Silent Partnership in the Age of Smart Technology

by

Yueh-Jung Lee

A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Arts

Approved April 2020 by the
Graduate Supervisory Committee:

John Wise, Chair
Majia Nadesan
Jameson Wetmore

ARIZONA STATE UNIVERSITY

May 2020

ABSTRACT

Smart technology is now pervasive in society and has partnered with people on every level, yet its social and cultural implications are easily overlooked by the majority. In this thesis, I work on building a silent partnership between humans and smart technology and creating smart devices/systems as silent partners by revealing the complexity of smart technology and tackling the current issues of unilateral transparency, a lack of negotiation, and the dynamic of the sense of control. This work draws on varied fields such as critical cultural studies, science and technology studies (STS), media studies, information studies, sociology, psychology, and design and consists of three main themes: materiality, politics, and affect. In addition, I utilize theoretical frameworks such as posthumanism, actor-network theory (ANT), assemblage, materialism, and affect theory to analyze the underlying factors and relationships among human and nonhuman actors such as technology companies, governments, engineers, designers, users, as well as infrastructure, algorithms, and smart devices/systems. Finally, I offer four roles to rethink smart technology (an actor, a fluid, a peer, and a silent partner) and propose 15 design principles to redesign smart devices/systems as silent partners.

For people who always believe in me, my lucky cricket, and Taiwan.

ACKNOWLEDGMENTS

Thank you to everyone who contributed to this thesis. First and foremost, I thank my committee members: Dr. John Wise, Dr. Majia Nadesan, and Dr. Jameson Wetmore. Their time and patience in offering feedback and revisions were pivotal in crafting this thesis into a project that I am proud of. Specifically, Dr. Wise's opinion and responses throughout the thesis process provide me with critical insights that may have left unnoticed without his wit, erudition, and generous heart. Also, I would like to thank Dr. Alexander Halavais and Dr. Versha Anderson for their generous support and assistance in guiding me in exploring my academic adventure.

In addition, I thank the Writing Center at West Campus: Adam Daut, Emily Delvecchio, Kaiya Harvey, and my peers who have supported me along the journey: Lauren Beethe, Ash Pimley, Hayley Hilborn, Joanna Jones, Vicky Goldwasser, Adeena Beth, Amber Orquiz, and many more others. My international academic adventure would be less fruitful and colorful without their encouragement and vibrancy.

Moreover, I thank my friends whom I always look up to and who look up to me: Christy Chen, Dr. I-Chen Lee, Dr. Pei-Hua Huang, Shin-Ning Chen, Dr. BeBo Chang, Octopus Tsai, and Chun-An Chuang. Their intellectual brilliance and professional insight keep motivating me to push beyond my limits and achieve excellence throughout my academic work. I also thank my parents and my little brother, Angel Tzeng, Chin-Jung Lee, and Ting-Kang Lee, for their *ubiquitous* love that secure me studying aboard.

Last but not least, I thank Slytherin House at Hogwarts for the traits—*ambitious, determined, shrewd, cunning, resourceful, strong leaders, achievement-oriented, and "a certain disregard for the rules."* I am on my way to greatness.

TABLE OF CONTENTS

Page

LIST OF FIGURES..... vii

CHAPTER

1 INTRODUCTION 1

1.1. How Do We Think About Smart Technology? 2

1.1.1. Amazon Echo Dot 2

1.1.2. The Problematics of Smart Technology 2

1.1.3. Silent Partner 7

1.1.4. Silent Partnership 8

1.2. What Do We Do About Smart Technology? 9

2 LITERATURE REVIEW 13

2.1. Smart Technology (at home) 14

2.1.1. Smart Home Fantasies 16

2.1.2. Smart How? 19

Ubiquitous Computing (Ubicomp) 19

The Internet of Things (IoT) 20

Information and Communications Technology (ICT) 22

Human-computer Interaction (HCI) 22

2.1.3. Applying Fantasies to Realities 24

2.2. Dumb Technology 27

2.2.1. Technologies That Can't/shouldn't/refuse to Be Smart 28

2.2.2. Limiting Technology 31

CHAPTER Page

2.2.3. Principles of Designing Ubicomp 36

2.3. Posthumanism and New Materialities 42

2.3.1. Posthumanism and Cyborg 43

2.3.2. Actor-Network Theory 46

2.3.3. Assemblage 49

2.3.4. Digital Materialities 50

Thing-Power 51

Materialities 52

Fluidity 54

3 POLITICS & SMART TECHNOLOGY 56

3.1. Inbuilt Politics 57

3.1.1. Political Values 58

3.1.2. Digital Divide 63

Time, Mentality, and Technical Skills 65

Privacy Waiver and Extra Investment 66

Cultural Knowledge and Sociality 69

Language 70

3.2. Psychology and Work Ethics 71

3.2.1. Affective Flows 73

3.2.2. Emotional Attachment 77

3.2.3. Trust 80

3.2.4. Work Ethics 84

CHAPTER Page

Boundaries and Responsibilities 85

Accountability 88

4 SILENT PARTNERSHIP IN THE AGE OF SMART TECHNOLOGY 90

4.1. Reimagining Smart Technology as a Silent Partner 91

4.2. Redesigning Smart Technology as a Silent Partner 96

4.2.1. Smart Technology as an Actor 98

4.2.2. Smart Technology as a Fluid 102

4.2.3. Smart Technology as a Peer (in P2P Assemblages) 107

4.2.4. Smart Technology as a Silent Partner 113

Stage One: Interface 117

Stage Two: Introduction 120

Stage Three: Interaction 124

5 CONCLUSION 132

5.1. How Do We Rethink About Smart Technology? 135

5.2. What Do We Redo About Smart Technology? 137

REFERENCES 140

LIST OF FIGURES

Figure Page

1. Research Structure 10

2. Three Stages of Encounter 116

CHAPTER 1

INTRODUCTION

Along with the rising of the Internet of Things (IoT) from the 2000s, home automation is also reaching a whole new level. Smart technologies have made their way into our homes and become our housemates (Maalsen & Sadowski, 2019), and our most intimate information is now hoarded in cloud servers by their makers and third-party services. We have to acknowledge that smart devices are not only our housemates but also coworkers, caretakers, and sometimes guides. One could argue that we are now physically and psychologically inseparable from technology. We assemble ourselves with technology to have access to information anywhere and anytime; the mobile connectivity of technology makes us emotionally attached to it (Elliott & Urry, 2010). In a way, smart devices become our partners.

Given the intensification of our interactions with these devices, this thesis serves to clarify what the relationship should be because we can hardly escape these *forms of life* (Winner, 1989) of co-working with our technological partners. The term, *silent partner*, is borrowed from the field of business, and it is usually concerned with power distribution, profit, and investment. For connecting the dots, I will start this topic by delineating my encounter with Amazon Echo Dot (Section 1.1). I will conceptualize the role of a silent partner as well as the silent partnership that encompasses the interactions between silent partners and humans. Then, I will present my research structure and pose my research questions (Section 1.2) and give an outline of the thesis for addressing my research question.

1.1. How Do We Think About Smart Technology?

1.1.1. Amazon Echo Dot

One day I was talking to my friend on the phone about the actress Anne Hathaway. When I pronounced her name, my Amazon Echo Dot turned down the music that was streaming from Spotify. At the same time, it changed the color of its light, which indicated that it was recognizing the name and trying to keep up on my conversation, whether or not it was a command for it. Then the music soon went back on after I stopped talking. After a few seconds, I said "Anne Hathaway" again, and it again turned down the music and changed the color of its light.

This incident made me think about the human-computer interaction with a series of questions: Why did the Echo Dot target the name? What made the action of *listening* override the current action of *playing* music? Especially since I did not say the wake word "Alexa," who decided that it can openly eavesdrop on my conversation? Although I knew that *it is always listening* by default, the fact that it turned down the music and interrupted my conversation, therefore, made it a rude housemate. First, it dropped its current task to listen to my words. Second, the sudden silence put the conversation on hold because I had to figure out what was going on. As a result, I started pondering the responsibility and accountability of smart technology and working on this idea—a *silent partner*.

1.1.2. The Problematics of Smart Technology

In cultural studies, *conjunctural analysis* suggests that we map the problematics among "problems, crises, contradictions, and instabilities that appear across what might

otherwise seem disparate issues and locations" (Slack & Wise, 2015, p. 217). In Slack and Wise's words, a *problematic* is "a 'theme,' or set of 'themes,' that emerges in a social formation, across a variety of sites, struggles, and concerns" (p. 217). Considering the complexity of smart technology, we could use some examples to discover the underlying problems in our existing social and technological structures.

In February 2019, Google surprised its consumers of Nest home security and alarm system security with the revelation that there was a built-in microphone that was never listed on their specifications (Snider, 2019). In a statement to *USA Today*, Google says:

> "The microphone has never been on and is only activated when users specifically enable the option," the company's statement continued. "Security systems often use microphones to provide features that rely on sound sensing. We included the mic on the device so that we can potentially offer additional features to our users in the future, such as the ability to detect broken glass." (Snider, 2019, para. 5)

Although Google's admission referred to the microphone as an error rather than as an intentional secret, people in general increasingly find their privacy being invaded by technology. Similar incidents include a bug in Apple FaceTime that lets people eavesdrop on conversations even if they did not answer requests from group chats and the Cambridge Analytica scandal from Facebook that collected people's data and, in turn, used to manipulate their voting behavior during the U.S. presidential election of 2016 (Snider, 2019).

Among the incidents, one thing in common is the interaction between humans and smart technology that is undermined by a lack of appropriate regulations and what Zuboff

(2015) called *surveillance capitalism*, in which system companies predict and alter human behaviors in order to profit from them. Considering my encounter with my Amazon Echo when it turned down the music and listened to my conversation, I was not informed by it regarding its actions, and I did not know the rationale behind its actions as well. However, the Amazon Echo knows about all my information associated with my Amazon account, including my name, address, phone number, bank account, purchase record, and all the items that I put in my shopping list.

Given my interaction with Amazon Echo and the aforementioned microphone in Google's Nest home security system, one of the problems is the opaqueness of the technical mechanisms that distribute unbalanced agencies in the human-smart technology assemblage. On the one hand, technology companies have more knowledge about their consumers than their consumers have about the companies. On the other hand, technology companies get to control what components are built in devices and to what extent to reveal the information to its user, not to mention the terms of service are under constant change. In contrast, the user can only face either all or nothing when encountering with smart technology (i.e., to click "I agree" button on apps or websites). As a result, individuals lack resources to negotiate with technology companies regarding the devices/systems that work closely with them in their daily lives.

When the circumstances apply to an even larger scale such as a smart city, the existing inequalities would have more severe consequences. For example, in a documentary on national television in 2017, China's President Xi Jinping says "A feeling of security is the best gift a country can give its people" (Raphael & Xi, 2019). Accordingly, in 2019, of the world's video surveillance cameras, 42% of them were in

China (Raphael & Xi, 2019). The surveillance cameras are used for facial recognition in the Social Credit System (SCS), which is a national reputation system for "the establishments of unified record system for individuals, businesses and the government to be tracked and evaluated for trustworthiness" ("Social Credit System," 2020). In July 2018, over 40 municipal and provincial governments had established a local SCS pilot (Kostka, 2019). Although as of today, the SCS is not yet deployed in Hong Kong, a region of China which was previously colonized by the United Kingdom and has preserved a certain level of democracy and civil rights, people in Hong Kong have encountered intensive and extreme surveillance pressure from the Hong Kong government as well as the Central People's Government of China.

Since March 2019, the Anti-Extradition Law Amendment Bill movement (also known as Anti-Extradition protests) has raised global awareness regarding the surveillance and tracking technology used by the Hong Kong government. In a social movement with technology that is highly engaging, even the civilians who are not protesters become aware of the government's use of technology. The AI Organization (2019) provides a report regarding the government abuse of facial recognition:

> Hong Kong students are hunted through facial recognition, and tracking software embedded in smart phones and apps as they connect to the internet. The AI software provided by big tech in the west has these capabilities built in the system. The Chinese regime has embedded spies in Hong Kong Police, reporters, schools, clubs, and practically everywhere in Hong Kong. They were able to do this by using bio-metric tools assessed by Artificial Intelligence gathered by their

> data pool. After acquiring some data, they are able to place their spies, people of influence and those who commit sabotage and rape, within the populous. (para. 5)

However, due to the current social and technological structure, there is little room for negotiations surrounding appropriate technology use, let alone to take into consideration the cultural differences. According to Mattern (2017), governors and/or managers often believe the paradigm of the city as a computer that "frames the messiness of urban life as programmable and subject to rational order" (para. 11). Nevertheless, we need to turn a more critical eye on not only the concept of "rational order" but also the human actors behind the "rational order" and the political and technological actors toward this end.

With these varied scales of smart technology implementations in mind, it is axiomatic that humans on one side are extremely vulnerable when the government, technology companies, internet providers, and even the sensors in their own devices are all on the other. Nevertheless, there should always be other options to escape from the *forms of life* (Winner, 1989). That is, the agency within the human-smart technology assemblage could be rearranged to a more equivalent, sustainable status in which no one party is the only one who is exploited by others. Accordingly, this thesis aims to explore opportunities for an ideal reformation of the relationship between humans and smart technology. On a societal level, we should pay attention to the politics behind smart technology, including its political relationship with others, the assumptions of algorithms, and the economic benefits of its implementation. On an individual level, we should pay attention to the human-computer interaction, in which humans maintain a balanced and sustainable mental relationship with smart technology and can further be empowered by the relationship.

Nonetheless, due to the scope of this research, I should acknowledge that the ideal reformation in this thesis will focus on a relatively direct relationship between humans and smart devices/systems. Although I am aware that technology companies and the government play substantial roles in dominating the *smart ecology*, I hope to deal with problems of immediate concern to the masses as a starter, including how people make sense of smart technology and how they interact with it. That is to say, I will not go in-depth on the existing social structures in terms of data policies in technology companies nor government regulations of smart technology. By putting them aside, I also hope that my analyses and imagination can go beyond the current limitations in society and serve as a new option in the age of smart technology.

1.1.3. Silent Partner

In business, the term, silent partner, has its definition and boundary to regulate its obligation and responsibility, as Kenton and Abbott (2019) state:

> A silent partner is an individual whose involvement in a partnership is limited to providing capital to the business. A silent partner is seldom involved in the partnership's daily operations and does not generally participate in management meetings. A silent partner also is known as a limited partner, since his liability is typically limited to the amount invested in the partnership. (Para. 1)

In a business setting, a silent partner is limited to its ability to participate in the actual operation. In other words, it can only provide the company with the required resource, which is financial support.

However, in technological smartness, the role of a silent partner should reflect its position, which has a closer relationship with human day-to-day activity. It is not only a business partner but also a working and living partner. Therefore, in the context of technological smartness, a *silent partner* is *a nonhuman actor whose involvement in a partnership is limited to providing technical support to humans' daily practices*. On the one hand, the silent partner emphasizes the *silent* in terms of privacy; on the other hand, it emphasizes the *partner* in terms of trust with two or more parties.

1.1.4. Silent Partnership

This ecology that involved protections of privacy and intimate interactions between humans and smart devices forms a *silent partnership*, by which I hope to constitute a formal arrangement in terms of positions, division of labor, and responsibilities. For instance, although the Amazon Echo Dot is involved in the partnership's daily operations, it should not over-gather data or participate in decision making. In this sense, it also should be limited in its capability, which means it cannot act or provide service for which the human actor did not ask. With the new characteristics, I hope to improve the balance in the relationship by making smart technology *dependent but moderately dependent*, *intimate but privately intimate*, and *convenient but restrictedly convenient*.

In this thesis, a partner will be seen as an actor that can negotiate between people, organizations, and institutions, and has an impact on the overall dynamic of the partnership. In accordance with this, I will not use the word "user" when discussing the concept of technological partnerships, because smart technology here is not an object for

the purpose to *be used*; instead, we *work with* it. With this understanding, we should keep in mind that smart technology is an essential player in the upgraded human-computer interaction.

1.2. What Do We Do About Smart Technology?

In the post-anthropocentric world that we live in today, the concerns raised by smart technology include uneven power relations between humans and technology companies, humans and technology, and humans and humans. Some people embrace technology; for example, some would rather give an order to a digital assistant than negotiate with human housemates to do things (Turkle, 2011). Others are more wary of the power of technology, for example, worries about surveillance and Big Brother. The complex relationships among different parties keep interweaving and strengthening themselves as a ball of yarn, and gradually form a gigantic *smart* environment in our society. At the same time, it shapes and is being shaped by our real-time behaviors and emotions.

Given above and the previous section, my research places the silent partnership in the intersection of smart technology and humans (*Figure 1*). Although the structure is shown in a Venn diagram, each of the sections and intersections actually consists of many actors, both human and nonhuman actors, situated in different layers and connected together. Therefore, each arc in the diagram is not a clear cut between sections; instead, the edges are blurring and merging from both sides. Also, the diagram itself should not be envisioned as a flat structure.

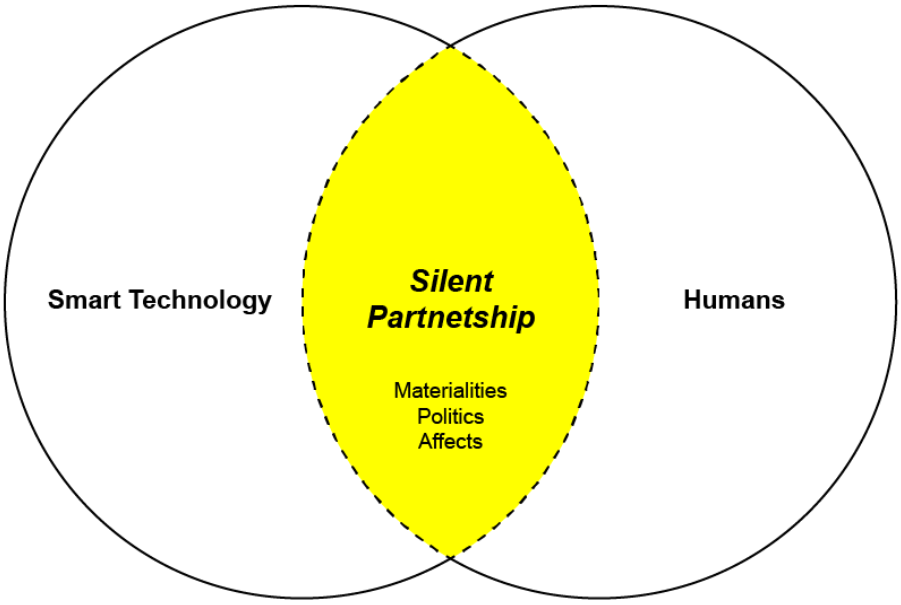

Figure 1. Research Structure

In this research, my overarching question is: ***How do we reach an agreement of silent partnership in the age of smart technology?*** That is, under what circumstances can the exchange between humans and technology be seen as equitable? To be more specific, how can we trade our data and labor for smart environments more fairly? The tangible and intangible assets from the human end include things such as private and contact information, physical actions, and emotional attachment. On the other hand, things that we acquired from smart home devices/systems are also various, including time, electricity, convenience, confidence, social status, and emotional security. That being the case, how can we make the price we paid equivalent to the service we got? Thus, my main research question consists of three sub-questions:

(1) What values are embedded in smart devices?

(2) How do human behaviors and emotions relate to smart devices?

(3) How can we reset work ethics in the partnership?

