknowledge that things play an active role in constituting human sociality. Practices are “generally construed as materially mediated nexuses of activity” (Schatzki, 2001:20). And though most practice theorists tend to focus on humans, there is recognition of the agency of non-humans as well.

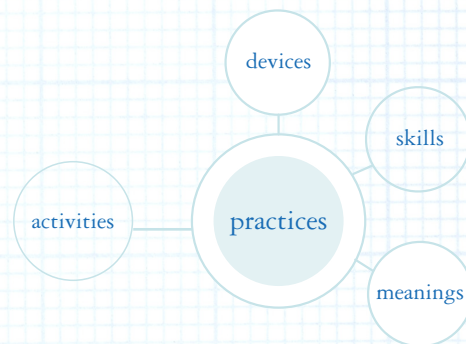


Fig. 1.5 Social Practice Theory

Practice Theory

“Social Practice theory suggests that we humans tend to chunk activities into discrete ‘practices’, which comprise constellations of devices, skills, and meaning” (Tonkinwise, 2013: 9). Everyday life involves a series of these practices in which humans are engaged in the active process of doing things with things. Therefore, specific practices can be best understood when we recognize the role of nonhumans in them. “Whereas philosophers and social investigators once

cited mental entities such as beliefs, desires, emotions, and purposes, practice theorists instead highlight embodied capacities such as know-how, skills, tacit understanding, and dispositions” (Schatzki, 2001: 7). In other words, the role of practice theorists is to focus more on the external manifestations and conditions of human activity, rather than the mental and cognitive actions. The idea of practice leads to the interesting concept of social order. “Social order can be defined as arrangements of people and the organisms, artifacts, and things through which they coexist” (Schatzki, 2001: 43). Here the notion of order is based upon practice, but involves an additional component of arrangement. There is a sense of order to the structure that emerges from the way all the entities involved in a system or network are organized. That constitutes order.

Social Systems and Shared Practices. Social systems are seen as “ongoing, self-reproducing arrays of shared practices, and structured dispositions” (Barnes, 2001: 17), while “shared practice is actually a composite... constituted of... many separate individual habits” (Barnes, 2001). The authors question what exactly shared practices mean, and what is it that is being shared to create a social system. In such systems, what is the role of humans and nonhumans? And how do things change as they are shared? What remains unchanged and what is modified in the process? These are questions that the design considerations will have to address.

Design Considerations

In order to design for social systems in which shared practices create a sense of order, there are several areas that need to be addressed.

- The role of design practice in sharing systems
- The meaning of the shared artifact
- The changing and unchanged components of artifacts in sharing systems
- Guiding conditions of social order

networks and systems

Design Heuristic: This section on networks and systems is an attempt to move design thinking beyond the artifact to larger, interconnected systems of humans and nonhumans. The goal here is to inspire design practice into new ways of observing, thinking and acting. Bruno Latour's Actor-Network Theory, Donella Meadows' Systems Theory, and David Snowden's Cynefin have provided a framework for thinking about scales and complex systems. The following section is an overview of some of the literature in networks and systems that can start the conversations about designing for scales and systems.

Actor-Network Theory

ANT was developed by Michael Callon, Bruno Latour and John Law in the late 1980s as a social examination of technological systems. According to Law (2003), one of the fundamental principles of ANT is that "society, organisations, agents and machines are all effects generated in patterned networks of diverse (not simply human) materials." All actors in the network (humans as well as non humans like objects, spaces, animals, buildings, institutions, etc.) have agency and they are shaped by the network within which they exist. For Callon, Latour, and Law, nonhumans also possess agency, and this is perhaps one of the more intriguing and unique ideas of ANT.

Interactions of care can be imagined as relationships that exist in a network of humans and nonhumans (people and technologies), and new design interventions are disturbances in this network. In ANT, the term actant refers to a person, an organism, a machine, or anything else that exists in the network, and all actants have equal agency. ANT scholars (especially Latour) use this theoretical framework to analyze such technical devices as seat belts, door hinges and key systems. These artifacts shape our behavior by insisting on certain activities. For instance, a car will continue to beep annoyingly unless a seat belt is put on. In this case, the driver, the seat belt, the car, the electronics, the beeping sound, the designers, the engineers and everyone else is part of a socio-technical network. It

is this entire network that acts in unison to shape human action. They can guide our decisions, influence our actions and change the way we navigate our way through the world. And in this process, they play an important role in shaping human relationships in social, political and economic ways.

Systems Theory

Scholars in a variety of disciplines regard systems thinking as a critical tool in being able to understand and deal with several of the social, economic, and environmental problems we are dealing with today. Meadows defines systems as "a set of things—people, cells, molecules, or whatever—interconnected in such a way that they produce their own pattern of behavior over time" (Meadows 2009: 2). Donella Meadows, a pioneering systems theory scholar, suggests that in order to understand how complex systems work, it is critical to recognize the relationship between structure and behavior. Understanding this relationship makes it possible to realize how systems work and what makes them function the way they do. In a world that is getting continually more complex, systems theory has the potential of being able to guide us in helping manage decision making, adapt to changing conditions and generate strategies to mitigate problems.