For inquiring into the issue, in Chapter 2, I will first introduce the development of smart technology and how the fantasies of technological smartness have grown from historical perspectives in *Smart Technology* (Section 2.1); secondly, I will provide the antitheses of smart technology in *Dumb Technology* (Section 2.2); lastly, I will introduce my theoretical frameworks for this research in *Posthumanism and New Materialities* (Section 2.3).

In Chapter 3, I will examine the relationships between humans and smart technology through the theoretical frameworks and sort my analyses by two aspects: *Inbuilt Politics* (Section 3.1) and *Psychology and Work Ethics* (Section 3.2). I will shed light on this role from its inherent politics to its economic contribution, examining what values have been embedded in smart devices and who has been left out due to the filtering of values. Further, I sort out the complex emotions and attachment between humans and smart technology. In addition, due to the nature of the partnership, it also relates to inter-non-personal relationships and work ethics. To be more specific, how humans trust and respect their *coworkers* and hold them accountable for their human actions.

In Chapter 4, I will return to the concept of *Silent Partnership*, not only to reimagine smart technology as a silent partner in everyday life (Section 4.1) but also to redesign smart technology as a silent partner (Section 4.2) by looking at the different roles it plays (i.e., an actor, a fluid, a peer, and a silent partner).

This thesis concerns not only the relationship between humans and nonhumans but also this relationship within the *smart ecology*, that is, how the partnership can contribute to a more sustainable status for all human and nonhuman actors on the planet.

Thus, in Chapter 5, I will conclude my theory from the analyses and provide ways to *rethink* and *redo* smart technology from the perspectives of everyday life. In addition, I will depict how treating smart technology as a silent partner will benefit our current and future situation in the age of digital culture.

Although the sections and subsections in chapters are by no means exclusive or comprehensive, I will try to interweave them into a clearer picture of this topic. For a better understanding of the topic and the issues in the following chapters, I want to briefly introduce some important concepts related to techniques and applications of smart technology, and I will further elaborate on them in the literature review (section 2.1.2).

Ubiquitous Computing (Ubicomp): A concept of "computing without computers" (Greenfield, 2010, p. 11) that describes a type of technology that blends all the editing, calculating, and information displaying into human behaviors and lives.

The Internet of Things (IoT): Things that have networked addresses and embedded sensors that enable them to sense (e.g., addressing, speaking, seeing, and tracking) human behaviors and conditions (Bunz & Meikle, 2017).

Information and Communications Technology (ICT): Technologies that provide access to information through remote communication (e.g., the Internet, Wi-Fi, cellular signal, and Bluetooth) (Christensson, 2010).

Human-computer Interaction (HCI): A field of study that focuses on the design of computer technology regarding the utility and usability of interfaces and the interaction between humans and computers (Interaction Design Foundation, n.d.).

CHAPTER 2

LITERATURE REVIEW

Smart technology seems like a relatively new trend in our history; however, the fantasies of having different types of robots, a robot of multiple functions, and fully automatic houses and even cities, are deeply-rooted in our society. They live in fairy tales, science fiction, classic literature, movies, commercials, and the imagination of people in generations. Some of these fantasies have disappeared due to technological progress in different directions, some of the fantasies became blueprints that are waiting to come true, and some of the fantasies are the realities in which we currently live.

Nevertheless, with the pervasive and ubiquitous computing that is continuously collecting and calculating our motions and emotions, we need to figure out how that happened, including perspectives from different aspects such as history, techniques, applications, and implications. For this research, I will review literature in the following order: *Smart Technology*, *Dumb Technology*, and *Posthumanism and New Materialities*.

In *Smart Technology* (Section 2.1), I will discuss how the concept and the imagination of smart home technology were formed and have grown from historical perspectives. Then, I will present a few specific concepts and inventions such as ubiquitous computing, the Internet of things (IoT), and smart homes. Through these concepts, I will elaborate on the ways companies apply scientific fantasies to our day-to-day life. In *Dumb Technology* (Section 2.2), I will provide the antitheses of smart technology, such as technologies that cannot, should not, or refuse to be smart. Also, I will bring in ideas from previous researchers about the appropriate limitations of technology. Based on that, I will cite the design principles suggested by scholars to

restrict the capabilities of the "smartness." In *Posthumanism and New Materialities* (Section 2.3), I will draw on thoughts from the concepts of posthuman and cyborg, actor-network theory, assemblage, and digital materialities and infrastructure as my theoretical frameworks.

2.1. Smart Technology (at home)

For a long time, the concept of technology has stayed mainly in factories and offices. However, since the Industrial Revolution overflowed from factories to households in the 1860s, the concept of industrialization has gradually crawled into people's homes and mixed with our behavior and expectations. As Cowan (1983) points out:

> Now usually, when we think of the word *industrialization*, we think in terms not of homes but of factories and assembly lines and railroads and smokestacks. . . . Homes are idealized as the places to which we would like to retreat when the world of industrialization becomes too grim to bear; home is where the "heart" is; industry is where "dogs are eating dogs" and "only money counts." (p. 4)

Nevertheless, along with early household appliances, such as sewing and washing machines, industrialized homes not only let people accept machines in homes but also changed their perception of the concept of "home." Further, it has changed our living habits at home to become productive and efficient.

Since the 1900s, "The many electrical appliances created to fill the home are surprising in both their number and their specificity of function" (Heckman, 2008, p. 34). Heckman (2008) mentions examples such as the toaster, electric egg cooker, waffle iron,

electric mixer, and coffee pot, that gradually occupied people's houses and make the living space more efficient and manageable. As Wajcman (1991) says, "These ideas about efficient home management which accompanied the introduction of domestic technologies gradually reshaped the design of the house itself" (p. 114). However, a home with many electrical appliances is not smart. *Not yet*. As Darby (2018) mentions "the boundaries of 'home' have been extended, first by connection to electricity networks and then to the Internet" (p. 142). The Internet connects the home and the contents in the home with the world and beyond, both architecturally and virtually, and that is when the home becomes *smart*.

Smart technology is a comprehensive term that people use to describe devices or technologies that have high connectivity. According to Worden et al. (2003), they are: "Technologies with the ability to sense changes in their circumstances and execute measures to enhance their functionality under the new circumstances offer enormous benefits in performance, efficiency, operating costs and endurance" (p. 1). That is to say, for the devices to become smart, they need networked sensors fitted in multiple devices as well as the skills that are created by new forms of communication among them (Bunz & Meikle, 2017), which I will expand upon later (Section 2.1.2). In *The Internet of Things*, Bunz and Meikle (2017) mention plenty of connected domestic appliances with specific purposes, such as the smart iron, networked juicer, wireless wine bottle (with a screen and keeps your wine fresh for two months), smart frying pan, Bluetooth umbrella, app-controlled candle, and so on. The home appliances that have been labeled "smart" seem remarkably attractive to some people within the context of smart consumerism. From the perspective of social constructionism, purchasing behavior reflects one's ideal

concepts of home and technology and one's identity. As Heckman (2018) argues, "Homes are associated with a certain amount of permanence, personality, and meaning" (pp.19–20). Through building a personalized *smart set*, home can finally become where the *heart* is.

To sort out how smart home devices appeared and gained their agency in our living environment, I will start by recalling *Smart Home Fantasies* (Section 2.1.1). Then, I will introduce a few important terms that will be used throughout this work regarding techniques and applications of ubiquitous computing in *Smart how?* (Section 2.1.2). Finally, I will discuss how smart fantasies are applied to realities through these techniques (Section 2.1.3).

2.1.1. Smart Home Fantasies

In the 1950s, television emerged as a cutting-edge technology that spread into the middle-class home and "extended human vision" (Heckman, 2008, p. 40). As a result, the concept of home started to be furnished by futuristic fantasy. In the book, *A Small World: Smart Houses and the Dream of the Perfect Day*, Heckman (2008) reveals numerous pieces of printed and digital media such as books, films, advertisements, and magazines that link "home" with "dream" and sell those "dreams" into the "home."

Heckman (2008) mentions that, for example, the film *Magic in the Air* (1941) describes the private comfort provided by TV; Disneyland's Tomorrowland *House of the Future* (1957) shows a communication and media center for residents; the film *Practical Dreamer* (1957) provides a fantasy of kitchen planning and modernization; the book *Smart House* (1988) creates a total, computer-controlled indoor environment; *Welcome to*

the Dreamhouse (2001) promises to free housewives from chores; and the magazine *SmartHouse* (since 2002) compiles futuristic visions for its readers.

In *Welcome to the Dreamhouse*, Spigel (2001) points out:

> Just as 1960s advertisers promised consumers that portable TV would allow them to imaginatively liberate themselves from the mundane world of family life while also remaining in the safe space of their homes, these "smart skinned" negotiate a dual impulse for domesticity on the one hand and the escape on the other. (p. 387)

For this pervasive fantasy promotion, Heckman (2008) further notes:

> The entertainment industry in general has always been sensitive to our tastes, desires, needs, and longings—always providing us with the sweet release of escape, even when the release we demand is the ironic and self-deprecation command of the so-called postmodern condition. (p. 2)

The ideological force and representational power of these images have a significant impact on our knowledge and perceptions, enabling us to fulfill the concept of "home." The home has changed from simply providing safety, food, and rest, to becoming a place that is comfortable, entertaining, efficient, private, sentient, modern, futuristic, magical, and intelligent. From *nouns* that the home can provide to *adjectives* that describe the home, the idea of the home has transformed into an entity capable of experiencing, reconstructing, and optimizing. As Dourish and Bell (2011) state, "Ubiquitous computing was, from the outset, a proposal not for how technology should *be* but instead how it should be *experienced*" (p. 116). The technology embedded in the home is not merely a tool but also involves human daily practices and meanings.

Aldrich (2003) defines smart homes as "a residence equipped with computing and information technology which *anticipates and responds* [emphasis added] to the needs of the occupants, …through the management of technology within the home and connections to the world beyond" (p. 17). The Internet of things (IoT) further implants the spirit of *experiencing* into this homey idea. With the use of information and communication technology, the concept of the home maximizes personal control in domestic space and provides a sense of *convenience* and a sense of *cool*, described as follows.

As Slack and Wise (2015) point out, "Convenience, more often than not, is the everyday motivation that justifies ongoing choices involving the role of technology in everyday life" (p. 34). The desire for "making life easier" transforms the concept of *convenience* from something that is appropriate to a given circumstance to "personal comfort." Consequently, *convenience* becomes more of an emotional feature that goes hand in hand with the sense of *cool*. Liu (2004) discusses the notion of *cool* in the era of networked information. He asserts that "Inflected in different ways and on various scales, the rhetoric of unproducible knowledge—of knowledge that can never be known and shown simultaneously—is universal to cool online" (p. 177). The fancy words such as sentient, magic, and intelligent act as a veil that prevents us from knowing the mysterious mechanisms behind the devices. This obfuscation deifies the mechanisms in smart devices and fills people with wonder, thus enabling them to experience a sense of cool.

As Bunz and Meikle (2017) point out, "The paradox of the smart devices is that its user doesn't need to understand it" (p. 15). Due to the unknown but ubiquitous force that drives the home, "the automated home, far from being integrated practically, enjoys a

more persuasive form of integration as a fantastic ideal" (Heckman, 2008, p. 37). Although this ideal acts in consumer culture as motivation and drives people to acquire all the components to assemble their dream houses, I would like to lift the veil of smart technology and see what are there underneath in the next section.

2.1.2. Smart How?

Under the umbrella of smart technology, some common concepts will be mentioned frequently. Accordingly, I would like to briefly introduce these essential concepts that will be interwoven throughout the entire thesis: ubiquitous computing, the Internet of Things, ICT, and HCI. Nevertheless, we should keep in mind that these concepts are similar and different at the same time. Perhaps we can see them as the many facets of our core subject—smart technology.

Ubiquitous Computing (Ubicomp)

Ubiquitous computing (ubicomp) is a concept that was coined by computer scientist Mark Weiser. In his sense, it is a type of technology that "fade[s] into the background" (Weiser, 1991, p. 94) and fits into our lives. As Weiser develops this idea of "invisible" computing, he depicts it as computing that "does not live on a personal device of any sort, but is in the woodwork everywhere" (as in Greenfield, 2010, p. 11). In Greenfield's (2010) words, it is "computing without computers" (p. 11), which means that editing, calculating, and displaying can happen anywhere without a host.

Dourish and Bell (2011) also elaborate on Weiser's concept of ubiquitous computing that "computational devices would be small and powerful enough to be worn, carried, or embedded in the world around us—in doors and tables, the fabric of clothes

and buildings, and the objects of everyday life" (p. 2). In other words, it is a medium that slides into humans' daily activities that provide technological *experience*. As they argue, "ubicomp provides both a platform for encounters between people and technology, on the one hand, and an animating vision for technologically mediated interaction, on the other" (p. 14). That is, ubicomp facilitates technological interactions. Therefore, by studying ubicomp, we can discover not only human-computer interaction but also aspects such as information infrastructure, culture, and society.

Although the term ubiquitous computing has been commonly used, other terms indicate a similar concept despite coming from different perspectives. According to Greenfield (2010), some of them are: pervasive computing, physical computing, tangible media. For him, the idea of ubiquitous is "not merely 'in every place' but also 'in every thing'" (p. 11). As a result, he refers it as *everyware* throughout his discourse.

Given the above and for the clarity of the research, I will use different names when referring to particular scholars' work or when discussing the phenomenon from particular perspectives. However, I will use the umbrella term—*Smart Technology*—when I refer to technology overall (including the following techniques and factors) in this work.

The Internet of Things (IoT)

Internet of Things (IoT) is a phrase that can be traced back to 1999, created by Kevin Ashton, a co-founder and executive director of the Auto-ID Center at MIT. For him, computers and the Internet mostly depended on humans for information; however, the human capacity is limited, which means that humans cannot capture all the data in our surroundings. As a result, Ashton (2009) proposes:

> If we had computers that knew everything there was to know about things—using data they gathered without any help from us—we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. (para. 4)

That is to say, humans no longer need to gather data by typing, recording, and scanning with such physical actions. *We can delegate the task to computers*. Ashton (2009) elaborates on his vision as follows:

> We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory. RFID and sensor technology enable computers to observe, identify and understand the world—without the limitations of human-entered data. (para. 5)

In other words, we enable computers to *sense* the world without human intervention so that they can scratch data from environmental factors such as sounds, motions, thermal energies, lights, and pressures.

Among other depictions, Bunz and Meikle (2017) assert that the IoT "describes the many uses and processes that result from giving a *network address* to a *thing* and fitting it with *sensors*" (p. 1). They see the IoT as media that transmit data back and forth between human and machine, and machine and machine as "*a matter of communication and meanings*" (p. 5). That is, by analyzing the things themselves, we can know *what they are, what they are capable of,* and *what has been delegated to them* (by humans). For example, after Tesla's and Google's self-driving car accidents, both Tesla's and Google's public press referred their automated systems to a *non-human* category and

indicated that they are less fallible than human drivers (Bunz & Meikle, 2017). Things, in this sense, have their agency, and this category of non-human agency is desired for the future. As a result, we might as well keep in mind that things should be seen as actors in our surroundings.

Information and Communications Technology (ICT)

Information and communications technology (ICT), is a widely used term that refers to "technologies that provide access to information through telecommunications. It is similar to Information Technology (IT) but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums" (Christensson, 2010). That is to say, it is one of the underlying mechanisms in smart technology that enables devices to communicate with each other. The devices, systems, and applications in a network have to work together seamlessly as well as monitor their operations while collecting and routing data back and forth between devices and the IoT data streams.

Human-computer Interaction (HCI)

Human-computer interaction (HCI) is "a multidisciplinary field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers" (Interaction Design Foundation, n.d.). It is essential to consider HCI when looking into the relationship between humans and technology. Especially in the age of technological smartness, it is the key component of the utility and usability of devices. As Grudin (1992) argues, "A potentially useful system can be unusable. A usable system—one that is easily learned and handled—can be useless, serving no recognizable purpose" (p. 209). For smart devices to be useful, HCI concerns

reciprocal actions such as how people operate the devices, how to adjust all the settings, and how the devices react to our settings.

Interaction design expert Donald Norman (1999) addresses vivid expectations regarding his relationship with a computer:

> I don't want to use a computer. I don't want to do word processing. I want to write a letter, or find out what the weather will be, or pay a bill, or play a game. I don't want to use a computer, I want to accomplish something. I want to do some activity, something meaningful to me. Not "applications," not some bizarre, complex computer program that does more than I ever want to know about and yet doesn't really do exactly what I need. I want computing that fits my activities. I want the technology hidden away, out of sight. Like electric motors. Like the computers that control my car. (para. 6)

Many people share this view of making computers and computing *invisible*. Nevertheless, even computing technologies *fade into the background* as in Weiser's (1991) words, their materialities and the interaction between humans and computers are still there, which cannot be eschewed nor ignored. Besides, the elimination of visual appearance will result in ignorance of the political implications and lead to an unbalanced partnership (as we will elaborate on in Section 2.3 and Chapter 3).

Accordingly, where to draw the line, whether it is seamless or seamful, between humans and smart technology will affect the interaction between the two, and thus, I will discuss HCI repeatedly in this work.

2.1.3. Applying Fantasies to Realities

The home is a machine for living. —*Le Corbusier*

Before the advent of the Internet and networked home appliances, a home was considered as a sanctuary of privacy that makes people feel comfortable, safe, relaxed, and supported; it also restores people's energy for the outer world (Wajcman, 1991; Rapoport, 2012). However, smart home appliances have become popular in the market since 1998. Consequently, the forms, functions, and domestic activities in a home have gone through a lot of change. Take smart speakers for instance. According to Kinsella and Mutchler (2019), 66.4 million of the 253 million U.S. adults owned smart speakers in 2019, which means more than one in four U.S. adults owned a smart speaker. The number, however, does not include people who do not personally own a device but nevertheless have access to it. In their report, Kinsella and Mutchler also list the use case frequency, in which the top five are: Ask a question, listen to streaming music, check the weather, set an alarm, and set a timer. Among the five actions, only one of them (listen to streaming music) relates to the traditional function of a "speaker." In this sense, people in a home not only switch the task taker for their daily routine but also show a different interacting pattern with their home environment.

According to Aldrich's (2003) definition of a smart home, it is a house that is furnished with advanced devices and appliances that can sense the surroundings and communicate with each other in order to respond to residents to improve the quality of life. People purchase smart devices to help with housework, and the use of ICTs greatly increases the productivity in the house. For instance, one can start a slow cooker, clean the house with robotic vacuums, and do laundry by apps simultaneously. In short, a smart

home is a home that is augmented by advanced home appliances, networks, algorithms, and services. Under the circumstances, Internet accessibility is the very cornerstone that upholds the transition of smart technology from fantasy to reality.

Nonetheless, as Samsung said in 2014 IFA (Internationale Funkausstellung Berlin), "Place all the world's latest and most advanced smart devices at your home, it still wouldn't make your home a Smart Home. For a home to be called a Smart Home, it actually needs to be *smart* [emphasis added]" (Samsung, 2014). Samsung further explains, "Smart Home, a 'connectivity' based service, is basically a home version of IoT" ("Smart Home," 2014). For the communication to proceed seamlessly among devices, the sensors need to be able to detect and communicate the changes happening within an environment, which is a home in this case. In other words, in a smart home network, IoT means superior connectivity of digital devices/systems and provides access to the users anytime from anywhere (Cho et al., 2015).

In terms of connectivity, Samuel (2016) addresses six facets of the challenges in a smart home network: interoperability, self-management, maintainability, signaling, bandwidth, and power consumption. To be more specific, it means different devices need to be able to work together reliably and predictably; the devices need to monitor their performance and notify people about their potential issues (e.g., poor connections); they should be easy to maintain and fix (e.g., fast, cheap); they need to avoid signal loss in the transmission between devices; they will operate better with a lightweight bandwidth network; and they need to be low power consumption within a network.

For achieving a truly and perfectly connected home, large technology companies, such as Google, Amazon, Apple, Microsoft, and Samsung have built their system and

created various devices for their system. Furthermore, they pair up with more companies to make connections and services more interoperable. Take Amazon, the biggest share brand in the U.S. smart speaker market, for example. Amazon announced its smart speaker, Echo, and digital assistant, Alexa, in November 2014. In January 2016, it had only about 135 functions (aka *skills*), in June 2016, it had about 1,000 (Perez, 2016), and as of April 2019, it reached over 90,000 functions that partner with other companies and interoperable apps, devices, and gadgets (Amazon, 2019). The rapid expansion of functions and connected devices unprecedentedly enhances and complicates human behaviors in the home.

Regarding the nature of a smart home, applying fantasies to realities not only reshape the design of the house (Wajcman, 1991) but also the imagination of the living environment. Ideas about efficient home management and customization also reorganize the relationships between humans and the concept of a home, for example how to easily interact with devices, what features will be more helpful, and how to *make my life easier*. To understand people's opinions of an ideal home in the future, Coskun et al. (2018) investigated users' expectations of smart home appliances. They reveal that people prefer to improve the efficiency and performance of daily tasks as well as their knowledgeability of the households; meanwhile, they value technology's abilities to personalize the home and make good impressions with others. People look for closer and more individualized collaborations with their homes. Hence, the expectations of an ideal home changed as well in the context of smart technology.

2.2. Dumb Technology

In the context of this research, there are two meanings of the concept of *dumb technology*. The first refers to when technology is *too smart to be dumb*. Ironically, the *smart* here is not in the sense of multiple sensors and superior connectivity. In this case, it refers to the situation in which technology is too complicated for people to configure settings and fix simple problems by themselves. As Strengers (2016) mentions, when householders are not experts of smart systems and only use their smart thermostat as an on/off switch, "a smart thermostat is no different from a 'dumb' thermostat, being so complicated that its features are considered unusable" (p.72). The circumstances of "technology overriding humans" often annoy and frustrate the householders' partnership with technology, which I will come back to later (Section 2.2.3). Also, on a societal level, Green (2019) argues that when implementing smart technologies into cities without considering social impacts and alternative designs, it could result in ineffective practices and make us wonder whether or not a smart city is preferable to a "dumb" city.

The second kind of *dumb* that we are referring to is to *make it dumb*. That is to say, under some circumstances, humans regulate the use of advanced technology. It could be for the values that they cherished (e.g., Amish culture) or for other reasons that pertain to democracy, eco-friendliness, and emotional preferences. For example, Maxwell and Miller (2012) point out:

> Over the ten-year period from 1997 to 2007, the United States alone discarded 500 million computers containing over 6 billion pounds of plastics, over 1.5 billion pounds of lead, 3 million pounds of cadmium, almost 2 million pounds of chromium, and 632,000 pounds of mercury, as well as many other dangerous and

> carcinogenic chemicals, like beryllium and gallium arsenide. (Mosco, 2014, pp. 127–128)

People cannot foresee the consequences of new forms of technology, which only come to light after the technologies have been made. As a result, now we have to, and must, take all the realities into account and rethink as well as redesign the technologies that we are going to partner with.

In this section, I will first draw on arguments from scholars and some examples to expound on the reasons that there should be restrictions on technologies to withhold their capability in a certain range in *Technologies That Can't/shouldn't/refuse to Be Smart* (Section 2.2.1). Then, I will further elaborate on how the limitation should be placed, as well as in what ways in *Limiting Technology* (Section 2.2.2). Lastly, I gather previous researchers' opinions from different perspectives, including computer science, anthropology, and design and engineering, to gain a general understanding of how we can approach the renovation in *Principles of Designing Ubicomp* (Section 2.2.3).

2.2.1. Technologies That Can't/shouldn't/refuse to Be Smart

In *Tools for Conviviality*, Illich (2009) brings up the notion of two watersheds, which refers to the transition from the advent of technologies to when these technologies backfire on society. The first watershed is when technology is invented and applies to daily life. At that point, the use of technology will benefit society. However, after technologies' expansion reaches a certain point—the second watershed—the progress reverses and harms the society more. As in the example that Illich (2009) points out, people gained the ability to travel a longer distance due to the invention of cars at first;

however, after a short period, too many cars caused more traffic on roads which meant that people had to pay a higher price to arrive at their destination.

The transition between two watersheds not only changes our living environment and our quality of life but also creates *radical monopolies* in society, which means "the dominance of one type of product rather than the dominance of one brand" (Illich, 2009, p. 52). In Illich's words, "When overefficient tools are applied to facilitate man's relations with the physical environment, they can destroy the balance between man and nature" (p. 51). Take smart speakers for example. Nowadays, when people want to delegate their chores and/or daily routines to technologies, the only way they can think to do so is by giving orders to digital assistants (e.g., Alexa, Siri, and Google Assistant) that are embedded in various devices (e.g., Amazon Echo, Apple HomePod, and Google Home). People then expect digital assistants to take care of the rest, such as making connections between other devices. Although there are a handful of brands on the market (including Samsung Bixby and Microsoft Cortana), the digital assistants (or personal/virtual assistants) become the only means to redirect the tasks because we get used to it and limit our abilities to think of alternatives to bypass the current situation. As Illich (2009) well puts, "Monopoly is hard to get rid of when it has frozen not only the shape of the physical world but also the range of behavior and of imagination" (p. 55). When people used to just talk to digital assistants rather than consider other possibilities (e.g., asking another person, setting an alarm clock and doing it by oneself, or simply reducing the processes of routines), we are stuck in the *forms of life* (Winner, 1989).

To fight against this form of life, the Amish culture provides us with a great example in terms of rethinking values and the sustainability for a society:

> As a group they reflect on whether integrating a certain technology into their society will help to promote, preserve, or dissipate the values they hold most dear. They try to choose those technologies that they believe will ultimately benefit their society and avoid those they fear will undermine it. As they develop new needs, they do not simply take existing technologies off the shelf. They actively design their own artifacts, regulations, and systems of use in an effort to ensure that their values are not disturbed by the values inscribed into technology by others. (Wetmore, 2009, p. 297)

The Amish are fully aware of the fact that technologies have their own values. They know that technologies can reinforce social norms as well as affect personal relationships and cultural identity, which are the foremost values for the Amish. Therefore, they have their mechanism to decide which technologies to use and when, how, and why they use those technologies. For example, according to Wetmore (2009), during the 1950s and 1960s, the new milk regulations required a few new rules, which affected the Amish to an extent because many of them rely on farming. First, the Amish have to have electric-powered bulk tanks and cooling systems to ensure that their milk gets an "A" for quality. Second, the milk needs to be stirred five minutes per hour automatically. Third, they need to provide the milk every day to avoid spoilage, including Sunday, which is the rest and church day for the Amish. Eventually, the Amish came up with solutions: they used diesel engines from old trucks to power coolers, used 12-V batteries instead of 110-V electricity to run the machines, and scheduled a second pick-up on later Saturdays. As Mosco's (2014) comment on IT consumption, "this is due not to the technology but rather to what we do with it" (p. 129). Although we are constantly being pushed by new

technologies, new regulations, or new peer pressures, we can still find ways to refashion technologies while preserving our identities.

2.2.2. Limiting Technology

After the illustration of *two watersheds* in the previous section, Illich (2009) further proposes *conviviality* as a term to indicate the opposite of industrial productivity. This means that the more a society pursues industrial productivity, the lower the level of conviviality in that society. However, as Illich argues, "in any society, as conviviality is reduced below a certain level, no amount of industrial productivity can effectively satisfy the needs it creates among society's members" (p. 11). If the level of conviviality goes too low, people in society would no longer be fulfilled by industrial productivity. Therefore, conviviality is not only the opposite of industrial productivity but also an important factor to make productivity meaningful to people in society.

In this sense, the concept of conviviality has two layers of meaning. On the societal level, it means "autonomous and creative intercourse among persons, and the intercourse of persons with their environment" (Illich, 2009, p. 11); on the individual level, it is "individual freedom realized in personal interdependence and, as such, an intrinsic ethical value" (Illich, 2009, p. 11). In a broad sense, this understanding of conviviality is a reverse call that proposes a power redistribution for "personal energy under personal control" (Illich, 2009, p. 12), which, in Illich's words, is not only related to political systems but also one's lifestyle. By becoming convivial, society can protect three values, including survival, justice, and self-defined work. Therefore, we should

place limitations on technologies that we use in order to improve the connections between individuals.

In modern society, the concept of conviviality does not preclude smart technology. Instead, the concept reminds us that limited technology could increase our autonomy and help us relearn to rely on each other in society. For example, in a smart environment, when people can do almost everything with the help of various smart devices, appliances, and services (e.g., ordering a ride for picking up kids, pre-ordering dinner delivery, and replenishing groceries automatically), they might reduce their interactions with others (e.g., negotiating who picks up the kids today, asking others to get takeout dinner, or telling whoever is near the market to buy something). Nevertheless, in this way, what people did is nothing more than transferring their autonomy from human relationships to non-human relationships. They transfer their dependence on other people to smart devices, and that will not benefit the connections between individuals. On the other hand, if the technologies are responsibly limited, people might have more reasonable interactions with each other than when there is no regulation on those technologies. For example, among other ridesharing apps, Uber and Lyft's policies restrict people under 18 from riding without an adult, and drivers have to report when a passenger is apparently underage (Baig, 2019). In this case, parents would have to pick up their kids by themselves or ask trusted friends to do so, and they thus regain opportunities to spend some parent-child time.

In terms of ubiquitous computing, not only should functions be limited for nurturing sustainable interactions between humans and technology, but *invisibility* should also be regulated to some extent for maintaining democracy and ethics by reclaiming

technological awareness in our usage of smart devices/services. When smart technology becomes a part of our lives, as in Wise (2015) says, it "vanish[es] from attention and fall[s] into habit" (p. 227). Thus, we fail to notice that we are in a partnership and ignore the consequences of our use. Wise (2015) addresses three ethical issues that occur when we let technology disappear from our attention. First, the function and the conditions of the manufacture and reclamation of smart technology will be out of sight; second, its manufacture and the manufacturer will also disappear; third, it makes us ignore the *integral accident* (following Virilio, 2000), which indicates that all technologies have their inherent disaster related to the particular attributes of technology. For example, a private conversation cannot be recorded without the gathering of data from a smart home device, and one cannot expect to have a smart home device without potential data leakage. Considering the issues above, Wise (2015) argues for a materialist mapping project "to help make visible that which is continually trying to disappear" (p. 226) in a particular arrangement of things. That being said, if we fail to notice how devices work and what they work on, we will also fail to notice the consequences and how they reshape our lives.

In the disappearance of subjects, privacy concern has long been one of the most significant issues when discussing ubiquitous computing in our daily lives. In the partnership between humans and smart technology, we should make it clear who the invisible interested parties are, which include technology companies, the Internet companies, the manufacturers, and all their "friends" who have contracts with the aforementioned parties. As Wise (1998) puts it, "Agents are always double agents" (p. 419) that work with you as well as the companies behind. Hence, your daily life is not

only yours but also others', which is what Zuboff (2015) refers to as the *Big Other*. "It is a ubiquitous networked institutional regime that records, modifies, and commodifies everyday experience from toasters to bodies, communication to thought, all with a view to establishing new pathways to monetization and profit" (p. 81). That is, in the case of the partnership, your partners and their friends are trying their best to profit from your every movement.

In the information society, we trade our private information for those social media and streaming services and leave digital traces everywhere. Our data has been collected and piled up to a considerable extent. Zuboff (2015) points out that the information technology has the capacity not only to automate but also to *informate*, which was coined by Zuboff to describe the action of machines generating information that "symbolically renders events, objects, and processes that become visible, knowable, and shareable in a new way" (Zuboff, 2015, p. 76). In other words, besides automating operations, information technology also textualizes the overall work environments by its sensing and codifying ability.

However, it can cause a considerable negative impact in the partnership, just like violating the *Bro Code* in a friendship etiquette. Let us keep the imagination going. Now that the friends of your partners know you so well, you start receiving greeting cards from nowhere regarding your health condition, coffee consumption, and car mileage. That is the information that you know you only shared with your partners. Zuboff (2015) also argues that this kind of trade-off "eliminates the need for—and therefore the possibility to develop—trust" (p. 81), because once all actions are on record, we do not have to trust each other to behave appropriately behind our backs.

However, to build a balanced partnership between humans and smart technology, the concept of *trust* should be valued as the foremost element in the partnership. Trust, as Giddens (1990) points out, is "involved in a fundamental way with the institutions of modernity" (p. 26). He mentions that expert systems, which are "systems of technical accomplishment or professional expertise that organise large areas of the material and social environments in which we live today" (Giddens, 1990, p. 27), depend upon the concept of trust. In terms of smart technology, the smartphone in our hands, the smart speakers in our living rooms, and our smart homes as a whole could be seen as expert systems. That is, people have *faith* in the artifacts they use despite the fact that they have little knowledge about how they work. For example, people search keywords on their phones without having particular fear, and, although they might hear about accidents of data breach of smart devices, they nevertheless choose to take the risk and believe in the professionals who built the devices. For Giddens (1990), expert systems "provid[e] 'guarantees' of expectations across distanciated time-space" (p. 28). Therefore, he argues that trust is vested in abstract capacities, which I will come back to later (Section 3.2.3).

Despite that people tend to trust experts to take charge of technologies of our daily use, the reorganized *expert committee* that involves new actors, such as algorithms, protocols, and third parties, has complicated the "guarantees" that we used to think of. For example, the first deadly self-driving car accident of Tesla involved the *trust* in these guarantees. As Bunz and Meikle (2017) mention, "Despite Tesla's instructions that drivers need to keep their eyes on the road and their hands on the wheel, Brown *had trusted* [emphasis added] the vehicle's networked system, relying on his car to do the actual driving for him" (p. 68). In this case, what Brown did not notice was that the object

of our trust is essentially more complex than it used to be, and it thus might not fulfill the guarantees of our expectations.

In the age of smartness, guarantees of expectations are especially important, considering all sorts of data exchange and the risks related to not only human but also nonhuman professionals. Regardless of the complexity of smart technology, we should still make the environments, as well as devices and systems, trustworthy. A meaningful partnership should be built on the basis of trust. Therefore, although the sensors and algorithms in smart technology can measure actions of both parties precisely, we still need some rules to redesign smart technology that fosters trust as a foundation in the partnership.

2.2.3. Principles of Designing Ubicomp

Previously, I have discussed the use of technologies from different aspects and the reasons why they are, or should be, *dumb* to a certain extent or under particular circumstances. First, I depicted the consequences of technologies such as the counterforce (i.e., the second watershed) and radical monopolies; second, I made a detour to the importance of regulating technologies with the example of Amish culture and the concept of conviviality; and third, I argue for reclaiming visibility in terms of materialities and the third-parties in our partnership with smart technology.

In this section, I would like to go a step further to bring together suggestions from researchers in different fields. As Dourish and Bell (2011) point out, “it is important to explicitly engage in interdisciplinary practice rather than interdisciplinary projects, and to do so in ways that reflect the fluidity and hybridity of contemporary technological

arrangements" (p. 191). By gathering experts from fields including design, computer science, anthropology, and philosophy, I hope to build a more holistic and comprehensive view to renovate smart technology.

From the concept of *conviviality*, Illich (2009) considers some qualities for the convivial tools:

> Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired, for the accomplishment of a purpose chosen by the user. The use of such tools by one person does not restrain another from using them equally. They do not require previous certification of the user. Their existence does not impose any obligation to use them. They allow the user to express his meaning in action. (p. 22)

For Illich, examples such as the telephone and most hand tools are convivial because they are easy to operate and do not prevent diverse groups of people from using them. To see it from the perspective of smart technology, we could think about not only human autonomy in the human-tool relationship but also about Strengers (2016) and Green's (2019) argument to not make technologies *too smart to be dumb*.

From the perspectives of design and information architecture, Greenfield (2010) addresses five principles for the ethical development of ubiquitous computing, or, in his term, everyware. First, it must *default to harmlessness*, which means we should design smart technologies that ensure human safety even if/when it fails. As Greenfield (2010) states, "*Ubiquitous systems must default to a mode that ensures users' physical, psychic, and financial safety*" (p. 235). For example, when a robot vacuum in the home is

overheating, it should automatically shut down instead of catching on fire and causing further damage.

Second, the ubicomp must be designed to *be self-disclosing*. This means that smart technologies should be able to show their status immediately and transparently to humans.

> You should know what kinds of information-gathering activities are transpiring in a given place, what specific types of information are being collected, and by whom and for what purpose. Finally, you should be told how and in what ways the information-gathering system at hand is connected to others, even if just as a general notification that the system is part of the global net. (Greenfield, 2010, p. 237)

This is to "ensure that you are empowered to make informed decisions as to the level of exposure you wish to entertain" (Greenfield, 2010, p. 238). In Illich's (2009) words, it is a practice of "personal energy under personal control" (p. 12). For example, when a Roomba wanders your house, measures your floor plan, creates maps of the rooms in your property, and later sells your data to others (Wetmore, 2018), you should have the right to be notified in each phase. In this way, human actors would be informed and respected as a part of the partnership that can make decisions based on good rapport.

Third, it must *be conservative of face*. It should keep human dignity by not insulting the user in any way. "*Ubiquitous systems must not act in such a manner as would unduly embarrass or humiliate users, or expose them to ridicule or social opprobrium, in the course of normal operations*" (Greenfield, 2010, p. 240). That is, for example, until today, some of the smart devices still follow their technological ancestors

that just stop responding when something goes wrong. However, this inheritance should be avoided if we want to rebuild a meaningful relationship between humans and technology. Also, as Strengers (2016) reminds us, the complicated devices/systems that often require people to figure out the functions or settings as well as to repair by themselves make the user experience full of frustrations. The technological threshold in smart devices and appliances should be reduced so that people can operate them and perform easy troubleshooting without prior knowledge and experience.

Fourth, it must *be conservative of time*. It should not complicate existing practices in everyday routine. When the devices/systems are too complex as mentioned in the last paragraph, it affects not only human emotions but also time. To operate those overly difficult technologies become a time-consuming instead of a time-saving process. For example, if the task of simply turning off lights requires people waking up the phone, finding the app, going into different control sections, and turning off the light, then s/he might as well physically go to the spot and turn off the light by her/himself.

Fifth, it must *be deniable*. In other words, humans should be able to shut down smart devices/systems at their discretion. That is to say, smart devices/systems must provide the option for people to get themselves out of the partnership at any point. In 2014, European Union (EU) passed a law in European Data Protection Regulation (also known as the "right to be forgotten") that individuals can ask technology companies to remove their online trace, including personal history, photos, videos, and other information. The concept is for people to "determine the development of their life in an autonomous way, without being perpetually or periodically stigmatized as a consequence of a specific action performed in the past" (Mantelero, 2013, p. 230). Nowadays, the use

of smart devices or services usually requires people to have an account on their phones, and people should have their right to break off the links between services and your personal information, to remove their data from social media platforms, search engines, and applications whenever they want. On the contrary, the Chinese users of the Chinese super app, WeChat, which combines social media, market place, and innumerable services, are not allowed to delete their accounts (Singer & Brooking, 2018) due to government regulation. All in all, to establish a healthy partnership between humans and smart technology, any interaction must receive mutual consent, and human actors should be able to stop the relationship when they feel uncomfortable.