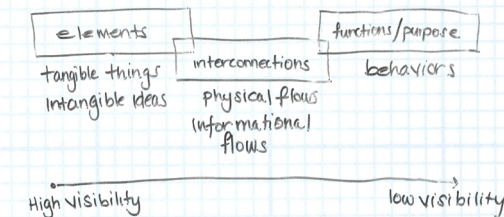


Fig. 1.6 Components of a system

According to Meadows, a system has three key components: elements, interconnections, and a purpose or function. Of these three, elements are those components that observers can quickly notice. These are, in most cases, visible,

tangible things but they can also be intangible ideas. The second component, interconnections, are responsible for holding the elements together. These can be physical entities or they can also be flows of information. Because interconnections represent the relationships between the elements, modifying them tends to lead to changes in the behavior of the entire system. And finally, purposes or functions are intangibles. The word function is generally used for nonhuman systems, while the word purpose is used for human systems. However, the differences between the two are not absolute, because most systems are made up not just of one or the other, but frequently both human and nonhuman (Meadows 2008).

Complex Systems

Systems are rather like networks, because they are connected not just in a unidirectional way, but in many directions, with multiple linkages between elements. In addition, systems can be parts of other, larger systems (not unlike constellations and galaxies), which are in turn part of yet other, larger systems. This is one of the reasons they are complex and difficult to explain. Complexity is more a way of thinking about the world. Understanding and dealing with complexity can help current and future leaders make sense of advanced technology, globalization, intricate markets, cultural change, and much more. In short, the science of complexity can help all of us address many of the new challenges and opportunities we are facing for the first time in human history. The practice of care, whether it is deployed in healthcare situations, in relation to products, about services, or anything else, exists in a system of systems. It always involves multiple elements, interconnections and purposes.

Cynefin. Developed by David Snowden and Mary Boone, the Cynefin framework “refers to the idea of using several factors from experience, environment, and influence, to better understand the context of decision making.” (Boston : 17). This framework is used in leadership literature, and is explained as a mechanism by which leaders can map out existing contexts in order to make the most appropriate decisions and choices. Snowden and Boone classify issues into five main categories: simple, complex, complicated and chaotic are the first four. The fifth one, disorder, is used when the other four are considered inappropriate in

order to explain the context. Simple contexts are often those in which there is a direct correlation between cause and effect. These are stable contexts and easily recognizable by people. Complicated contexts also assume an ordered universe where cause-and-effect relationships are visible, but there might be multiple answers or ways of tackling the issues. In complex situations, the right answers are difficult to reach or find out because there are several unknowns. And finally, chaotic issues are those in which there is no direct relationship between cause and effects as they are constantly changing. Complex and chaotic contexts represent no order—there is no immediately apparent relationship between cause and effect, and the way forward is determined based on emerging patterns.

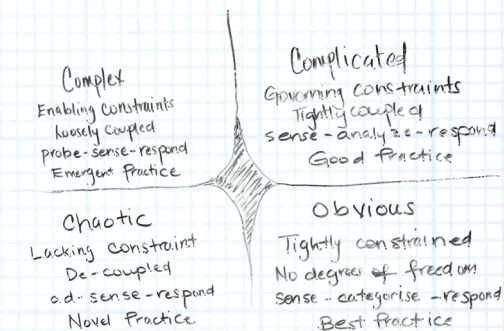


Fig. 1.7 Cynefin Framework. Adopted from A Leader's Framework for Decision Making.

Complex and chaotic contexts are unordered—there is no immediately apparent relationship between cause and effect, and the way forward is determined based on emerging patterns. The ordered world is the world of fact-based management; the unordered world represents pattern-based management. The very nature of the fifth context—disorder—makes it particularly difficult to recognize when one is in it. Here, multiple perspectives jostle for prominence, factional leaders argue with one another, and cacophony rules. The way out of this realm is to break down the situation into constituent parts and assign each to one of the other four realms. Leaders can then make decisions and intervene in contextually appropriate ways. (Snowden and Boone, 2007: 4)

Utilizing these frameworks will require thinking and acting differently than in

the past. This may not be easy, but it is essential in complex contexts.

Design Considerations

To begin to understand and analyze complex systems, some key questions should be taken into considerations. What things, elements, actants, or components make up the system? What is the role of the objects in the system? How can all the linkages and interconnections be described? What interactions are taking place between P/P, T/P, T/T? What are some characteristic behaviors that stem from the system? What is the feedback loop? What types of flow are being utilized? What outside forces are affecting the system? What are the implications for future behaviors within the system? How are decisions being made?