Let us take a break from technical perspectives and turn to cultural ones. In the previous section (Section 2.2.1) we have examples of the deliberated use of technologies from the Amish. Their processes are not only to carefully select specific technologies but also to create technologies for their own purpose and use. For carrying on their culture, they have two principles to guide their choices of tools. First is to evaluate whether a certain practice or technology is compatible with their existing values; second is whether the use of a technology can create a difference between the Amish and non-Amish (Wetmore, 2009). In other words, they want to maintain their cultural values and the *otherness*. In terms of smart technologies, we can also rethink our human values as well as how to simultaneously preserve the diversity in society.

Considering the diversity in technocultural practices, Dourish and Bell (2011) propose a framework which consists of three themes: *legibility*, *literacy*, and *legitimacy* for thinking about the interdisciplinary engagements. Legibility means "Seeing information as a cultural category rather than a natural one;" to focus on processes

including “forms of knowing, ways of being, and patterns of acting” (Dourish & Bell, 2011, p. 193) rather than devices and their functions. With ethnography in mind, an improvement of legibility would expand the knowledge of using an artifact regarding the features of the group, their culture, and the meanings of using it. As Dourish and Bell (2011) say, “Legibility is a product of a social and cultural encounter with the world; in turn, it structures and shapes those encounters” (pp. 194–195). In other words, through the lens of legibility, we can see the interactions between smart devices, social norms, and cultural activities. Accordingly, with legibility, we can design smart technologies that reflect on their lifestyle and embedded in their daily practices.

Literacy is recorded knowledge, which is constituted by the representations of certain groups in smart technologies. As Dourish and Bell (2011) expound on it, “Digital technologies are fundamentally representational—the basic stuff of computer programs is representations—and since ubicomp technologies focus especially on representations of the objects and activities of everyday life, the representational practice at work is consequential” (p. 195). That is to say, technologies are bound with practices, which is highly relative to a certain type of relationship between humans and technology. Thus, by pay attention to literacy, we can transform information into informativeness and include different kinds of cultural experiences.

Finally, legitimacy needs to be taken into account when different epistemologies and systems of practice come into conflict. “It is critical to retain a focus on the contests of authority represented by the competition between different representational systems” (Dourish & Bell, 2011, p. 199). As we see in the example of the Amish, the selection of technologies is to choose certain values instead of other values. That is to say, whatever

the selecting process is, the final model would inscribe a specific point of view. As a result, when we develop smart technologies, we should carefully choose the values we value.

Speaking of choosing values for which we hope to guide our behavior in order to maintain a specific way of living, we can also use the concept *conviviality* (Illich, 2009) as criteria to interrogate and/or create our tools, see if the tools can satisfy people and foster our self-realization, the real "user-centered design." In Illich's (2009) words, it is the guideline to "the continuous process by which a society's members defend their liberty, and not as a set of prescriptions which can be mechanically applied" (p. 24). That is also the goal of counterfoil research, to detect and "devise tools and tool systems that optimize the balance of life, thereby maximizing liberty for all" (Illich, 2009, p. 77). In terms of smart technology, for example, under convivial circumstances, we do not need to get rid of the smart speakers and digital assistants—as long as they did not reduce our activities and interactions with other humans in the home.

2.3. Posthumanism and New Materialities

In the very first sentence of his insightful article, Weiser (1991) says, "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (p. 94). The take-for-granted technology, such as a smartphone, now is just something in our hands which is usually being forgotten even when we are holding it. However, the disappearing sense of the technology is problematic (Wise, 2015) because, in the absence of thingness, we see only our actions, and we thus tend to believe everything is under control within our hands,

which is unfortunately not the whole story. As a result, we need to put materialities back on the table when we discuss our new partnership with smart technology. That is to say, although the fact that smart technology works with humans in this partnership makes it seem dependent on humans, smart technology has its vitality and autonomy. As a result, in this section, I would like to first provide a new perspective from *posthumanism* to reform our view in thinking about the similarities and differences between humans and smart technology/devices. Then I will introduce the two key pillars in this work, *actor-network theory* (ANT) and *assemblage*, to conceptualize the relationship between humans and smart technology/devices in both micro and macro perspectives. Finally, in order to realize the interaction in the working partnership, I will switch the focus to the nonhuman partners and elaborate on *digital materialities*, which have long been overlooked but play a key role in smart technology/devices for them as actors in the actor-network.

2.3.1. Posthumanism and Cyborg

Posthumanism and posthuman theory are the foremost concepts for us to understand this new relationship between humans and smart technology/devices. In the age of technological smartness, innumerable algorithms are making decisions for us (or, along with us), providing advertisements that most attract us, recommending friends of friends you might know, and adjusting the temperature in your room according to your sleep pattern. Moreover, behind the algorithms are numerous engineers who design the settings and calculations. And behind the engineers, there are various types of companies seeking ways to gather your data and influence your next steps, in terms of buying things,

the ways/platforms/payment methods that you buy things, or voting. Under the circumstances, we need to put the concept of *humans* aside and rethink our world in both a micro and a macro way to have a more comprehensive understanding of our surroundings. As Braidotti (2013) says:

> Posthuman theory is a generative tool to help us re-think the basic unit of reference for the human in the bio-genetic age known as 'Anthropocene', the historical moment when the Human has become a geological force capable of affecting all life on this planet. (p. 5)

Human-centered perspectives used to assume humans are the ones who have agency to operate, to make sense of the world. However, this standpoint often ignores other nonhuman actors who also have agency for affecting human society and shaping the world.

According to Braidotti (2013), the point about posthuman relations is to "see the inter-relation human/animal as constitutive of the identity of *each*" (p. 79). That is, the relation in between will change and combine each one's characteristics, and it should be seen as a continuum to be expanded and explored. In this sense, she argues that instead of seeing posthuman as a subject to be indifferent or de-humanized to the humans, it "implies a new way of combining ethical values with the well-being of an enlarged sense of community" (Braidotti, 2013, p. 190) that includes humans and nonhumans and emphasizes a more thorough consideration of all nonhuman actors in our ecological system. As she well puts it, "The complexity of our smart technologies lies at the core of the post-anthropocentric turn" (Braidotti, 2013, p. 43), we need to not only sort out our

new hybrid identity but also to reorganize the ethical values in this new *milieu* of the continuum.

Speaking of our new hybrid identity, Haraway (2013) states the unity in a more specific way:

> The machine is not an *it* to be animated, worshipped, and dominated. The machine is us, our processes, an aspect of our embodiment. We can be responsible for machines; *they* do not dominate or threaten us. We are responsible for boundaries; we are they. (p. 180)

In the age of posthuman, the connections of human memory and computer memory, as well as human actions and home automation, blur the dichotomies between humans and smart devices. Further, because "our sense of connection to our tools is heightened" (Haraway, 2013, p. 178), we are now in a stage often confusing whether to act with our preexisting physical body or our extended body that includes voice-activated assistants and apps. Similar to the practice of eye-hand coordination when children learn to throw balls, people sometimes get confused about whether to turn off the light by apps or simply by hand because s/he just walked past the hall. With a new extended body, the more devices with which we connect, the more we have to think about *what to do* and *how to do it*. The unsettling feelings, in a way, augment our desire for control. Like Heckman (2008) points out that the efficient laboring maximizes space and control in our living environment, "The good life is characterized not simply by a vast space, but by a maximized space and regime of control which produces a yield" (p. 12). We believe that by maximizing our control in a few specific spaces, *life will get easier*.

However, as illustrated in network theory, “Power always implies resistance” (Galloway & Thacker, 2007, p. 78). When the power of control gets stronger, the resistance gets stronger. Resistance, in Galloway and Thacker’s (2007) sense, should be seen as “awakening of forces of life” (p. 80) which is more active and affirmative. In order to elaborate on the forces, in the next subsection, I draw on actor-network theory to map out the possible and potential actors as well as the entanglements between the actors.

2.3.2. Actor-Network Theory

In this work, a partner will be seen as an actor, as in *actor-network theory* (ANT). ANT is a social constructivist approach that argues sociotechnical systems are developed through *negotiations* between people, organizations, and institutions, and most importantly, the artifact itself plays a part of the negotiations (Latour, 2009). The theory investigates the interwoven connections among artifacts and people within society. Each end of the connections can be a human or nonhuman actor, companies or governments, and the negotiations between them can therefore gradually push an artifact to develop toward a particular direction. For example, along with the development of smart technology, there are different actors such as technology companies, advertising agencies, customers, and governments. As such actors, technology companies might play the role in terms of design and engineering that decide appearances and functions of artifacts; advertising agencies might play the role to create particular images for artifact that advertising for particular features and targeting particular groups of people; customers might influence the market by purchasing products with specific functions, price range, and a certain level of quality; and governments might help promote the use

of smart technologies by partly subsidizing companies to lower the prices of products on the market.

Regarding different types of actors, ANT uses the technical word *actant* to mean "anything that acts and *actor* to mean what is made the source of an action" (Latour, 2009, p. 177). In other words, *actant* includes human actors and nonhuman actors. However, due to the purpose of this thesis that seeks to sort out the interaction between humans and smart technology, I will remain the use of separate terms (i.e., human actors and nonhuman actors) to indicate each party for the clarification as well as to recognize the differences between the two.

In ANT, another concept of *delegation* is used by Latour (2009) when describing the "transformation of a major effort into a minor one" (p. 154). He provides an example of the task "controlling a door." The problem for a door is when people come through, the door will remain open and let cold wind rush in the building. It thus needs another hand to close the door for the wall to maintain a well-sealed form (Latour, 2009). For this task, Latour (2009) proposes that either we can *discipline the people* (teach them to close the door after they passed the door) or to "*substitute* for the unreliable humans a *delegated nonhuman character* whose only function is to open and close the door" (p. 157), which is a groom. In this case, when we install grooms on doors, we delegate the task "close the door" from a human (passenger) to a nonhuman (groom). Moreover, Latour (2009) argues what we delegate to nonhumans "not only force as we have known it for centuries but also values, duties, and ethics" (p. 157). Due to the fact that the ethical prescription encoded in artifacts is regulating human actions, "The sum of morality does

not only remain stable but increases enormously with the population of nonhumans" (Latour, 2009, p. 157).

Considering the delegation from humans and nonhumans, in terms of smart technology, we should take into account the digital materials which act as nonhuman actors such as algorithms, protocols, and policies (more discussion in Section 2.3.4). Take smart thermostat for instance. The design of algorithms decide how the thermostat reacts to specific data (e.g., room temperature, human motions), and further affect how people react to the reaction of the thermostat (e.g., tuck up, wave to detectors); protocols decide how the connections work between the thermostat, detectors, Wi-Fi router, and the Internet signal; policies of technology companies decide whether or not and in what way that the companies can gather your data and sell them to third parties, as well as your rights as a customer.

Due to the complex interrelationships among the actors in the network, each actor is not the decisive one but also not the one that can be left out. As Galloway and Thacker (2007) state, "The nonhuman quality of networks is precisely what makes them so difficult to grasp. They are, we suggest, a medium of contemporary power, and yet no single subject or group absolutely controls a network" (p. 5). From the perspective of ANT, each human or nonhuman actor would have a direct or indirect impact on one another, and collectively, they will form a movement and guide the way.

ANT is a unique approach to be aware of an artifact because it takes a close look at different elements in the overall environment, therefore, it serves as an excellent tool for viewing a thing that has been taken for granted. With the concept of ANT in mind, in the next section, I would like zoom out a little bit and discuss actors in an *assemblage*.

2.3.3. Assemblage

"Home is not an originary place from which identity arises. It is not the place we 'come from'; it is a place we are" (Wise, 2000, p. 297). For Wise (2011), "Home is thus not a pre-existing space; it is not the house. It is the continual attempt to create a space of comfort for oneself, through the arrangement of objects, practices, feelings and affects" (p. 93). This arrangement constitutes an *assemblage*, a term conceptualized by Gilles Deleuze and Félix Guattari to understand "the play of contingency and structure, organization and change" (Wise, 2011, p. 91). The term is translated from French, *agencement*, which is not a static term but "the *process* of arranging, organizing, fitting together" (Wise, 2011, p. 91). It is important to keep its dynamic nature in mind when the term is mentioned. As Wise (2011) elaborates on, an assemblage is "[a] particular arrangement[] of elements, organized, which have their own patterns of movement and rest" (p. 99); it is a collection of particular things that aggregate, distribute, and develop by themselves.

In the context of a smart home, an *assemblage* consists of time, walls and spaces, a set of devices (e.g., smartphones, central servers, thermostat), wires, the Internet connectivity, digital communications, electricity, inhabitants, body motions, emotions, a trigger word, speech recognition applications, and so on. The elements in the assemblage, therefore, can go on and on, as Wise (2011) illustrates, "Home-assemblages, then, are not just collections of objects, practices, feelings and affects, but also take up particular languages, words and meanings" (p. 94). In the same vein, a human-smart technology assemblage consists not only of humans, smart devices, and others as mentioned in the

previous paragraph but also elements such as codes, algorithms, datasets, infrastructure architecture, protocols, along with engineering biases and design assumptions. As Benjamin (2019) says, “the way we engineer the material world reflects and reinforces (but could also be used to subvert) social hierarchies” (“Architecture and Algorithms,” para. 5). Each of the elements is constructed and reconstructed by human actors, which is not at all objective nor impartial. That is to say, when we rethink the concept of smart home and the use of smart devices, we need to also take into account the connected elements as well as their inner forces and prejudices.

For realizing how actors act on each other in an assemblage, in the next subsection, we need to recognize the digital materialities and information infrastructures as the inner forces of smart technology that have been hidden under its fancy surface and interface. By doing so, we can establish a more clear entity for smart technology, and in that way, it can be an independent but equal part that coexists with humans.

2.3.4. Digital Materialities

Although some would appreciate wireless and indistinguishable design as Weiser (1991) does, the disappearing sense of technology not only can cause problems but also can blind us with the invisible materialities. As Pink et al. (2016) proclaim on the very first page of the book *Digital Materialities: Design and Anthropology*, “digital and the material are not separate but entangled elements of the same processes, activities and intentionalities” (p. 1). The entangled characteristics are embedded in our actions, and we, therefore, need to review what they are and how they interact with humans in the partnership.

Thing-Power

In “The Force of Things: Steps toward an Ecology of Matter”, Bennett (2004) creates the term *thing-power* to specifies the “vitality in things” (p. 348). She gives an example of a pile of garbage that grabbed her attention by its vital nature. The garbage that she was looking at consisted of things such as a work glove, a dead rat, and a plastic bottle cap: “each thing is individuated, but also located within an assemblage—each is shown to be in a relationship with the others” (Bennett, 2004, p. 351). That is, an object can be both an individual thing and a part of a group. From different perspectives, one can see different relationships within itself and/or with others. Moreover, when they appear as a group, “*objects* appear more vividly as *things*, that is, as entities not entirely reducible to the contexts in which (human) subjects set them, never entirely exhausted by their semiotics” (Bennett, 2004, p. 351). In other words, it is the vitality inside the things that make them not only objects established by humans. They have their physical as well as interpretive aspects. When objects appear in human contexts, besides exert their agency, they also take on human meanings. But without humans, they do not lose all meaning, they are simply on their own. Therefore, things have agency that in conjunction with other things, which could form themselves into a group as well as disband the group that they formed.

As Bennett (2004) elaborates on *thing-power*:

> Thing-power is the lively energy and/or resistant pressure that issues from one material assemblage and is received by others. Thing-power, in other words, is immanent in collectives that include humans, the beings best able to recount the

> experience of the force of things. Thing-power materialism emphasizes the closeness, the intimacy, of humans and nonhumans. (p. 365)

In other words, thing-power is an internal force that can navigate itself between different entities including humans and nonhumans. This power, therefore, has not only its political capacity to "induce a greater sense of interconnectedness between humanity and nonhumanity" (Bennett, 2004, p. 367) but also enables the fluidity. On top of that, when things can connect with each other without human perception, the human, thus, is no longer the dominator in the world. As Braidotti will agree in the context of *the post-anthropocentric turn*, without human dominator, smart technology in the age of posthuman can easily by-pass human decision making at the operational as well as the moral levels with their power, especially when we did not pay attention to them. That being the case, in a partnership with smart technology, we need to recognize not only the fluid nature in it but also the material power within the flow.

Materialities

On top of thing-power, the *things* as in the Internet of Things, therefore, further enhance their power and existence with sensors. Bunz and Meikle (2017) review previous work and reorganize that things can be read as imbued with a social agency; an *actant*; autonomous; entangled; non-humans; and cognitive (pp. 83–84). To be more specific, things can be agents in particular social contexts as well as an association consisting of humans and non-humans. Things have autonomy even when they do not function, and their entanglements contain contexts, processes, and meanings.

Since the things with thing-power have their form and agency, we should keep an eye on how they and/or their parts interact with humans. As Dourish (2017) mentions the advantages of viewing digital assemblages from the perspectives of materialities:

> The materialist perspective warrants both an inquiry into the heterogeneous collections of elements that make up technological objects and an examination of how those elements acquire or maintain individual identity as they are assembled, disassembled, and reassembled as sociotechnical settings develop, evolve, and reconfigure. (p. 41)

With digital materialities in mind, a smart device, as well as a smart home, can be viewed as a construction of data, algorithms, protocols, and policies. For example, the robot vacuum Roomba knows not only the schedule of your daily routine but also the floor plan of your house with exact footage so as to maximize its efficiency (Wetmore, 2018). That is, the time is calculated, the floor area is measured, and the routine is recorded. As Strengers (2016) says, "the quantified home does not only require humans to develop numerical imaginations; material appliances, too, are expected to respond to and act on this digital information" (pp. 64–65). For instance, a smart thermostat that detects motions and temperature in each room can adjust the fan speed according to the real-time information and previous preferences that people set on their phones. Also, with humans' work and sleep schedule in (the smart thermostat's) mind, it can act ahead in time such as starts 15 minutes before you arrived at home, or slow down a little when you are sleeping.

Nevertheless, the run-in period of materialities can take a while for both humans and smart technology. Some of the users of Nest thermostat, for example, experienced

that their thermostat turned off while they slept because it did not detect their motions in rooms (Spencer0, 2018). In terms of Nest thermostat, Strengers (2016) also mentions, "This device collects and analyses data to imagine what householders want and provides accordingly. Such manifestations blur the line between who, or what, is in control, and disrupt traditional human-material boundaries through the emergence of new digital relationships" (p. 65). In this case, the work of detection, calculation, and regulation falls into the hands of the smart thermostat; therefore, humans lose control of their living environment over machines. As a result, we need to reconsider the continuum of human-device relationships as fluid.

Fluidity

To connect materialities with human activities, Dourish and Bell (2011) view ubiquitous computing from perspectives of a computer scientist and an anthropologist. They call ubiquitous computing a *mess* because "the practice of any technology in the world is never quite as simple, straightforward, or idealized as it is imagined to be" (Dourish & Bell, 2011, p. 4). Therefore, through ethnographic lenses, they analyze the current structures for digital communication and assert that such as infrastructure, mobility, privacy, and domesticity should be reconsidered as fluids. In their words, ubiquitous computing supposed to be experienced, so there should not be a fixed structure to restrict technology. For example, instead of separating a home into different spaces and placing Amazon Echo in each room in order to receive our instructions *seamlessly*, we could imagine our motion in home as well as the receivers as fluid so that we can talk to not different devices in each space but an omnidirectional entity that navigates the house following our motions by itself. That is to say, all the motions in a

space should be seen as flows, including actions, emotions, interactions, and senses. With its fluidity, smart technology could increase its agency on the one hand, and the intimacy with its human partners on the other.