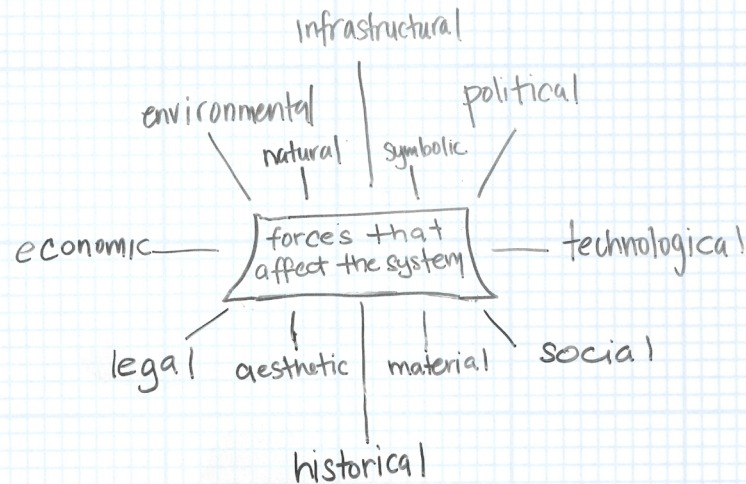


Fig. 1.8 Forces that affect the system

The complexity of systems emerge from the multiple forces that are at play. For instance, environmental, infrastructural, political, legal, technological, cultural, social, economic, historical, symbolic, natural, material, and aesthetic issues can cause havoc in a system. In order to tackle these contexts, it is important to consider the following points carefully.

- Cultural codes, norms and behaviors

- Existing habits, practices and skills
- Values
- Collective and individual concerns
- Human-artifact communication, interactions and behaviors
- Principles of symmetry (consumption/human/nonhuman)
- Resilience

The following properties are ones that designers can take into account during the design process.

- Feedback loops
- Input and Output Conditions
- Interrelationships between things
- Potential of unexpected outcomes
- Dynamic tensions

Chapter 4

research through design

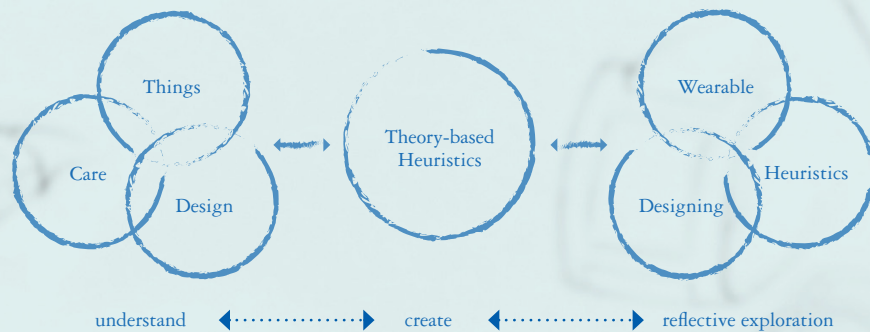
introduction

Whatever the practitioner does to things is grounded in attentive, perceptual involvement with them, or in other words, that he watches and feels as he works.

– Tim Ingold 1997: 111

In order to test whether the heuristics derived from theories of things and of care could be integrated into design practice, it was essential to apply them in the design process. In this section, therefore, I have documented the process that I went through in utilizing these heuristics, followed by some of the outcomes of the design work and critical reflection on the practice. After considering products from a variety of industry sectors, it was decided that I should develop preliminary designs of wearable health-related consumer devices for testing the heuristics. The designs, of which sketches are included in this section, should not be seen as solutions, but rather a means to understand the process, challenges, and thinking involved in integrating theoretical concepts into design practice. The goal of this exercise was also to explore how theory could inspire and influence practice. Very often, the world of theory is inaccessible from the world of practice; while theory is seen as abstract and academic, practice is seen as pragmatic and real. However, both can inform each other, and my task here is to explore the space between them.

For the purpose of this exploratory study, certain factors regarding the wearable device were not taken into consideration. For instance, the design was conducted as a decontextualized experiment and not with specific users in mind. Wearables are complex devices with intricate components and multiple functionalities, and my design exploration did not examine these issues. As my approach was not human-centered, I did not take into account all the aspects of ergonomics, mechanical details or interface design. Instead, I focused on letting the heuristics drive the materiality of the thing.



testing the heuristics

The process of testing the heuristics through the design of a wearable device was inspired by “research through design” (Zimmerman, Stolterman and Forlizzi: 2010), a methodology that treats designing as researching. I have employed this strategy during this phase of testing the heuristics by going beyond human-centeredness by emphasizing the materiality of things.

Beyond Human-centeredness. The standard human-centered design process typically starts with a defined problem statement or design brief, and a potential or target user. This often involves ethnographic research in the field and allows designers to determine human needs before develop a list of potential features and functions for the product or service. For this project though, my goal was to think beyond the parameters defined by human-centeredness and include nonhuman entities as well. Being acclimatized with the human-centered design process, it was clear I needed to re frame my approach to be able to shift my attention to the nonhuman.