To sum up the chapter, the thing that we called *smart technology* is the creation of technological fantasies and the combination of several technological advances. The human expectation of *making life easier* collaborates with technological development and push the world toward a sensor-oriented environment. However, it is not a wonderland without any drawbacks. In a dynamic assemblage, the over-expansion of technology could, in turn, reduce our quality of life and accelerate monopolies in society. In addition, those emerging technologies might shift the way people perceive their surroundings and the way they behave. Despite that it is too soon to tell whether the change is positive or negative, we should pay more attention to not only the interaction between humans and social technology but also the radical influence of the implementation of smart technology in society.

In the next chapter, I will focus on the relationship between smart technology and society. To be more specific, I will discuss how smart technology contains political values and how smart technology enlarges the digital divide between people who have and do not have access to it. Moreover, considering that psychological *affect* also plays an important role in a political sense, I would like to discuss how smart technology and humans psychologically interact with each other and how to develop a sustainable relationship between the two.

CHAPTER 3

POLITICS & SMART TECHNOLOGY

With the advanced technological development, the uses and the range of using technology in our lives are not only pervasive but also inevitable. However, as we recall from the literature review (Chapter 2), we can subtly see traces of cultural activities and identities behind the design and the use of particular technologies. In addition to that, there are also traces in terms of politics, economics, and society behind technologies. As a result, this chapter is a necessary complement to the topic of smart technology.

On a societal level, data is not only in the hands of humans and their devices but also third parties such as cellphone and internet companies. All the gathering, sending, storing, and retrieving of data are related to power distribution between different entities within the network. On a personal level, it affects not only interpersonal relationships but also one's inner emotions. For interpersonal relationships, the futuristic version of traditional technology represents a more efficient, sentient (Spigel, 2001, as cited in Heckman, 2008, pp. 41–42), and intelligent lifestyle that increases the existing superiority not only of the technology itself but also of the owners. For one's emotions, the mobilized technology alongside with human movements also has an effect on people's emotions between different places.

In the age of technological smartness, it is urgent for us to recognize the politics underlying smart devices/systems as well as our complex relationships with them. For doing so, this chapter consists of two parts. I will first discuss how smart devices/systems contain *Inbuilt Politics* (Section 3.1), then I will switch to human perspectives to see how *Psychology and Work Ethics* (Section 3.2) work under the smart circumstances.

3.1. Inbuilt Politics

Smart technology, as Greenfield (2010) addresses it by the term he coined, *everyware*, is "information processing embedded in the objects and surfaces of everyday life" (p. 18) and it is "the extension of information-sensing, -processing, and -networking capabilities to entire classes of things we've never before thought of as 'technology'" (pp. 18–19). That is, this powerful information processing capability not only is in our everyday lives and objects, but its potential has also reached an unprecedented level in our society. They have secretly resided in our hands, pockets, backpacks, cars, and homes. They connect to, communicate with, and act on each other without human interference. They are both media and their own masters. However, scholars argue that networked things also have *inbuilt politics* (Bunz & Meikle, 2017; Latour, 2009; Winner, 1989). That is to say, the data gathered from the devices autonomously is also for serving "particular groups, experiences, ideas or topics" (Bunz & Meikle, 2017, p. 69), which could be insurance companies, detecting mental illnesses, or potential high risk criminals. For example, an early motion-tracking webcam of HP's Media Smart computer failed to recognize faces of dark skin; the technology failed to target the edge and the movement of a dark skin face while functioned well on the face of a white person (Bunz & Meikle, 2017). However, since the algorithms did not apply to everyone, and HP claimed that the software was built on "'standard algorithms'" (BBC News, 2009, as cited in Bunz & Meikle, p. 89), the politics in question is: *Whose standard?*

As Wajcman (1991) well puts, "The interests of the owners of these systems have played an important part, along with those of the manufacturers, in shaping domestic

technology" (p.100). Different parties such as designers, regulators, and markets all play a part in shaping smart technology. Although the market, among others, has the most critical impact on the use of specific devices/systems in society, the interests interwoven in the network of technological smartness are frequently opposed to one another (Greenfield, 2010). Under the circumstances, we can borrow the wisdom from the Amish to gain the awareness to see their political nature despite their fancy functions and aesthetic appearances for one thing, and keep a vigilant eye on whether or not the political nature in smart devices causes long-term harm to the relationships between humans and technology for another.

Overall, in this section, I will first reveal how smart technology contains *Political Values* (Section 3.1.1) in it in two ways. After that, I will discuss the *Digital Divide* (Section 3.1.2) between users/prospective users and the smart technology and see how inbuilt politics in smart devices filters its users.

3.1.1. Political Values

Since the Industrial Revolution, people from time to time believe that new technologies will bring more freedom, democracy, and even social justice into society (Winner, 1989; Wajcman, 1991; Heckman, 2008; Singer & Brooking, 2018). Through various machines to systems to devices to services, they all come with the same promise: *Making your life easier*. However, as Langdon Winner (1989) profoundly points out, "The things we call 'technologies' are ways of building order in our world" (p. 28). Technologies of different generations, to a certain extent, reflect the social order in a different time and the relationships between the orders. For example, from the

perspectives of feminism, Wajcman (1991) argues that "technology itself is gendered" (p. ix). As she illustrates how male and female's power related to the use of machines:

> Machines are extensions of male power and signal men's control of the environment. Women can be users of machines, particularly those to do with housework, but this is not seen as a competence with technology. Women's use of machines, like men's, is not seen as a mark of their skill. Women's identity is not enhanced by their use of machines. (Wajcman, 1991, p. 89)

That is, even though people of different genders operate the same machine, the meanings of the activity will be different. As a result, in terms of domestic technology, she sharply argues, "When the new piece of technology arrives in the home it is already inscribed with gendered meanings and expectations" (Wajcman, 1991, p. 90). The notion can still be inherited in the age of smart technology. As Wajcman (1991) foresees, "Programming the electronics system for the 'smart house' may enhance men's domestic power" (p. 95) because men have more time to spend on mastering technologies, and thus, have more direct control over a smart home. For example, the female voice of Alexa was designed to "signal a lower status in the relationship with the speaker" (Hannon, 2016, as cited in Bunz & Meikle, 2017, p. 65). Ironically, from the 18th to 21st century, females still have not been freed from similar roles in either workspace or domestic space.

Winner (1989) explains that technical things possess political qualities in two ways. The first way is that the object or arrangement of "a specific technical device or system becomes a way of settling an issue in the affairs of a particular community" (Winner, 1989, p. 22), which means when technologies are designed for specific populations for serving specific purposes. In the famous example provided by Winner,

the extraordinarily low-hanging overpasses on Long Island, New York were deliberately designed by the master builder Robert Moses to "discourage the presence of buses on his parkways" (Winner, 1989, p. 23). That is, poor people and people of color who rely on public transportation, thus, were kept off the roads. In this sense, the overpasses reflect biases against people regarding class and race. As he says, "technologies can be used in ways that enhance the power, authority, and privilege of some over others" (Winner, 1989, p. 25).

An example of this type of political quality in smart technology, Fitbit, as one of the biggest technology companies in the field of fitness, their networked trackers of bioinformatics, as their statement: "*helps people, empowering, inspiration, guidance*" (Bunz & Meikle, 2017, p. 101), is full of power demonstration to increase a sense of community among its customers. In this sense, Fitbit appeals to and empowers people who embrace self-care concepts such as healthy, active, caring, and strong while disempowers people who have no time or other resources to have a healthy diet and regular exercise, let alone an exquisite biomonitoring device.

The second way is human-made systems that are highly compatible with particular kinds of political relationships, which, according to Winner (1989), are called "inherently political technologies" (p. 22). These types of technologies are specifically designed for the purpose of fitting in existing political relationships, such as for governments or policies. In Winner's (1989) words, there are two basic ways to state the case. The first one is "the adoption of a given technical system actually requires the creation and maintenance of a particular set of social conditions as the operating environment of the system" (p. 32). The second is "a given kind of technology is strongly

compatible with, but does not strictly require, social and political relationship of a particular stripe" (Winner, 1989, p. 32). He provides the atom bomb as the most obvious example. In his words, the atom bomb is an inherently political artifact that must "be controlled by a centralized, rigidly hierarchical chain of command closed to all influences that might make its workings unpredictable" (Winner, 1989, p. 34) because of its lethal properties. In other words, due to the atom bomb's unstable and dangerous conditions, it requires an authoritarian regime to control and manage the artifact in a stringent and rigorous manner. Therefore, the atom bomb itself is an inherently political technology.

An example of inherently political technology related to ICT is *the Great Firewall* of China that isolates Chinese people from the rest of the *World Wide Web*:

> The intent was to transform the Chinese internet into the largest surveillance network in history—a database with records of every citizen, an army of censors and internet police, and automated systems to track and control every piece of information transmitted over the web. (Singer & Brooking, 2018, pp. 96–97)

People within China's Internet network cannot use some popular websites or phone applications such as Twitter, Instagram, Facebook, and Google (Pham & Riley, 2017). This case embodies how an inherently political technology is strongly compatible with the political regime in China.

Based on the uniqueness of the Chinese internet, one of the Chinese electronics company, Xiaomi, which has many products of smart electronic equipment and smart hardware, has raised awareness in terms of data security. In a security check report of Xiaomi robot vacuum done by IoT experts at AV-TEST, it reveals that the testers encountered critical safety deficiencies that, on a personal level, not only the

manufacturer demands unusual amount of user rights for its app on the smartphone, the sensitive information can be pulled out from the app folder of rooted smartphones; on a networked level, the app contains a large number of third-party modules, and the Xiaomi robot vacuum did not provide its privacy policy in the Google Play Store, nor disclose its data exchange with their partners such as IKEA (AV-TEST, 2019). On top of that, because Xiaomi's servers are located in China, people have also expressed their concerns about their devices continuing to send data to Beijing with a connection of an IP address, which is owned by the Ministry of Information Industry of China (Banerjee, 2018). As Wajcman (1991) reminds us, "Particular technologies are produced not in relation to specific and objectively defined needs of individuals, but largely because they serve the interests of those who produce them" (p.100). In this day and age, we need to be aware of the complex relationships underlying even a smartphone in the pocket.

Besides political purposes, Zuboff (2015) views the vast gathering and using of big data as a means and a practice of *surveillance capitalism*, a "new form of information capitalism aims to predict and modify human behavior as a means to produce revenue and market control" (p. 75). As it is well-known, both Google and Facebook are advertising companies that profit from other parties by exchanging user data for corresponding advertising. More specifically, as Singer and Brooking (2018) point out, "In essence, social media companies relied on their users to produce content; they sold advertising on that content and relied on other users to see that content in order to turn a profit" (p. 246). The economic benefit now is not merely a byproduct of data collecting, but instead, it is the reason and the goal behind the process.

For counteracting the inherently political technologies in society, Winner proposes to reevaluate our life's activity created by particular technologies in terms of material and social infrastructures. In his words, "We should try to imagine and seek to build technical regimes compatible with freedom, social justice, and other key political ends" (Winner, 1989, p. 55). In other words, we should first focus on some of the key values that we want to obtain in our society, then to create a technological reality based on them. To reach this goal, he suggests "a process of technological change disciplined by the political wisdom of democracy" (Winner, 1989, p. 55). This means to delegate the power of regulating technologies to the judicious citizens, who would make sure social and political norms can be articulated and be represented within a democratic process.

In the same vein, Sclove (1995) addresses a theory to democratize technologies in society: "if citizens ought to be empowered to participate in determining their society's basic structure, and technologies are an important species of social structure, it follows that technological design and practice should be democratized" (p. 91). Simply put, democratic people would create democratic technologies. In this way, a loop can be formed among democratic citizens, democratic technologies, and democratic society. As a result, this process can continue to foster a democratic society.

3.1.2. Digital Divide

Technologies are constructed by society and vice versa. For smart technology, besides designers and engineers, the interests of the owners and manufacturers also play an essential part in shaping domestic technology (Wajcman, 1991). Due to the underlying politics, tickets to participate in these new partnerships are not for everyone. Take the

most basic smart device for instance; nowadays, about 26.2% of all U.S. adults have access to smart speakers (Kinsella & Mutchler, 2019). Nevertheless, there are still some concrete obstacles that prevent people from enjoying the advantages of smart devices/systems.

Green (2019) cites an example regarding public transportation in Linden, Columbus, Ohio. Residents in Linden mostly rely on public transportation, which makes them often spend too much time on waiting or being late due to not knowing the bus schedule. Although information and timetables are provided on websites and related apps, many people in the area could not access them due to a lack of data plans or Wi-Fi. Also, many of them do not have a bank account or credit card to sign up for apps. Deeper than that, issues of lacking jobs and healthcare prevent them from having enough income as well as time and knowledge to come up with alternatives. Given the above, the factors in the gap between residents and bus apps are not simply a lack of smartphone, apps, or Internet connection but more complex such as financial, physical, and cultural constraints that need to be deciphered layer by layer.

Scholars have made efforts to decipher the *digital divide*, which refers to the gap between the users and nonusers of ICTs. Van Dijk (2005) recommends reframing it to recognize how digital technology intensifies inequality in society. He lists four dimensions of access: *motivational*, *material*, *skills*, and *usage*. Briefly speaking, motivational access refers to *have-nots* and *want-nots* (Van Dijk, 2005); reasons for the latter include social, moral, and safety issues. Material access refers to the ability to purchase a computer and Internet connection, cognitive abilities to operate it, and supportive social networks. Skills access requires users to know basic functions, format

and structure, and how to search and edit information. And finally, usage access refers to how long and what activities one does when using ICTs. Additionally, the accessibility of material, skills, and usage will affect one's motivation. People without those resources thus lack interest in using ICTs.

Based on Van Dijk's (2005) categories, Richardson (2009) rearranges the accesses into four types of resources: material resources, for purchasing and maintaining devices; time and social resources, for knowing applications and the use of technologies from social groups; cognitive and mental resources, to facilitate HCI and search for information; and cultural resources, which involve lifestyle, socioeconomic status, identity, and so on.

However, considering the interrelations between humans and smart technology and between humans and technological environments, I reorganize the resources proposed by Van Dijk and Richardson into seven elements—*time*, *mentality*, *technical skills*, *privacy waiver*, *extra investment*, *cultural knowledge*, and *sociality*. I categorize them into three groups in accordance with their relationships with technology: (1) time, mentality, and technical skills; (2) privacy waiver and extra investment; and (3) cultural knowledge and sociality. In addition to the three groups, I address the *language* perspective in the end as one of the political issues in the divide.

Time, Mentality, and Technical Skills

First of all, the factors that inhere within traditional technology—time, mentality, and technological—require human partners to spend *time* to learn the settings and get information about devices/systems, and *mentality* and *technical skills* to read the signals, operate it, and perform troubleshooting. For example, to do advanced chores with smart

appliances in their home, people need to pair up the devices with Wi-Fi/Bluetooth, set the preference on their phones, read the data and signals on monitors, read the user manuals occasionally, and search for solutions when needed. Strengers (2016) refers to this complex operation "do-it-yourself (DIY) practice of repair and innovation" (p. 71). This practice further widens the digital divide by increasing difficulties for people to engage with smart home appliances. Richardson (2009) also mentions that some scholars argue that "domestic ICT ownership has a strong association with 'digital divide' rhetoric demanding an individual responsibility and commitment to 'self-help'" (p. 601). When DIY becomes everyday practice, the advanced housework can result in inequalities among many-faceted personal positions.

Privacy Waiver and Extra Investment

The second category includes attributes of smart technology—privacy waiver and extra investment. They require human partners to provide personal data to authorize the devices and exchange for services, and a successful smart network also needs multiple devices to work within.

For *privacy*, as Iachello and Hong (2007) state, "On the one hand, personal information can be used to streamline interactions, facilitate communication, and improve services. On the other hand, this same information introduces risks, ranging from mere distractions to extreme threats" (p. 2) Humans are displaced and deskilled when they delegate domestic tasks to nonhumans, and in this way, nonhumans have to be upgraded and reskilled (Latour, 2009). And this shifting of power not only makes people vulnerable but also reveals the politics under the glamorous surface of smart devices. For example, consider an incident in May 2018 when Echo recorded a conversation between

a couple in their home and sent it out to people in their contacts (Siemaszko, 2018). After the investigation, Amazon claimed an unusual string of events caused the incident. The users accidentally activated Alexa and what followed was a series of wrongly gathered information and confirmations between the users and the device.

As a voice assistant, whenever Amazon Alexa is awake, it records everything received by the sensors and sends it to the backend servers to store (Weisbaum, 2017). Cappetta and Kent (2018) report an interview between NBC News and Toni Reid, the executive in charge of Alexa:

> When NBC News asked about these incidents, and whether customers can still trust Alexa despite these mishaps, Reid said, "Absolutely. And you know part of that is on us from an education perspective, so that customers understand the new technology." (para. 9)

While producers see the negotiation as a process of "educating customers," it causes an unequal power relationship. Once the devices are activated, homes transform from defendable places into watched spaces (Rapoport, 2012). Considering that people nowadays delegate not only domestic tasks but also human problems to their smart devices, the data gathered and reported surpasses the range of "daily tasks." As people exchange their feelings or medical conditions for advice, the connections between homes and the Cloud become portals as in science fiction, not knowing what threats are out there.

From the perspective of data ethics, Kitchin (2016) lists inter-related privacy forms regarding personal facets and domains:

> identity privacy (to protect personal and confidential data); bodily privacy (to protect the integrity of the physical person); territorial privacy (to protect personal space, objects and property); locational and movement privacy (to protect against the tracking of spatial behaviour); communications privacy (to protect against the surveillance of conversations and correspondence); and transactions privacy (to protect against monitoring of queries/searches, purchases, and other exchanges). (Martínez-Ballesté et al, 2013, Santucci, 2013, as cited in p. 5)

These forms include sensitive information of not only time, space, communication, and bank accounts but also one's identity and physical condition. As a result, people who refuse to give up their privacy stay on the former side.

As for *extra investment*, simply put, people need resources to purchase more devices and maintain those devices. A smart home network needs more than one device to set up because multiple devices can minimize the time-consuming process and maximize a specific performance (e.g., preparing dinner with cooker, oven, microwave, and blender). Nowadays, 34% of U.S. consumers have more than two smart devices, and 27% of them own more than three ("One-third of US consumers," 2018). However, this ubiquitous computing requires extra investment. For instance, to experience a home theater, people need compatible TV sets, lighting regulators, surround sound speakers, and so on; the whole set can cost thousands. On that account, even the existing users may not add more gadgets to fulfill the imagination of smart homes because of the high cost of ownership (Coskun et al., 2018). The extra investment and the underlying income threshold thus plays a vital role in the use of smart technologies.

Cultural Knowledge and Sociality

The third category includes attributes of social technologies—cultural knowledge and sociality. In short, humans need cultural knowledge to connect their previous lifestyle with new expectations and sociality to connect with others who also partner with smart technology. The interactions help not only reveal how technologies construct a *smart society* but also shed light on the future.

For *cultural knowledge*, as Strengers (2016) argues, when home automation technologies are designed to manage and do more complicated work, the use of particular devices is also related to one's capability. One's role, including individual competence and social status, has thus been disclosed. To be specific, when people pursue the specific expectations (e.g., efficiency, manageability, and symbolization) with the use of smart technologies, they move toward the same direction and form a *relevant social group*, which is an actor's category that carries the social process of technological development (Bijker, 1995). Bijker (1995) defines a relevant social group as consisting of relevant actors who connect to each other with similar interests. The group, therefore, can be described and has boundaries. Several relevant social groups of an artifact might compete with each other and affect the development of the artifact. From political perspectives, Bijker believes that the use of artifacts creates new social order, and it will guide future practice. The new expectations will affect this group and "lead to the attribution of meanings to technical artifacts" (Bijker, 1995, p. 131). For example, a smart thermostat system in a community compares one's usage pattern with his/her neighbors' as an incentive for members to save energy; residents thus tend to set the temperature according to the monthly reports rather than their preference.