Research Through Design. Research through design served as an appropriate method with which to test and demonstrate application of the theory-based design heuristics. Zimmerman, Stolterman and Forlizzi define research through design as “a research approach that employs methods and processes from design practice as a legitimate method of inquiry” (2010: 310). In other words, this is a process in which the act of design serves as a form of research. The results of research through design are typically exploratory design artifacts and systems. As the authors explain, this form of research can really benefit both research and practice because the output is in the form of explorations that serve as means by which to share research findings and generate new knowledge.

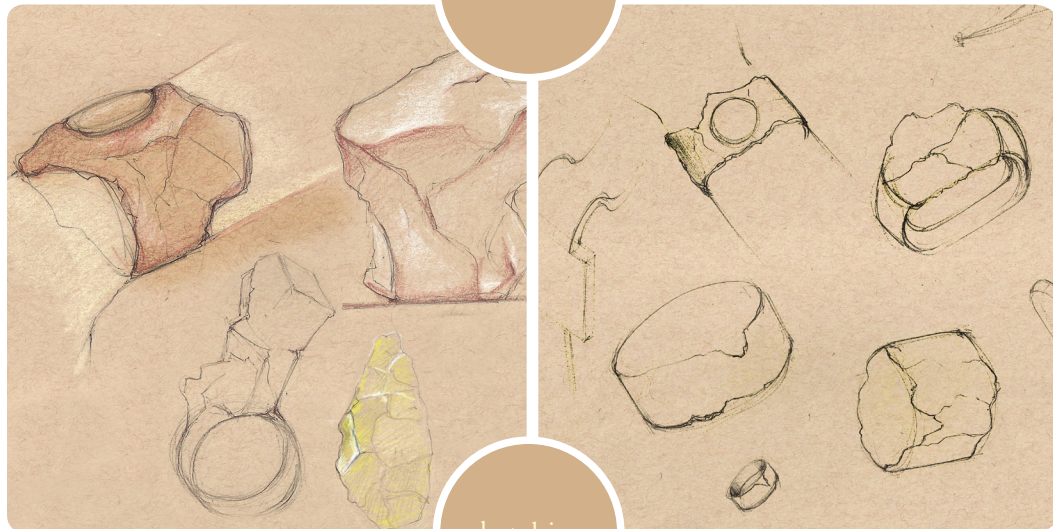
The Role of Theory in Research Through Design. According to William Gaver, “Design researchers often ‘borrow’ conceptual perspectives from other disciplines and discuss their applicability for design. Borrowed theories (or concepts) are

often used both to inspire new designs and to articulate existing ones. In doing so, the perspectives are usually translated for use by designers” (Gaver, 2012: 938). Drawing from the philosophies of things and care, my goal therefore was to develop sketches of the ideas as they emerged from the theory-based heuristics and annotate them during and after the process of ideation. These annotated ideas served as a test of the applicability of the design heuristics but due to the complexity of wearable devices and the time-frame of the research study, it was not possible to further develop the sketches into prototypes. Such models and prototypes, which could be part of future studies can be used to evaluate the design or test user reactions to gain more insights at different stages of the design process.

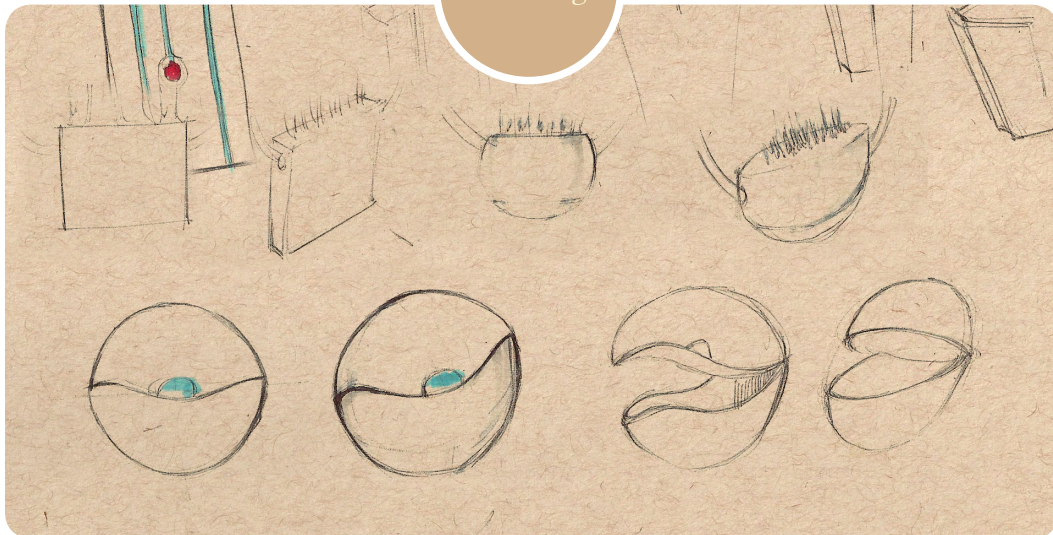
With the growing need to be able to address complex situations designers encounter in practice, theory provides a means to understand the world around us and influence the practice of design. In research through design, “design practice is brought to bear on situations chosen for their topical and theoretical potential, the resulting designs are seen as embodying designers’ judgments about valid ways to address the possibilities and problems implicit in such situations, and reflection on these results allow a range of topical, procedural, pragmatic and conceptual insights to be articulated” (Gaver, 2012: 937). Developing these early insights was the primary goal of this section on the application of the heuristics to the design of a wearable.



reflective



sketching



Reflections and Insights

The following section documents my reflections on the process of sketching designs for the wearable device based upon the theoretical heuristics.