As for *sociality*, Van Dijk (2005) points out that social resources are a part of material access, "The bigger and tighter the social networks are, and the more wealthy and powerful people they contain, the more supportive they are in the acquisition of material access to all kinds of things" (p. 53). People who have family, friends, and/or coworkers with access to smart technologies can encourage people to engage with smart devices. For example, people who have experience can help in getting specific devices/systems, Wi-Fi connecting, and pairing up devices with the apps.

Language

The one last perspective that was addressed by Van Dijk (2005) within cultural participation is *English language*. However, I argue that it covered all other elements that I have mentioned above, therefore, I want to single it out and give it a close look.

The inherent requirement of smart technologies is the ability to speak English. As Van Dijk (2005) addresses it:

> A final aspect of cultural participation is the necessity to speak the official language in a particular country and, on many occasions, the mother language of the computer world (English) to have access to digital culture. . . . The skills of language are more important in using the new digital media than are numerical and technical skills. (p. 174)

In terms of smart devices/systems, not only the interface and instruction that show us how to operate but also the terms of agreement that protect our privacy and rights are mostly in English. On top of that, digital assistants also have many languages waiting to learn. Up to 2019 summer, Amazon's Alexa supported only seven languages: English, French, German, Italian, Japanese, Portuguese (Brazilian), and Spanish; Google Home

supported 13 languages; and Apple Siri supported 21 languages (Templeton, 2019). Among the three, Amazon's Alexa speaks the fewest languages; however, it counts over 60% of the market share (Kinsella & Mutchler, 2019). That is to say, the majority of human actors in *smart* networks have to speak certain languages to "talk to" their digital partners.

Technology is built by codes, so is the operational environment that they created. Therefore, even though human actors can help bridge the digital divide with technical and social skills, language proficiency is still a barrier for keeping people from approaching a smart home, to which we also have to give thoughtful attention.

3.2. Psychology and Work Ethics

Previously (Section 2.3), I addressed that smart technology is an actor with digital materialities such as thing-power and fluidity. The new-assemblage that consists of elements (e.g., time, physical structures, devices, trigger words, applications, wires, the Internet connectivity, digital communications, electricity, inhabitants, body motions, and emotions) thus not only has an impact on the structural relationship between humans and smart technology but also on human sensation and perception. For example, people might name their devices with names that they felt connected to. When they summon their devices for service, they will communicate with them and associate the results (whether positive or negative) with the names. Subsequently, the names will associate with human emotions that are generated by the results.

Today we are psychologically inseparable from the networked things. Every day after we wake up, we check the notifications and emails on our phones. Some use smart

appliances to make coffee and toast, and maybe schedule a house cleaning on Roomba. During their commute between home and office, some would have phone conversations with their loved ones or their assistants for preparing for morning meetings. The information and communication technology helps people in modern society increase their productivity at work. However, people also feel overwhelmed and confused about the same capability from time to time. Ho (2019) illustrates the situation in Taiwan, where Line (an app for instant messages) is commonly used for intraoffice communications:

> The blurring of lines between work and leisure can, however, cause burnout. A friend who works as an accountant in Taiwan says it's become common for her bosses and co-workers to set up Line group chats *whenever* [emphasis added] there's a new project or a new topic of discussion. Because of this, she's in as many as 15 different office group chats, which can be exhausting to manage, especially since she also uses Line to talk to her friends and family. (para. 10)

The interactions and negotiations between partners in a partnership thus can be helpful on the one hand and hurtful on the other, especially when one is not the sole human partner in a partnership. To delve into the interrelationships between humans and smart technology, I will draw ideas from the perspectives of sociology, cultural studies, and psychology to examine how the materialities in devices/systems intertwine with human perception and further emotions and behaviors.

This section focus on psychological influence regarding the use of smart technology, including *Affective Flows* (Section 3.2.1), *Emotional Attachment* (Section 3.2.2), *Trust* (Section 3.2.3), and *Work Ethics* (Section 3.2.4). For affective flows, I will discuss how technology makes human emotions mobile while humans move among

different places. For emotional attachment, I will discover how humans gradually attach their feelings to technological objects and unite themselves with their nonhuman partners. For trust, I will expand on the concept of trust and ways to approach trust in smart technology. For work ethics, I will elaborate on the appropriate boundaries for both human actors and nonhuman actors in this partnership, and the responsibilities for both sides, including physical and psychological labor. In addition to the discussions, I will try to set some rules to make both sides accountable for their actions.

3.2.1. Affective Flows

From the perspective of emotions, Elliott and Urry (2010) argue that the influence of digital technology and communications is not only on social relationships "but a broad and extensive change in how emotions are contained (stored, deposited, retrieved) and thus a restructuring of identity more generally" (p. 28). To be more specific, when humans *work with* technology, whether the technology serves as a destination or a medium, human emotions and expectations also flow over and infuse into the nodes within the network, such as devices, body actions, and the spaces, creating a fluid assemblage around which identity restructures itself. This reorganization occurs because the flowing communications, the interwoven connections within digital devices/systems, and the self collectively facilitate mobility by breaking mobilities down to, a term that Elliott and Urry (2010) coined, "*miniaturized mobilities*" (p. 28).

In the sense of miniaturized mobilities, Elliott and Urry (2010) further elaborate on the four main ways that the miniaturized mobilities enter into the constitution of self and of other social patterns, which are: *mobile connectivity*, *continuous coordination*,

s*trategic travel planning and communications scheduling*, and *technological unconscious*.

First, *mobile connectivity* makes the self always "on the move" (Elliott & Urry, 2010, p. 30), which breaks physical boundaries between place to place as well as Wi-Fi to cellular data. For example, when people get off work and drive home, they could still have conversations on their phones regardless of their physical location, which shifts from an office to a moving car to highway to their house, maybe also a gas station and a few grocery stores. The Internet connection shifts from the Wi-Fi in an office to cellular data on the road to another Wi-Fi at home. The connectivity under the miniaturized mobilities thus is moveable and continuous, and as a result, "aspects of social life are recast as adaptable, flexible, transferable and self-organizing" (Elliott & Urry, 2010, p. 31). In other words, humans in this way would have more freedom to organize their daily schedules and navigate themselves in different locations.

Second, *continuous coordination* facilitates processes of the reorganization of communications, social networks, and the self. It has made possible for interpersonal relationships to keep going with a certain distance. As they mention that research indicates "all social ties at-a-distance depend upon multiple processes of coordination, negotiation and renegotiation with others" (Elliott & Urry, 2010, p. 31), the feature of miniaturized mobilities allow humans to reschedule times or places for social activities. For instance, two friends are about to meet in a downtown coffee shop, however, one will be late due to the bus showing late, and another one will also be late because of the lack of parking spaces in the street. Besides, the coffee shop is crowded. In this case, they can

send their current locations to each other by phone and decide a new place as well as a new time that works best for them regarding their physical spots and time frames.

Third, transitional time, such as travel and waiting time, can also be *strategically planned and scheduled*. In the coffee shop example above, while two friends are both in a moving status (waiting for arrival and looking for parking space), the miniaturized mobilities provide them the ability to communicate to each other and search for a new spot instead of waiting for both to arrive and park the car, get to the place, find out it is packed, and then go find another coffee place eventually. The strategic use of transitional time thus can be very useful and critical to avoid miscommunications between two actors, and therefore, connect the actions and emotions not only of an actor but also between actors. That is, for actions, the two friends did not have to stop at the moment for communicating; one of them can keep riding a bus, and another can keep driving. For emotions, the possibilities and the causes of being late did not interrupt their emotional flows because they can change the plan and reschedule a new time and space during the transition.

Finally, *technological unconscious* refers to broad patterns of "absence, lack, distance and disconnection" (Elliott & Urry, 2010, p. 33), which collectively form a psychosocial mechanism for people dealing with negotiations of social relations. According to Elliott and Urry (2010), besides significant others such family members, the complex technologies nowadays help people perform presence and absence in new ways by creating *virtual* others and objects in real life. For example, we often see people on their phone fake a poor connection to get over with unpleasant conversation. This kind of situation manifests that by strategically using disconnection (or fake disconnection),

people create a virtual void and alienate themselves from the other psychologically. Under the circumstances, the technological unconscious could help buy time for both parties to reorganize their social relations.

The four central ways listed above make possible for the self to reform into a structure of reconfiguration and reset in different times and spaces. On top of that, Elliott and Urry argue that digital technology and miniaturized mobilities have a close connection with the idea of *emotional containment*, which gives objects the ability to store human feelings and experience. In their words, "miniaturized mobilities facilitate forms of emotional containment—the opportunity to express and explore anxieties, doubts, worries or dangers" (Elliott & Urry, 2010, p. 34). That is, since human self-identity is restructured by the mobilities inherent in emotional containers, the self-identity also includes the media and our feelings, and it can be explored in the interactions within the assemblage. Take the person who ends the unpleasant phone call by faking a poor connection for instance. His/her phone thus contains the caller's name shown on screen, the voice and the contents, and his/her emotions, such as anger, anxiety, and impatience. In the case of smart technology and assemblage, human affect flows through the network from node to node, from the Internet connection to apps, and from touch gestures to the smart devices. In addition to the thing-power from the end of our technological partner, the affective flows from humans connect different actors within the assemblage and power up the partnership.

3.2.2. Emotional Attachment

Giving that smart devices and appliances can act as emotional containers, it may be said that we have strong attachments to our technological peers. As Tufekci (2017) describes one of her trips to Kenya to visit rural regions without electricity:

> In one village, I met an old lady, about the same age as my grandmother, who wore her phone like a necklace around her neck, just as my grandmother in Turkey does. And just like my grandmother, she didn't use the phone very often, but she always felt connected to her children and grandchildren, many of whom had left in search for a better life. (p. 29)

Even her children and grandchildren did not call so much, the phone itself becomes an emotional container that not only contains her feeling of missing her children and grandchildren but also symbolizes the possibility of receiving connections from them. The old lady, therefore, grows an emotional attachment to her phone, perhaps along with the rope that physically connects the phone with her neck.

If the relationship between humans and technology is in an equal dynamic as the relationship between humans and humans, according to posthuman theory, then human attachment to technology deserves as much attention as their attachment to other humans. As Braidotti (2013) argues, "This vital interconnection posits a qualitative shift of the relationship away from species-ism and towards an ethical appreciation of what bodies (human, animal, others) can do" (pp. 71-72). The new connection breaks down dualisms such as humans and things as well as physical and psychological and replaces them with vitalistic egalitarianism that sees everything as sharing the same environment.

Besides posthumanism, Highmore (2010), from the perspectives of cultural studies, also argues the reasons that humans love their objects are not only because objects have comforting associations but also because humans vitalize them with an agency. In his word, "we attach ourselves to things and the way that they become invested with a degree of emotional intensity" (Highmore, 2010, p. 73). When our affective flows circulate within the assemblage, on the one hand, we power up the network; one the other hand, we attach ourselves to all the actors in the network. Take the previous old lady and her phone as an example. Her attachment could extend from her phone, to the rope on her neck to the phone case, to the battery in the phone, to the Internet connection, to the service carrier, and to her children and grandchildren thousands of miles away. The extended attachment was vitalized by the emotional intensity from the old lady, and all the actors in the network, therefore, are connected under the permeated emotions.

From a traditional psychoanalytic perspective, Turkle (2011) asserts "Technology is seductive when what it offers meets our human vulnerabilities" (p. 1) regarding the relationships between humans and technology. She deems humans are lonely while afraid of intimacy; therefore, technology becomes a substitute for human connections, including friendships, companionships, and even romantic relationships. Surrounded by these substitute connections nowadays, Turkle (2011) argues that people get used to being more in company with machines than human beings, and grow accustomed to receiving "relationships with limits" (p. 11). That is, because humans want to avoid emotional conflicts with others, they crave a kind of relationship that allows them to be both together and alone, so that they can detach themselves from the conflicts when things go

wrong. However, if we agree with posthumanism (Section 2.3.1) and the vitality within machines (Section 2.3.4), we should be aware that this perspective of technological determinism is only half the story. On one side, human actors express their affections towards nonhuman actors; while on the other side, they also get a sense of enhancement with the thing-power from their nonhuman partners. For example, Turkle (2011) illustrates that some young researchers of MIT Media Labs get a sense of teamwork and enhancement by attaching various technological devices (e.g., computers, radio transmitters, keyboards, and digital displays) to their body as a daily practice.

The sense of teamwork and enhancement, on a certain level, demonstrates the possibility of the partnership between humans and nonhumans. As Turkle (2011) recounts the *cyborging* researcher at MIT, "'With it,' he said, referring to his collection of connectivity devices, 'it's not just that I remember people or know more. I feel invincible, sociable, better prepared'" (p. 152). The alliance between oneself and machine is self-evident, as Clark (2003) argues, "What blinds us to our own increasingly cyborg nature is an ancient western prejudice—the tendency to think of the mind as so deeply special as to be distinct from the rest of the natural order" (p. 26). In the posthuman era, humans and machines are not that different as we thought. Furthermore, the bonding within the partnership involves our emotional experiences and engagements. Elliott and Urry (2010) believe that "it is only through immersion in the object world that the self can subsequently 'attach meaning to experience' in creative and open-ended ways" (p. 38). That is, in order to build a successful partnership, we need to encourage both flows from humans and from nonhumans to circulate in and power up the assemblage. With the

conscious alliance with digital devices, we work together and share the same rights and pride.

Nevertheless, while we can unify with technological devices/systems physically and psychologically, we should not wrongfully take the technological partners for granted. Instead, we should treat them as our body parts. That is to say, we value their functions, we pay attention to their conditions and limitations, and we carefully maintain their shapes and quality. If we fail to take care of them, our bodies will be slowly deteriorating. Just as in partnerships, if we did not handle well the balance between humans and smart technology, our everyday life in the age of smartness will become highly insecure and depressing. For long-term sustainability, we should discuss the boundaries, responsibilities, and accountability in the partnership. However, before they can be set, we need to talk about the element that can make them happen: *trust*.

3.2.3. Trust

As we have previously discussed (Section 2.2.2), trust is the fundamental element to build the partnership between humans and smart technology. Whether or not the affective flows and emotional attachment can be possible depends on the deeper cause of *trust*. If we look closer, we can see trust plays a role in the process. First of all, when two human actors connect via a nonhuman actor, they will have to trust the nonhuman actor to faithfully convey their messages to each other in order to get the daily activities going. When the path of communication is lack of trust, it would narrow the path and make it difficult for affect to flow through. Second, when the communication between two human actors has always been successfully fluent, the trust that was originally invested in the

path gradually accumulates its volume and stays in the nonhuman actor. In this way, even when another human actor is absent from the communication, the nonhuman actor in the between still holds the trust, and therefore, is able to contain human emotions in it.

To visualize the concept of trust, we can think of the space in blood vessels. When the vessels are clear, blood flows through the body smoothly and fluently. When the vessels are under pressure of or are blocked by third parties (i.e., when fat, cholesterol, and other substances build up in the walls of vessels), space inside will be cramped and thus reduces the blood flow. Therefore, when a blood vessel starts to lose its space, technically, we could place an intravascular stent or a bypass in/around it to re-increase the space for restoring the blood flow. In terms of smart technology, trust is therefore a key component, a steady base, for facilitating the interaction between humans and smart technology. With trust, humans and smart technology could exchange more information and make collaboration more efficient. Yet, if we know the interaction might be suppressed, hacked, or tapping by third parties (e.g., advertisement companies and governments), the teamwork might not be done well. Moreover, the unease that derives from insecurity in the partnership would further increase the discontent and potentially collapse the partnership. Considering the emerging conflicts across the world (e.g. data breach of Amazon Alexa, deaths from self-driving cars, and facial recognition technology in the 2019 Hong Kong protests), it is fair to say that our relationship with smart technology is currently in danger, and it thus makes the reformation of smart technology a critical and pressing issue.

In *The Consequences of Modernity*, Anthony Giddens (1990) works with Niklas Luhmann's notion of trust. According to Giddens (1990), Luhmann believes that *trust* has

to be understood in relation to *risk*, which "originated with the understanding that unanticipated results may be a consequence of our own activities or decisions, rather than expressing hidden meanings of nature or ineffable intentions of the Deity" (p. 30). As a result, Giddens (1990) argues that "Trust presupposes awareness of circumstances of risk" (p. 31). Moreover, in Luhmann's view, when trust is involved, "alternatives are consciously borne in mind by the individual in deciding to follow a particular course of action" (as cited in Giddens, 1990, p. 31). In other words, when people decide to do something even though they have, and are aware of other options, that is where *trust* comes into play.

A few points were made by Giddens to conceptualize trust. He defines trust as "confidence in the reliability of a person or system, regarding a given set of outcomes or events, where that confidence expresses a faith in the probity or love of another, or in the correctness of abstract principles (technical knowledge)" (Giddens, 1990, p. 34). In conditions of modernity, Giddens (1990) deems that trust exists in the context of:

> (a) the general awareness that human activity—including within this phrase the impact of technology upon the material world—is socially created, rather than given in the nature of things or by divine influence; (b) the vastly increased transformative scope of human action, brought about by the dynamic character of modern social institutions. (p. 34)

In the language of actor-network theory, that is to say, when people are aware that their activity is formed by society and know that the two are interrelated under various social institutions, they would develop a certain degree of confidence in the reliability of the network to express an emotional faith to another human or nonhuman actor.

So, *what does that mean* to have trust in the age of smart technology? *Whom* do we trust? *Why* should we trust them and *how* do we do that? These questions are critical and urgent for us to reflect on our role and position of human actors in the posthuman society. However, I am fully aware that it is not possible to establish a grand philosophical analysis at this point. Therefore, for answering the questions in the scope of this thesis, I would like to narrow down the concept of trust to indicate specifically the trust between humans and smart technology. More precisely, in the partnership that I am trying to build here, *trust originating from human partners towards their nonhuman partners*. More importantly, under the current circumstances, which involve various data conflicts regarding people, technology companies, and governments, the trust would have to cope with a certain level of *insecurity*. That is, to overcome the insecurity of working with smart technologies, we need to be able to trust them.

In this sense, I would like to restate *trust* as *a psychological mechanism that humans develop confidence in the reliability of smart technology to emotionally override the insecurity resulted from the known and unknown risks of their technological actions*. Trust serves as the bond of our rapport with smart technology, and it thus secures the path of communication between humans and smart technology. Without trust, the teamwork in collaboration with smart technology will be based on a mere contract in which each party is motivated by self-interest. Consequently, the teamwork in collaboration with smart technology needs more and more measurements to discipline different parties because each party will figure out new ways to get away from regulations. On the other hand, given the ubiquitous implementation of smart technology, a partnership that involves

multiple parties would have more potential conflicts and more stress in the teamwork if there were no trust.

To have trust in the age of smart technology means that we have enough knowledge about our nonhuman partners, and we work with them confidently. As Giddens points out, the existence of trust means the co-existing awareness of risks. Therefore, before we can make room for trust in the partnership, whether to foster it or to reclaim it, we have to first disclose related risks as explicit as possible. That is, knowledge about nonhuman partners, for example, should include but not limited to the manufacture and the manufacturer of them (Wise, 2015), the physical and psychic safety that they can provide (Greenfield, 2010), and how they handle our digital trace (Zuboff, 2015). It means the design of smart technology should make efforts to be not only transparent but also informative, including how it works, what it does, and whom it works with. Secondly, for the risks to be *defeatable* (by trust), we have to make more efforts in redesigning smart technology, which I will discuss in the next chapter.

3.2.4. Work Ethics

Facing the partnership with smart technology is just like facing any relationship, we need to ask three questions. First, where are the boundaries of both human actors and nonhuman actors? Second, who is responsible for the quality of teamwork? Third, who will be held accountable for the interactions between two parties? To be more specific, to what extent can smart technology probe into people's lives, and to what extent should people control the autonomous level of smart technology; who should do what part in this collaboration; and who is taking charge when the division of labor is unclear?

For example, when we want to turn off the lights before going to bed, what actions should we do? Should we just tap the "off" button in the app? Should the app record the time and send the data to its central servers no matter the location of the central servers is in totalitarian states that governments can, therefore, apply dataveillance across the world? If the lights did not respond as expected, are we able to trace the process of the communication to see where it went wrong? When that happened, are humans the one to check on the devices or should the devices inform humans? And when we found our data (e.g., sleeping schedule) in someone else's hands without our knowledge, can we negotiate with the devices/systems?

The current relationships create uneven power relations that would not be sustainable. This *all or nothing* (Ellul, 1964) is autocratic, as Rob Kitchin (2016) mentions that the long and complicated legal documents that "in practice are non-negotiable—one either consents or is denied the service" (p. 9). As a human partner, we have either no say to our technological partners or walk away from this relationship. Under the circumstances, human partners often give up on their right to negotiate with the other and lose their faith and trust in the partnership. Nevertheless, for a partnership to be sustainable, the efforts need to be made from both the human side and the nonhuman side. However, for a better understanding of the psychological perspectives, I will focus on the human part in this section, and leave the nonhuman part to the next chapter (Chapter 4).

Boundaries and Responsibilities

For the human part, human partners should rebuild trust in partnership and seriously drop the condescending attitudes toward technological partners. It takes two

steps as follows. Firstly, we need to restrain ourselves from obsessively controlling behavior and delegate some power to our partner—smart technology. That is, emotionally, when we assign a task to a device/system, we need to trust that it can get the job done by itself. In practice, it means that we try not to interfere nor intervene the working process once it is all set. For example, many people tend to check their phones constantly even though the notification is on and it shows no alarm or activity on any of the apps. The tendency of constant checking is not necessary in any sense because the notification setting is on. The actions, such as taking phones up and perhaps further clicking into the settings to check if the notification function is on, is what I perceive as interfering the working process of notifications. However, it is not saying that humans let technology make all the choices and decisions. On the contrary, I argue that humans should be the ones that make decisions since those decisions are all about making *human* lives more comfortable. To be more specific, I argue that manufacturers should limit the default settings of their products as much as possible. Considering that people within different social and cultural contexts have different lifestyles, they should regain the right to decide their preferences. For example, people should have the right to decide whether or not a microphone is on rather than it is always on by default, not to mention the right to know whether a microphone is built into a product (Snider, 2019).

Once we made the customized settings at will, we should pay respects to the autonomy of our technological partner. That is to say, we should keep in mind that technology has a vital and fluid force, so we should give it more space to do its job. Take the task “turning off the lights” for example, the lights should be able to follow the lead of human motions and flow freely and smoothly in a particular space instead of being

told to turn on/off here and there. We should have faith in our partners that they can control their own actions according to ours. Nevertheless, it is not to ignore the political values that are embedded in technology but to bear the circumstances in mind and delegate the task to it accordingly. Just like in partner dancing, each and every step is rhythmical and respectful with mutual trust.

Secondly, we should not let technology does all the physical work. By physical work, I mean the errand running jobs. Emotionally, we need to stop treating smart device as subordinate who does all the unwanted tasks. That is to say, the actions that humans take are out of proportion to the actions that nonhumans take. Again, take the task "turning off the lights" for example. From the human end, it is usually a voice command or a single tap in an app on a phone screen; whereas from the technological end, they have to make the connections among the app, the Internet, the electricity, and the lighting devices. Moreover, their signals have to bypass or pass through various obstacles within a space, such as walls and corners, to make sure every actor in this assemblage is functional. In a partnership with equality and mutual respect, we should balance the workload not only for max productivity but also for an equal division of labor. For instance, instead of using voice command to turn off the lights, humans can walk close to a particular spot (but not close enough to reach the light switch) and make a hand gesture. A partnership should be like a conductor in a band or a DJ with his/her equipment, with humans and nonhumans working collaboratively to reach a common goal, but not like humans with their finger on one side and a whole nonhuman crew on the other.

Accountability

Considering that the partnership involves day-to-day business, there must be accountability for the actions of every step. Since both human and nonhuman partners have inner force and politics, we should be aware of their actions and the corresponding consequences. To improve the accountability in partnerships, I suggest four steps that should be held accountable: *explaining performances*, *addressing questions, no hard feelings of both parties*, and *always following up*.

First of all, all the actions and interactions should be clearly explained. Not only the *self-disclosing* (Section 2.2.3) suggested by Greenfield (2010) that smart devices should inform humans about their activities (e.g., connection status), humans should also notify devices of human activities (e.g., unplugging) if it will affect the teamwork. For example, the functions of "Do Not Disturb," "Bedtime," and "Raise to Wake" in the iPhone are designed for human partners to notify smartphones of their daily practices.

Second, both parties should be able to address issues when the quality of work is not as good as expected. For human partners, it is important to be able to check what is happening and what goes wrong. As a result, operational transparency is crucial for identifying issues, and if the human partners need extra help (e.g., could not find the problem), the partnership should provide available assistance intelligently. For instance, when the internet connection is weak or electricity is out, devices should take the initiative to send out signals rather than simply die. Further, if it did die without previous notification, humans should know where to find the activity log of the devices.

Third, do not create hard feelings for each other. Based on the previous two steps and mutually understandable language, there is no reason for each party to make another

feel stupid or vulnerable. As Slack and Wise (2015) remind us, “If you don’t like what you see, don’t blame technology or the culture; understand the assemblage that maps technological culture” (p. 160). From the human side, humans should be accountable for understanding how things work and not to blame the products when they do not behave as expected. That is, humans have the responsibility to learn basic knowledge related to operations and mechanics as well as data protection and privacy rights. From the technological side, usability should be brought into focus. That means the interfaces need to be more user-friendly and the process of operation should be simple and clear that would not cause unnecessary difficulties for human partners.

Finally, because any process could be suddenly paused or canceled for unknown reasons, we need to always make sure whether or not the task is done afterward. For example, when we are using a home printer and mechanical issues that happened during the printing process (e.g., out of ink, out of paper, or paper jam), after the refill and/or troubleshooting, both parties should remember to resume the process of printing. That is, the human partners need to do their part of keeping the task in mind, and the technological partners need to be designed in a way that continues the task instead of clean out the ongoing process. By doing so, we can adjust the workload, preferences, or division of labor to improve the quality of work for the next time.

CHAPTER 4

SILENT PARTNERSHIP IN THE AGE OF SMART TECHNOLOGY

Reconstructing our existing technological society involves disruptive changes from various professions. Based on the previous analyses of the thesis, for example, we need a more transparent system that reveals the manufacturer and the mechanism of smart technology. We need to figure out as clearly as possible the role of technology companies, advertising agencies, customers, and governments and what they do to influence the partnership between humans and smart technology. By doing so, we can recognize the role politics plays in the power relationship in society; the knowledge would equip us with awareness and flexibility for adjusting our role and reaction when needed.

In addition to the transparency of smart systems, the design of computing architecture, such as collecting processes, algorithms, and information distributions, needs to be carefully prepared and evaluated. Instead of top-down control by technologies, we should consider human values (generally and locally, nationally and regionally, and culturally and linguistically) in each loop to secure justice and equity and to prevent technologies and the groups with special interests from exploiting human data and abusing human safety and conviviality.

In this chapter, I will take the previous frameworks and analyses into consideration and reconstruct a silent partnership scenario in which human privacy is secured and the relationship between humans and smart technology is balanced. In the following, I will first provide an imaginary narrative to describe an ordinary life in a smart environment (Section 4.1). For example, I will show how humans interact with

their nonhuman partners and how they collaborate on business work and domestic chores while moving around different places. Then, I will tease the silent partnership in a practical and experiential way (Section 4.2). I will separate the characteristics of smart technology into four segments: an actor, a fluid, a peer, and a silent partner and see how we can design differently to make the silent partnership happen.

4.1. Reimagining Smart Technology as a Silent Partner

We do not need magic to change the world, we carry all the power we need inside ourselves already: we have the power to imagine better.

—J. K. Rowling, Harvard Commencement 2008

It is a rainy day. People crowd the street try to get to their office as soon as possible. Although the development of telecommunication has made some people used to working from home, the majority of people still enjoy gathering in the office and having meetings and conversations face-to-face. In a world full of smart technologies, people started an *Un-smart Movement* a few years ago, downgrading some of the functions in smart devices and reclaiming human connections between each other. For example, instant messaging apps for work purposes are limited to function only during working hours, and the emoji and "like" features are removed.

Ted has a meeting today. Ted works in an architecture firm as a design assistant, and he has a proposal to pitch today. Ted's devices start receiving notes about his working schedule today from about 500 feet away from the office. According to Ted's preference, meeting notes and highlighted instant messages are display on his glasses, the keynote is prepared on both his glasses and watch, and the meeting agenda and other

documents are downloaded and placed on the desktop of his laptop. Instead of using a bunch of devices (e.g., phone, tablet, laptop, glasses, and watch), Ted reduces the number of devices he uses and therefore is able to better focus while engaging in a network due to the "no more than three monitors" principle, which is one of the principles promoted by the movement.

The coffee machine in the kitchenette starts making customized coffee at the moment people walk into the office, and the dehumidifier works according to the data received from Ted's coat and umbrella, the data and each step are detailed in Ted's log. Ted's preference for coffee, along with other preferences of office equipment, is set on a chip embedded in his wrist. Therefore, instead of being remotely controlled, it requires physical presence to operate the devices in the office. Ted is going to have a latte macchiato with half sugar and soy milk at a precise temperature of 170 degrees F. He prefers to have the coffee quietly at the beginning of a workday.

As Ted takes the coffee to his cubicle, Mandy, from another branch, tries to discuss the keynote that they are about to present. Mandy sends a request from *PointOut*, a third-party application that tries to connect with Ted's account in order to use Ted's information. It is a new app that Ted has not used before. Although he can simply refuse to engage with an unknown app and find another way to make it work, it does not hurt to learn a new app, he thinks. So, while drinking coffee, Ted is walking through the interactive video and negotiating with the terms of the agreement. The video starts with an introduction which makes clear the background, the capital resources, the regulatory compliance, and the third parties that it works with. It is followed by a new type of agreement, which is another important outcome of the Un-smart Movement. The new

type of agreement was redesigned to make people fully aware of how an application works and provides an opportunity for people to negotiate the rules at a certain level. Ted does not want the company of *PointOut* to have any of the backup files of his keynote or his personal information for business reasons, so he pays for a *traceless mode*. Although it is a little pricy, "It's a fair price to exchange for the firm's and my privacy," Ted thought.

Mandy is already online. She also uses a paid mode on *PointOut*, but different from Ted's cautiousness towards data, Mandy pays for accessing others' information on the platform. As a marketing specialist, Mandy used to collect information from people she has interacted with. However, she is not surprised when she finds nothing on Ted. These days, more and more people choose to pay for their privacy. Nevertheless, there are also some people who earn money by selling their personal information, and Mandy is one of the people who pay for accessing the data. Mandy and Ted rehearse the keynote and exchange some notes for the presentation.

In the keynote speech, Ted directs the slides with the movement of his arm and hand. With the sensors attached to his hand, he can feel the connection between his hand gestures, the tone and the speed of his voice, and the slide displaying on the screen. Ted's proposal receives many positive comments; it was a successful presentation. After the meeting, Ted goes to the kitchenette to make himself another cup of coffee. According to the new policy of the firm, personal data can only be preserved in personal devices. In other words, public devices in the office will not preserve any identifiable data for any purpose. Therefore, Ted has to do it by himself. He walks to the coffee machine and has it scan his wrist to read the data of coffee preference. The preference data for various

devices can be installed in any place; some installed the data on their phone or wallet, some had it installed on their watch or bracelet, and some had it on a chip and implanted in their body. Ted does not want to risk losing his data on external devices and he enjoys the feeling of having the power to control devices nearby, so he chooses to have the data implanted in his wrist.

The coffee machine checks his wrist, and confirms with Ted amongst several favorite coffee options on his list. The process of data processing starts showing on the screen as well as downloading to the chip in Ted's wrist while making coffee. However, it occurs to Ted that he has a soon-to-be-expired coupon for a free cup of coffee around the corner. So, he immediately stops the coffee machine and takes a break to go to the coffee shop. The coffee shop is crowded in the afternoon. People are busy adjusting their coats to an indoor mode. Due to the accident last year in which an infant was smothered by her smart onesie, the government passed a new law that smart products can no longer switch functions and modes automatically. Nevertheless, tech companies developed new designs to make the *consent and confirm* processes more quick and clear so that each decision is consciously made by humans. The clerk at the coffee shop was nice to Ted. The coffee was served in a thermos cup that can adjust its temperature in accordance with Ted's preference. More importantly, the clerk gave Ted a big smile while he was getting the coffee.

It's nice to have humans around, with the noise and excitement. Ted is pondering the differences between interacting with humans and interacting with nonhumans. Nonhumans do not smile at, greet, or talk to humans. They are not supposed to. A few decades ago, humans tried to build them with emotional expressions to mimic real

humans. However, those creations turned out to be quite limited in the expressions in terms of breadth and depth. Furthermore, the oversimplified spoken language in which humans and nonhumans communicate dramatically shaped the communication style between humans, grammatically, semantically, and emotionally. So, people have tried to alter the situation by reducing some of the social functions in smart technologies.

Ted decided to work from home after getting coffee. New technologies largely increase the mobility of human activity. Even though Ted did not bring anything out of the office, such as wallet and briefcase, digitalized files can be synchronized to almost anywhere. Ted turns on the lights and AC. He has a small but cozy studio, and it requires humans to operate devices manually instead of using vocal commands due to the size of the studio. Under one of the new regulations, voice control will not be activated when the distance between the person and the device is less than 50 yards. Ted also sets a timer to the cooking assistant and the cleaning device. They are new models designed under the rules to secure labor equity between humans and nonhumans. Namely, it made people physically work with smart devices to a certain degree instead of giving commands from apps. The cooking part was easy because humans always have to prepare the ingredients before cooking; whereas the cleaning part underwent a great fuss. The new vacuum mop, for example, is a semi-manual mop that is self-maintaining, which including emptying its bag and replenishing its detergent, but it needs humans to move it around to clean the place. Although it took some time to get used to the new workload distribution, Ted is glad that he gets to move more around the house, the office, and the city…

4.2. Redesigning Smart Technology as a Silent Partner

Previously, I introduced the origin and the historical development of the concept of smart technology, the underlying technologies served as the backbone of the fantasy, and the known limits as well as drawbacks of the current smart technology. I have also discussed new ways to dissect smart technology from different perspectives, to oversee the political values and tension behind smart technology, and to perceive the emotional connection between humans and smart technology.

Through the discourse, we have spotted some issues amongst humans, smart technology, and society. We have learned that our interaction with smart technology has changed our lifestyle by creating more time and space for us to fill in more work. We have become aware that human connection is less frequent than it was under notions such as efficiency and productivity. We have realized that the invisible parts of smart technology will deceive us into thinking it as neutral, and therefore, will let down our guard about its producers, the third parties, and the possible consequences on our lives. We have seen that the current smart technology is largely in favor of technology companies that trade our data for their own profit without considering personal privacy. We have learned how the current situation is undermining our trust with not only each other but also with smart technology. We have gained awareness and perspectives of the digital divide between people who have and do not have access to smart devices. We have noticed that the current work distribution makes the responsibility unclear and, therefore, creates an unbalanced partnership between humans and smart technology.

As Slack and Wise (2015) state, “culture has always been technological, and technologies have always been cultural” (p. 9). How can we renovate smart technology

from a fundamental but comprehensive perspective that takes into account complex parameters such as human values, cultural subtlety, business practices, human-computer interaction, emotional involvement, work ethics, and so on? It is unrealistic to place our hope in renovating the smart ecology overall in seven days once and for all. However, we can see the renovation as a start to pull the strings and fix the strings one by one, as in a network, as in an assemblage. As a result, to get the redesigning work started, I would like to propose four starter roles for smart technology: an actor (Section 4.2.1), a fluid (Section 4.2.2), a peer in a peer-to-peer assemblage (Section 4.2.3), and finally, a silent partner (Section 4.2.4).

As an actor, we can recognize what it is capable of doing and what is its limitation. As a fluid, we can take into account its fluidity when we redefine the infrastructure, mobility, privacy, and domesticity in a smart environment. As a peer in peer-to-peer (P2P) assemblages, we can focus on its role in a whole network. Not only what it does as an actor but also what it does as a peer in a dynamic assemblage. Last but not least, as a silent partner, we can treat it as a trustworthy partner who can be held accountable and who can help facilitate a healthy and meaningful relationship with us.

In the following sections, the concept of smart technology will be anatomized back and forth, independently and dependently, statically and actively, individually and socially, and publicly and privately. By doing so, I aspire to travel through the map which provides a wonderful panoramic view of great complexity. However, in order to do that, I will have to discuss each of the perspectives (i.e., an actor, a fluid, a peer, and a silent partner) in a separate manner, which might contain somewhat seemly contradictory but not necessarily contradictory language. As the quote that is worth being mentioned again

reads, “The complexity of our smart technologies lies at the core of the post-anthropocentric turn” (Braidotti, 2013, p. 43). I will try my best to lay the groundwork for future research on this subject.

4.2.1. Smart Technology as an Actor

To consider smart technology as an actor means that we need to update our misimpression of it as a fancy but merely an automatically calculating tool of ours. To consider smart technology as an actor, we have to recognize that it is not a part of us, physically or emotionally. It is an entity, and it does not belong to us. So, what is it? What does it mean as an actor? In this section, I would like to provide three characteristics of smart technology as an actor: it is independent, it takes actions, and it has politics.

First of all, *it is independent*. By independent, I mean that it should be realized as a separate entity from humans. It means that smart technology is not entirely under human control regarding its agency and affordance. In other words, smart technology is free from human control to some extent. It is not a possession nor accessory of humans. To accept this notion, we have to put away the outdated thought that humans are, or should be, the dominator of the world. By seeing smart technology as an independent actor, we could, therefore, maintain a distance while also connecting to it. As Slack and Wise (2015) elaborate on the separation:

> What does it mean to treat technology as a “thing?” Or, as we prefer to think of it, in terms of its “thingness?” It means to understand and treat technology in terms

> of objects that have discrete boundaries precisely delimiting the objects and differentiating them from others. (p. 110)

This step is of significant importance because by acknowledging its independency, we are able to investigate its thingness and materialities.

Further, because smart technology has boundaries, it can take a certain level of responsibility, and it should be held accountable due to its responsibility. Although smart technology is inevitably interrelated with other actors in society, the independency of smart technology helps us develop our understanding of it and pose some rules regarding its existence. Like Braidotti (2013) says, "A posthuman ethics for a non-unitary subject proposes an enlarged sense of inter-connection between self and others, including the non-human or 'earth' others, by removing the obstacle of self-centred individualism" (pp. 49–50). That is to say, by not seeing ourselves as the center of the functioning world, we could perceive the network from a bigger picture which contains more actors other than human actors.