Though sketching has its limitations, going through this process revealed certain insights about the design process and helped me think of potential improvements to the design heuristics. As a result, I was able to imagine possible ways by which design practice could evolve to include an object-oriented perspective

(1) Theory-based Heuristics

Materiality and Mediation: In working with the heuristics to bring to light the social role of objects, materiality, and their mediating capacity, Verbeek's notion of "material mediation" served as a starting point for drawing attention to the thing itself. The purpose was to start with these initial explorations and then build upon them to inspire and understand the design of systems.

In experimenting with the sensorial qualities of materiality, I was able to think more deeply about the notion of affordances and the material backstories that link to the origins of how things are made. And as their sensorial qualities and backstories of all materials differ widely from each other, so is the care that they afford. Verbeek suggests that the aesthetics of things should include attention to the sensorial qualities of materials. Plastic, for example, has become associated with disposability, flexibility and durability. I wondered what kind of a sensorial experience would a juxtaposition of a fragile material like ceramic combined with a durable material like plastic create? Would it communicate the material backstory? Another example is wood. Wood encourages certain types of care, because as a living material, it warps and bends as it interacts with humidity in the air. It breathes and reacts to the environment and context in which it exists. In thinking about the affordance of materials, I explored the potential possibilities of such concepts as fragility. The temporal nature of the notion of fragility led me to think about materials such as porcelain. The thinness

of form, which is needed to express fragility might not be possible from the perspective of utility, and that could present some challenges. In exploring potential materials for the design of the wearable device, I looked into wood, glass, ceramic, and a range of metals including copper, tin, gold and silver. Each of these materials has its own set of sensorial properties—a look, feel, sound, texture, weight, tactility, temperature, transparency, opacity, and smell. Each material has a unique relationship to the thing in which it exists, what it communicates, and therefore to the people who interact with it.

(2) The Design Process

Limitations of Sketching: While this project is a test of the design heuristics, I realized (as did Gaver with the design of the Drift Table), that sketches are a limited means by which to present these ideas. A working prototype of the wearable, which would be far beyond the scope of a project of this nature, would be the most effective means of testing this reciprocity. As Bower and Gaver mention, “we used a number of approaches for prototyping the final design of the Drift Table. In general, we pursued the concept development largely through imagery including sketches, diagrams, and collages... One of the most important lessons we learned in developing the Drift Table was the value of creating a highly finished, robust prototype. This was crucial in allowing users to suspend disbelief and engage fully with the device over long-term trials” (Bower and Gaver). For this project it was not possible to build a working prototype or test it in any way.

Managing Tensions. In this process of research through design, I discovered that I had to manage competing tensions between the constraints presented by: (a) specifics of the physicality and size of personal wearable devices, (b) the unique process of thing-centered designing, and (c) the constraints presented by the design heuristics. First, the wearable fitness device is a unique object—it is multifunctional in nature, it requires specific technological components, it presents unique ergonomic issues, it needs to have a certain form factor and a specific context of use. Second, designing with materiality in mind sets up its own challenges as the process is inspired by abstract, theoretical concepts. And third, the design heuristics, which helped me set up a mechanism by which I

could translate theories of care and things into tangible artifacts and services, provided a way to focus on thinking and designing. Together, these three driving forces had to work in tandem to allow me to explore interactions of care. As I learnt during this project, this is not necessarily an easy or straightforward task, but a complex program that involves the management of various tensions.

Conceptual Exploration and Functional Usability: By their very existence, things have utility. All things perform a certain utilitarian role in people’s lives. While exploring design from this point of view, my goal was to foreground the materiality of things. While things are often seen as standing in for other characteristics like symbolic value, meaning, etc., Verbeek and other scholars who write about “the material turn” suggest that we confront things for what they are, not what they might represent.

In designing a wearable, it was critical to ensure that the product presented its existence through an affordance as a wearable (a functional quality), while also presenting its materiality. Balancing this tension between functionality and materiality took a significant amount of iteration during exploration. In this process, I found myself negotiating between the contemplative, experimental and reflective exploration at one end and the functional, usable and utilitarian demands on the other end. To me, this design exploration was working through various possibilities set on a continuum between extremes, and therein lies the excitement as well as the difficulty. Design provocation relies on this spectrum of possibilities.

(3) Object-Oriented Focus

Focus on Things. As an interaction designer, my work fundamentally deals with the shaping relations among people, among things and between people and things. After all, interaction is a relation. And what we create as interaction designers are opportunities through which these relations between people and things become rich, meaningful, and equitable. Things are at the center of these interactions, and to truly see them for what they are, I turned to the philosophies of Borgmann, Latour, Verbeek, Heidegger, Tonkinwise, and other scholars on things. These writings were truly beneficial because they helped me to see

things from an ontological perspective, recognize the critical significance of their materiality and sociality, and be fully aware of the mediating role they play in our lives. This has changed the way I now view things.

Engagement and Material Interaction. After taking a 3D prototyping course, I gained a better understanding of materials in the raw. In other words, I was able to work with raw materials, like wood, to creating a finished artifact. The experience of working with materials, also led me to thinking about how we interact with things, and what the nature of this engagement is. Verbeek and Borgmann suggest scripting responsibility for certain aspects of the function of objects to the human in order to develop better relations between people and things.

Products, Systems and Networks. Designing interactions that can help to create an understanding of materiality and its implications has its own set of challenges. Since people are always with things, it is important to consider the one-to-one relation between the two, which also became a means of analyzing things. I chose to begin this exploration at the product level first. I came to recognize that in every interaction, even in sharing economies, there is always a one-to-one relationship between a person and a thing. That relationship is extended to networks of more people and more things in multiple relationships, but it does not negate or minimize the relevance of singular engagement. In addition, one other benefit of starting at the tangible product level was that it served as an anchor around which services, other things, and other relationships and networks among people, among things, and between people and things, could be constructed.

Agency and Reciprocity: Starting at the object level gave me a better understanding of the interconnected relations that need to be designed in order to develop the “programs of actions” that support and foreground the need to care for things. While I knew that the wearable device would perform a set of specific services designed into it for the benefit of people, I was also thinking of how the device would care for the person. In other words, this was about a relation that functions in the both directions. How can humans serve things,

while being served by them? Non-humans here are given agency to enable the care they need from humans. In the process of designing the wearable, I was consciously delegating care to the humans who would be using the device, and the process itself helped me be more aware of the agency of things and humans.

Evaluation

After having gone through this process, I wanted to examine the overall significance of doing this study using a proposed “set of criteria, or four lenses for evaluating an interaction design research contribution: process, invention, relevance, and extensibility” (Zimmerman et al). These four are presented by Zimmerman as evaluation criteria.

- **Process:** The process should have detail, rationale and should be repeatable.
- **Invention:** There should be a new integration of ideas that leads to a significant advancement in research.
- **Relevance:** The preferred state that this research could lead to should be articulated.
- **Extensibility:** Others professionals should be able to build upon the work done to extend it.

I would like to address each one in the following paragraphs.

Process. I have discussed the research through design project of wearables by annotating my work, discussing design decisions made, and commenting on the process itself. It is evident that the methodologies of doing research through design as well as object-oriented focus present a unique set of challenges and possibilities. The designed thing, in this case, is no longer only human-centered, it is also a research object and an exploration of theoretical concepts as well as design heuristics.

Invention. As mentioned above under approaches and methods, this project has served as a nexus for me to explore philosophical concepts, research through design, theories and interactions, and object-focus design. And whether this constitutes a true invention is difficult to gauge, I do feel that I have been able to integrate a diverse range of subject matters. Extensive prototyping and testing

might be needed to truly judge this criterion.

Relevance. In the case of this project, my goal from the very beginning has been to find a means by which to go beyond human-centeredness towards the recognition of the role of things in our lives, and what our interaction with them means. The methodologies I have explored have helped me think of the relevance of things in new ways.

I think that it's important to bring to light the equality of agency between humans and nonhumans to enable designers to think beyond the parameters of human-centered design and for design to evolve towards sustainability. In establishing new ways of looking at the world and developing a sensitivity towards the kinds of interactions that facilitate this change, the need for new perspectives and ways of designing could guide us towards a society that moves away from the convenience of disposability by enabling us to think about our everyday things, towards a closed loop system of care through recognition that things have a materiality and an ethics of sustainability. If we can, through design, truly create interactions between humans, nonhumans and the broader world through the three lenses of care, our society and the planet in which we live will continue to flourish for future generations.

Extensibility. This thesis project has several potential future paths that I have outlined in the following chapter. The processes as well as the products of my thesis represent one step in many that can and will hopefully follow. These ideas can be extended by developing the design heuristics in greater detail, creating a more developed methodology that designers can use, and exploring research through design further through more sketching, rendering, prototyping, and development of future scenarios.

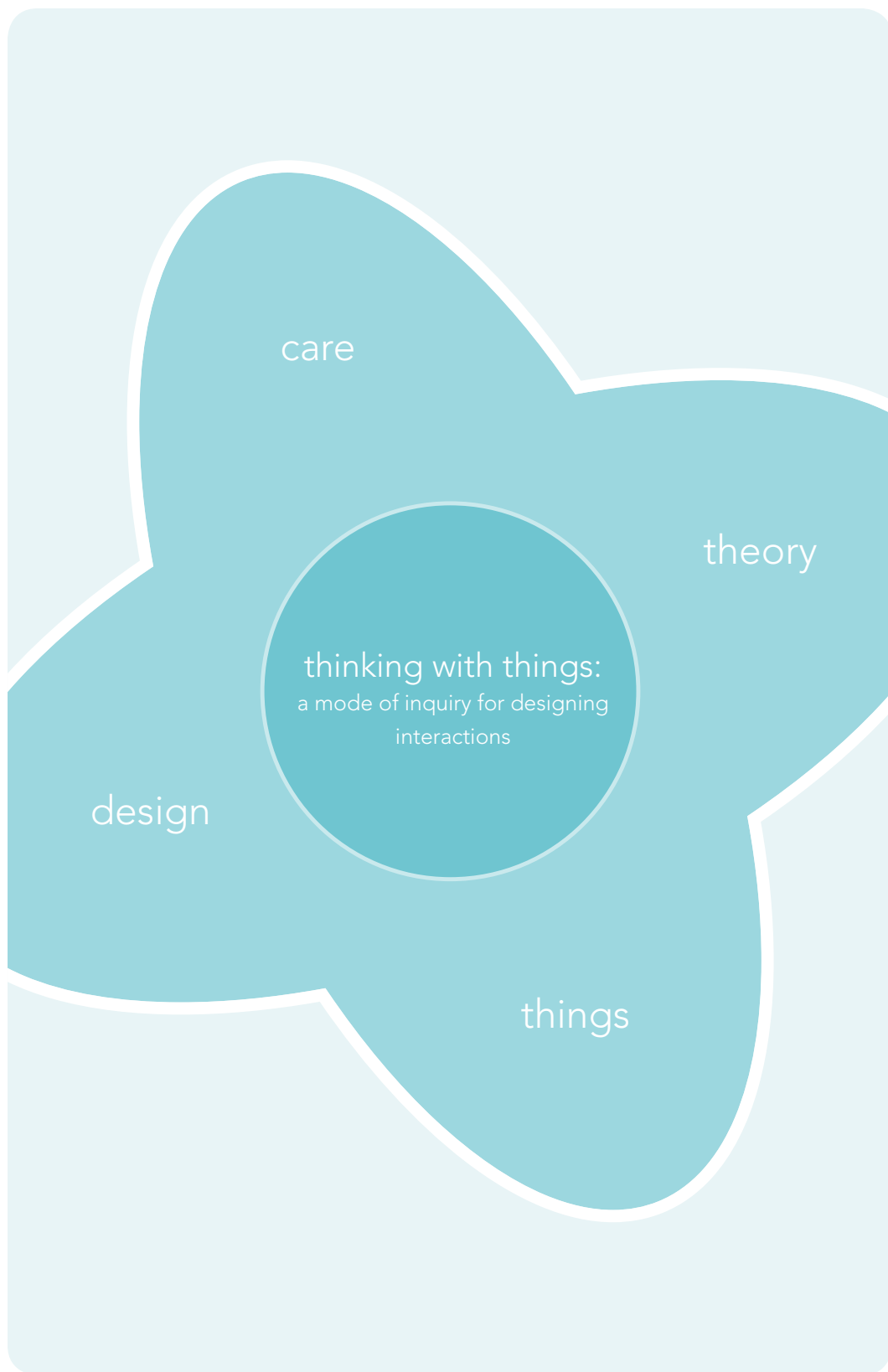
Conclusion

Overall, I have learnt that the research through design process has to be iterative so that it continuously pushes designers to develop new artifacts that function as research objects. There are inherent tensions in this process as described earlier between conceptual exploration and functional utility, humans and nonhumans,

analytical work and generative work, the abstract and the concrete. Research through design is a process of negotiating one's way on a continuum represented by these polar opposites. Therefore this practice is not easy, and will take additional development and testing before it can be truly embraced in the design world. More research about the process and its applicability needs to be undertaken.

The selection of a wearable device to test the applicability of the propositions led to some interesting insights. Had I chosen a simpler object, the design process would have presented fewer complexities. However, it is likely that a simpler object may not have revealed the kinds of tensions about usability and functional issues as ergonomic size and shape, safety, screen location and orientation, interface design, component layout and so on. The choice of a wearable device for exploration foregrounded these issues.

The theory-based heuristics of things and care has the potential to create change because they provide an opportunity to understand materiality and its impact but only when we can truly find means by which to apply them in design. And finally, I have learnt that things are a lot more than what they seem to be at first glance. I imagine that while adoption of these ideas and heuristics might not be immediate, easy or widespread, I do believe that learning from theory of things and of care opens up new possibilities. It was while going through this process that I realized and encountered tensions between the act of designing, the unique constraints of wearable things, and the theory-based heuristics of design.



future work

As this thesis document comes to a close, I want to outline areas of further research and exploration that will help in continuing this project beyond my work. I have identified areas of future work, and I have briefly explained them below.

Future Work

(1) [A Detailed Methodology](#). Since this research is just the beginning, a more detailed methodology for Thinking with Things: A Mode of Inquiry for Designing Interactions will need to be developed. This method has been derived from theory, and then transformed into design heuristics as listed in the preceding chapter. Further development and refinement is needed if it is to inspire design practice. More specifically, the methodology needs to be explained in greater detail, the process organized in the form of a series of steps, and a list of potential outcomes articulated. Additional heuristics to ensure its comprehensiveness will also need to be researched.

(2) [A System for Continuous Improvement](#). It would be advisable to have a system in place to allow for continuous improvement over time. This will prevent it from being outdated and to allow for new ideas and theories to be incorporated as a means to remain adaptive to changing situations.

(3) [Engaging Designers and Educators](#). The process might benefit from feedback from designers and educators. Their input on the heuristics, the process and the expected outcomes might make the methodology a lot more usable for the people for whom it is being created. Prototyping and testing this system would be beneficial to the research.

(4) [Examples of Application](#). As this project is entirely new, there are no examples (apart from the one I am working on) that can be seen in order to guide future users of the methodology. Therefore, it will be useful, in the future,

to have a bank of ideas that are based upon the design heuristics. These can help to teach future users of this methodology.

(5) *From Things to Systems*. In order to address the kinds of complex issues we face as society today (especially regarding such wicked problems as global climate change as well as health of the planet and all its inhabitants), our solutions should be expansive. We cannot address these complex problems with only artifacts; we need to take into account services and a system. These systems can be imagined as the actor-networks proposed by Latour. The heuristics serve to inspire systemic thinking for potential intervention efforts. However, it needs to be researched and explored further so that it can be employed in designing at the service level and finally to extend to a system level as a natural process of progression up a set of scales from artifact to infrastructure.

(6) *Metrics for Evaluation*. While Zimmerman et al have developed a mechanism for evaluation of the process of research through design, it will be useful to have an evaluation process designed specifically for this system I have developed in this thesis. Such an evaluation, with metrics, might help create the viability of potential solutions and also serve to increase its impact.

(7) *Other Interests*. In addition, I am interested in further studies on things including the design and development of an illustrated survey of objects from the philosophies of things as well as a research study on objects for shared use which is currently lacking.

Epilogue

In *How Forest Think*, the author Eduardo Kohn asked, “Why ask anthropology to look beyond the human?” ... And his answer, “It can tell us about how that which lies “beyond” the human also sustains us and makes us the beings we are and those we might become” (2013, 426-27). He sought to find ways to “open our thinking” in order to “allow us to realize a greater *Us*—an *Us* that can flourish not just in our lives, but in the lives of those who will live beyond us. That would be our gift, however modest, to the living future” (2013: 440).

Design too should look beyond the human.

Every act of creation involves destruction. To build a chair, you must kill a tree, or two. An ethical designer believes that what he or she has created is worth more than what was therein destroyed. Presumably the chair is more beautiful than the tree, or provides respite to people more important than cute, furry nesting creatures, or at the least, gets used for longer than it took the tree to grow the wood.

A truly responsible designer will realize that it is not enough to merely make a piece of good design and hope that it gets used long enough and well enough to justify the resources consumed to make it.

A truly responsible designer will do more to ensure that that happens: marketing the designed chair to communicate its value; providing instructions about use and care and maintenance; perhaps providing repair or return-to-maker services. In this way, whatever destruction was necessary for the creation of such an artifact is more than recompensed by the ongoing valuable services afforded by that artifact.

— Cameron Tonkinwise, *Time, Timing and the Timely* (2012).

This beautiful, poetic sentiment by Cameron Tonkinwise encourages one to think beyond, to reflect on what values we cherish, and to seriously contemplate the effects of our actions. To think beyond ... is to care. “That we retain a concern for care in speaking is all to the good, but it is of no help to us as long as language still serves us even then only as a means of expression” (Heidegger 1974: 2).

...what is the use of a book,' thought Alice
'without pictures or conversations?'

Lewis Carroll (1832-1898)
Alice and Wonderland



I think we've got
enough information
now, don't you?

All we have is one
"fact" you made up.

That's plenty. By the time we add an introduction,
a few illustrations, and a conclusion, it will look
like a graduate thesis.

acknowledgements

I would like to thank my thesis advisor Cameron Tonkinwise for guiding me to the philosophy of things and the world of sustainability. I read books and articles that I would not otherwise have read. Thank you for introducing me to a whole new body of literature; thank you for an entirely new set of books that I now have on my shelf. I have truly enjoyed them all, and will continue to do so for a long time.

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Pour mon cher ami Ben Sitzia ... Merci d'être qui vous êtes. Et merci pour votre sens de l'humour incroyable. (To my dear friend Ben Sitzia... Thank you for being who you are. And thank you for your incredible sense of humor.)

Lastly, I wish to thank my Mom, Dad and sister Jen for their continuous and undying love, support and encouragement. It is through you that I learned to care.

And to all things of this world, thank you for Being-there.

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