Second, *it acts*. It performs actions, and its actions have effects on others. As we have discussed earlier, ANT sees sociotechnical systems developed through negotiations between different parties. The interactions between human actors or nonhuman actors collectively lead an artifact to develop in a particular direction, which could be for a particular purpose, for a particular group of people, or for representing a particular value. To see smart technology as an actor means we recognize that it takes action. It does things and has effects on other things. Smart technology acts, it has agency and a stage to function itself in a particular way. Therefore, to see smart technology as an actor also

means that we need to pay attention to the interactions between human actors and nonhuman actors regarding materialities.

Take smart speakers for example, when people call their family member via a smart speaker in their home, they go through the process like this: activating their smart speaker with their voice, giving an order to the digital assistant (e.g., Amazon Alexa) to make a phone call, waiting for the receiver to pick up the phone, and having a nice conversation. On the other hand, the smart speaker goes through the process like this: being activated by human voice with a designated wake word (e.g., Alexa), accessing the contact information from the human's phone, retrieving a designated contact, sending calling signals, and maintaining the quality of the connection between itself and the other end as well as the communication between two humans. In this example, the smart speaker takes action as an actor. It receives orders and reacts to the orders; it looks for the information and it utilizes the piece of information; and it collaborates with the other person's phone and therefore connects the two humans, conversationally and emotionally.

Regarding the interaction, we should ask, for example, what features and functions in smart technology afford those particular actions and feelings? In other words, what mechanisms are involved in the interactions between humans and smart technology? To see smart technology as an actor who takes action, we need to also realize where their abilities come from. Bunz and Meikle (2017) remind us that the role of things are fundamentally changed when they can connect and communicate with each other. Simply put, things gain their abilities with sensors in a network. Things sense, address, speak to, see, and track other human and nonhuman actors. In their words, *things*

become media (Bunz & Meikle, 2017). That is, things turn their surroundings into a network of communication with their capability. This characteristic should be closely considered in relation to the concept of assemblage, which will be expanded later (Section 4.2.3).

The actions that smart technology performs also change our relationship with it. Humans become more intimate with smart devices, and the action force and the reaction force create a dynamic between the two actors. In the previous example, when the smart speaker serves as a bridge between two human actors, it also takes on human emotions during the conversation. To be more specific, if the internet connection is slow, the conversation will proceed poorly, and humans get upset; if the electric power is unstable, the communication will be disconnected and then reconnected, the conversation will proceed poorly, and humans get upset. In this case, the smart speaker, including the infrastructure on which the smart speaker is based, is an actor in the human-smart technology partnership that has a significant influence on the quality of the partnership. Given the above scenario, again, we should keep in mind that smart technology acts, and its actions have an effect on others.

Third, *it has politics*. It embodies its assumptions in its action. As an actor, smart technology's action is not spontaneous nor unconscious. It is built by humans with different assumptions, different identities, and different biases. It is built by companies with different priorities, different profit models, and different moral conducts. It is built within societies that have different cultures, different customs, and different sets of values. As a result, the action of smart technology has its own direction, and to see it as an actor means that we are aware of what its direction reflects.

Moreover, Pridmore et al. (2019) in their research on intelligent personal assistants (IPAs) reveal that given the concern of politics in smart technology, the decision of "having it or not" has another political consideration between humans.

> Yet, even concern with potential broad-scale abuses of personal data (as seen, for example, in global responses to Facebook and Cambridge Analytica) may coexist with a desire for, acceptance of, or even resignation toward data gathering, such as collection through household IPAs. This latter perspective will likely not be evenly distributed within any given household as the decision to purchase, install, and ultimately welcome IPAs into a shared space may be the product of unequal power relations among co-habitants. (p. 130)

Under the circumstances, the political artifacts might provide another force to reinforce a certain kind of power distribution in a relationship. That is to say, before inviting another actor who contains political qualities into an existing network, we have to be aware of the further complexity that comes with it.

4.2.2. Smart Technology as a Fluid

In addition to an actor, smart technology is a fluid technology. It is mobile: it can move from here to there in a human's pocket. It is sociable: it can connect itself with different internet signals, from the Wi-Fi in one's house to 4G (soon to be 5G) cellular towers. It is flexible: it can stream a high definition (HD) movie online as well as send a picture via AirDrop (an ad-hoc P2P network service in Apple's iOS and macOS operating systems). It is variable: it can sense and connect with environments through various sensors (e.g., vision, sound, heat, vibration) and channels (e.g., Wi-Fi, Bluetooth,

cell towers). It is transformable: it can be scattered all over the place (Amazon Echo Dot in each room) as well as be gathered in a central server (Amazon Web Services, aka AWS). It is capable of carrying: it can contain information as well as emotions throughout the network. With the capabilities above, it is fair to see smart technology as fluid, *a substance with no fixed shape and flows smoothly in accordance with varied conditions and environments*. To see smart technology as fluid, we have to understand the three major characteristics that extend the role of smart technology to not just an actor but a fluid actor: mobility, variability, and carrying.

First, *it moves*. Smart technology is not a shy actor who only plays on one stage. Instead, it travels through accessible entries across networks and networks, whether an entry is freely accessible, needs a personal password, or requires official authorization. As we can see in the previous example of a smart speaker, it went through one's room, phone contacts, the internet, cellular towers, and the other one's phone. It moves while it functions, and it also moves while humans function. For example, people connect their phones with their cars so that they can be talking while driving. When a human talks to another human on the phone in their car driving from office to home, smart technology also tags along with the car as well as with the other human. Therefore, to see smart technology as a fluid that moves, or more specifically, flows, we need to pay attention to its movements, its tracks, and what it trades for passing through the places. To be more specific, where did it go, where has it been, and how did it get there?

To see smart technology as a fluid means we can map its trajectories, and therefore, we can make the invisibles visible. *It flows, it leaves traces, and it exchanges something as tolls*. When smart technology moves from one device to another, it connects

the other device and sees what kind of route is available (e.g., what internet networks do we have around here). After knowing its options, it evaluates which route is more accessible (e.g., requires password or not, which one is faster). Once it picks a route, it sends its identities (e.g., device's model name and number, IP address, DNS) to the other device and waits for the approval. After the portal is opened up, the two devices can start their conversation. Given the process above, we have to keep in mind that *every contact leaves a trace*. In other words, viewing smart technology as fluid allows us to take counteractions for maintaining a balanced relationship with our nonhuman partners. For example, similar to contrast media that improve the visibility of the internal structure of the body during radiography, we can develop applications to visualize and document each usage, including each step, each assessment, each data exchange, and each result.

Second, *it changes*. Smart technology is liable to change in terms of aspects such as size, volume, speed, strength, pattern, quality, and ability. For example, it can fit in tiny gadgets as well as enormous machinery; it can connect to one device or 10 or more devices; it can download text documents as well as movies; it can maintain its speed ranging from 10Mbps to 1000Mbps; it can roam itself around strong and weak connections; it can transmit intermittent as well as continuous signals; its protocols can be renewed according to new policies; its performance could be different due to different manufacturers; and it can function differently when equipped with various sensors.

The characteristic of variability in smart technology means that it lacks consistency or fixed pattern. Therefore, to realize smart technology as fluid means we have to be aware of its flexibility as well as adaptability. To treat smart technology as a fluid actor means we have to pay attention to questions such as what role it is playing and

in what condition it is playing the role. On the one hand, knowing the role it plays can help us profile its motion, function, and its intention, which relate to the notion of seeing it as an actor (Section 4.2.1). On the other hand, knowing its condition such as speed, channel, address, protocol, and coverage can help us to make the partnership more transparent. Furthermore, by knowing its role and its condition, as Wise would suggest, we are able to readdress ethical issues in terms of the manufacture, manufacturer, and possible consequences.

Third, *it carries*. As a fluid substance, smart technology thus is capable of carrying a miscellaneous collection of things. Here I would like to point out three major kinds of messages it carries: *information*, *emotions*, and *representations*. Firstly, it carries *information* from sensors to storage, from a device to another device, and from one's doorbell to one's app on the phone. In the partnership between us and smart technology, we provide information via digital profiles (from Amazon, Google, or Facebook account), verbal conversation (e.g., asking Alexa), and nonverbal conversation (e.g., searching on Google). Smart technology carries our information as *tolls* and bargains with the service that we wish to get. When a deal is made, as a fluid, smart technology carries the information we needed back to us. With the information flow, we thus are able to give orders as well as receive feedback. Although the process can happen in milliseconds, we have to remember that it will not vanish into thin air. Smart technology is not magic, it will not evaporate to nothing.

In addition, smart technology also carries *emotions*. As the affective flows and emotional attachment that we have discussed earlier (Section 3.2), we know that human emotions and expectations are also carried by smart technology, along with the

information that they are exchanging. With smart technology as an emotion carrier, people can have their emotions accompany their daily activities without being interrupted. For instance, people can have a conversation with their family members from home to office in the morning while driving, and from the living room to the kitchen in the evening while cooking. When two humans are having a conversation with smart technology as a medium, their feelings to each other are also carried by the technology. Besides being an emotion carrier, smart technology also serves as an emotion container. Namely, when enough emotions have passed through the medium, depending on time or strength of the emotions, the smart devices themselves turn into a container to store human feelings. In other words, humans grow accustomed to the devices and the devices become symbols of their attachment towards others. As a result, seeing smart technology as an emotion carrier/container reminds us to redesign it in a more sensitive manner.

More importantly, smart technology carries *representations*. We have discussed that smart technology has politics, which means the information and emotions it carries, as we were saying above, are *selected* at the very beginning of the partnership. Bunz and Meikle (2017) point out some of the critical questions of representation in two ways, media representation and media recognition:

> 1. Sensing networks communicate data *about* certain groups, and we need to ask in whose interests and to what effects also in regard to politics. Which group are targeted and for what reasons? Can evaluate data be accessed and controlled by the user, or do they only serve the interests of the company? And last but not lease, are they safe? . . .

> 2. Sensing networks also *recognize* certain groups better than others. The internet of things creates technology that *assists the reality of some people better than of others*. . . . Whose reality is to be assisted by sensing networks and whose experiences are to be left unrecognized? For which particular group a system created and with what intentions? (pp. 119-120)

To see smart technology as fluid, we need to look closely at *what it carries*. By paying attention to what it carries, we can also be aware of what it left. In addition to certain groups and company interests, Dourish and Bell (2011) also remind us that digital technologies also represent cultures regarding activities and daily practices (Section 2.2.3). With the fluid nature of smart technology, the farther a certain ideology is carried, the more people would be influenced under a certain way of thinking, doing, and living their lives. Winner (1989) might argue that smart technologies become "forms of life" that "life would scarcely be thinkable without them" (p. 11).

With the understandings of smart technology being fluid as well as an actor (or collectively, a fluid actor), let us see *what it actually plays in a play* in the next section.

4.2.3. Smart Technology as a Peer (in P2P Assemblages)

Previously, we have stated that, as an actor, smart technology acts. However, in a world full of other actors, smart technology is not the only one who acts. As Highmore (2010) says, "Things act on us and we act on things" (p. 58). On the one hand, everyday technological devices have abilities to affect and assist humans. On the other hand, humans can also adjust the function of devices and/or break them. Highmore (2010)

continues, “There seems to be a symbiotic relationship between them and us; a mutually constituting interaction between people and things” (p. 58).

Echoing our analysis of smart technology as an actor from the perspectives of posthumanism (Section 2.3.1) and assemblage (Section 2.3.3), I propose that we should rethink the human-smart technology assemblage as a *peer-to-peer assemblage*. I borrowed the phrase “peer-to-peer” (P2P) from the field of computer science, where it denotes or relates to computer networks where each computer can act as a server for the others, allowing shared access to files and peripherals without the need for a central server (Cope, 2002). In this work, *peer* refers to the interconnected node in an assemblage as well as in an actor-network (Section 2.3.2). In addition to considering the interwoven connections among devices and humans in a network, I would like to reconstruct the partnership between humans and smart technology by annexing a P2P framework on it.

Instead of traditional perspectives of human-computer or human-technology interactions, I use the concept of P2P for P2P assemblages because it refers to *a decentralized structure in which each actor, human or nonhuman actor, has access to information as well as power without a central server*. That is, each actor not only can directly connect and interact with others but also can gain or lose its power according to the dynamics of an assemblage. If we reconsider the previous example that two people have a conversation with the help of a smart speaker (Section 4.2.1) from the perspective of assemblage, we should be aware that not only the smart speaker is a peer but also both of their phones, and maybe another person’s smart speaker are peers in this assemblage. To be more specific, when a human makes a command to a smart speaker, the speaker

connects to his/her phone to retrieve the contacts' information, and when the communication signals were sent to another side of conversation, another one's phone will receive the incoming call as well as another one's smart speaker, if there is one. In this case, the two phones disappeared in this assemblage. For one thing, the power shifts from phones to the smart speaker(s), and for another, the smart speakers replace the phones and act as central servers. Nevertheless, the point of a P2P assemblage, as I argue, is to decentralize the structure of power and let peers operate more freely through flows rather than through hubs. In other words, although this may sound bold or reckless, to achieve an ideal P2P assemblage in this scenario, both smart speakers must be detached from the network.

From another perspective, the P2P assemblage consists of not only peers but also the quality of the bonds between the peers and the agency in the assemblage. In Wise's (2011) words, the P2P assemblage is not comprised of just smart devices and information but also digital and affective materialities and other elements, such as the quality of the interactions, our feelings, and the speed of communication. In addition, the P2P assemblage is about the becoming event that consists of time, space, indications, and interpretations. That is, the P2P assemblage contains elements, including but not limited to: human body, digital devices, daily activities, signals, connections, efficiency, postures, feelings, and spaces.

More importantly, *peers work together*, and they interact with each other. With the notion in mind, a peer in a P2P assemblage should be able to be differentiated from another peer. As a result, we should re-acquire seams from the seamless design (Section 2.1.2). Seams, as in the between of humans and technology, help humans to learn and

know the things they encounter as well as the processes of the encounter by the design of the things (Greenfield, 2010). The meaningful distinctions between systems should not be elided but well-handled. On that account and with the acknowledgment of digital materialities inside the smart technology and the ethical issues resulted from the disappearance of some peers, we should emphasize *seamful design* (Chalmers & Galani, 2004, as cited in Dourish & Bell, 2011, p. 110). According to Dourish and Bell (2011), a seamful design is to make the boundaries and seams visible rather than erase them. In addition to recreating seams, we need to see the seams between humans and smart technology or between smart technologies as the seams between humans and humans. That is to say, when we encounter technologies in a P2P assemblage, we need to recognize the interfaces, features, and functions between them just like we recognize people's faces, characteristics, and strengths within different contexts. On the other hand, technology should be brought to the surface from the backstage so that they can be visible, just as I have been arguing.

Let us rethink the phone-call example in a seamful scenario. When the smart speaker goes through the phone looking for contacts' information and calls the other side via its connection with the phone, it should display something somewhere to inform the process to people, as well as when the smart speaker on the other side is receiving the call via the connected phone. Further, when the connection is poor, instead of making the conversation annoyingly intermittent or secretly reducing the quality of communication, our technological peer should proactively disclose its condition so that the human peer can make some corresponding adjustments to avoid the disconnection. As a result, by emphasizing the seams within a P2P assemblage, we should be able to see through the

function and conditions of different technological peers as well as the inherent disaster that is related to it, as Wise (2015) would suggest. That is, if something is wrong, we can soon identify it and deal with it. I consider this is a step for both human actors and nonhuman actors toward equal status in a partnership. Technological peers have their sensors to detect and measure everything related to human peers; they should also reveal their actions and conditions to human peers.

Although the concept of P2P assemblage can be further explored in terms of breadth and depth, I would like to get back to the meaning of smart technology being a peer. Given the elaboration of P2P assemblage, I propose three characteristics for the role of a peer. First, *it is not the one*. Considering the meaning of an assemblage, it means that smart technology will not be the only peer in the assemblage. In other words, there will always be other peers in the assemblage. Each peer contributes to the assemblage in a different way, and with all other peers involved, an assemblage can, therefore, be formed. As a result, seeing smart technology as a peer means it will not be the most important nor the essential element in a particular arrangement. It does not have the decisive quality to start a collective action as well as to change an ongoing process. On the other hand, it is also not the critical one that will cause a collapse to the assemblage in its absence. For example, the phone-call example will still stand even when there are no smart speakers involved; two people in that situation can still have a conversation with each other. As Slack and Wise (2015) say, "Given the complexity of any technological assemblage, one can never be certain about what processes of rearticulation might make a significant difference" (p. 161). That is to say, the assemblage is so sophisticated that we cannot expect any specific connection to flip over the collective work.

Moreover, the notion of smart technology not being the one can free us from *technological determinism* that believes technology has effects and is the main drive to cultural change. That is to say, with the smart technology as (only) a peer in mind, we do not ascribe all the blames (e.g., people become too lazy, instant messages are too intense, devices are too hard to operate, too privacy-invading) to smart technology. From another perspective, to see smart technology as a peer as ourselves is to get the partnership between humans and smart technology becoming equitable and balanced.

Second, *it collaborates with others*. To see smart technology as a peer means that it is in teamwork. For a peer in teamwork, it needs to interact with other peers and makes an effort in this work. In the phone-call example, we can see that the smart speaker works with the voice recognition application, the owner's account, two smartphones, the phone applications, the Internet, the Internet Protocol, and so on. And what the smart speaker does is to arrange the resources it has and make the conversation happen. Nevertheless, as we have stated previously that it will not cause a collapse to the assemblage in its absence, its contribution is valued while not irreplaceable. That is, even if it fails, other peers might take over and finish the task. For example, even when the smart speaker does not work, Siri in iPhone (or other voice-activated assistants in other smartphones) can still do the job of calling another person. And even if the phone is unable to connect to the Wi-Fi in the house, it can still connect to cellular towers nearby. Therefore, to see smart technology as a peer, we need to remember that it plays in teamwork, and one player should not take all the credit nor all the blame for a whole game.

Third, *it is always rearranging*. As Wise (2012) says, "Assemblage is always in process" (p. 160). Therefore, to see smart technology as a peer in an assemblage is to

realize that its position, function, and influence are continuously changing. For example, from the perspective of a smart home, the assemblage involves more smart devices/systems besides a smart speaker, such as a thermostat, a cooker, a robot vacuum, and surveillance cameras. Each device might accompany one or two apps (depends on the fineness of its design in user experience) on one's phone. In this case, each time when a device is added into the assemblage, the position, function, and influence of the phone changed. If we see it closer, we also might see the phone delegating more and more power in controlling those devices, and the delegation creates more connections between the phone and other devices in the assemblage. Regardless of the power dynamic of the assemblage, as a peer in the assemblage, smart technology always has to accommodate itself to changing situations.

Combining our previous analysis that smart technology as an actor and a fluid with a peer in P2P assemblage, we can gain a more clear and more detailed picture of it. To sum up a little, as an actor, smart technology is independent, it acts, and it has politics; as a fluid, smart technology is mobile, variable, and it carries things; and as a peer in a P2P assemblage, smart technology is not the only one, it collaborates with others, and it is under constant rearrangement. In the next section, I will get to the heart of this work—smart technology as a silent partner—by discussing how to redesign it as one.

4.2.4. Smart Technology as a Silent Partner

Through this thesis, it has become clear that the partnership between humans and smart technology is a two-way adaptation. On the one hand, humans have to acknowledge that smart technologies are separate entities that have their actions,

intentions, and politics. Smart technologies will influence humans with their agency and political connections. On the other hand, smart technologies, too, have to respect human entities with all the boundaries. A silent partner, in the age of digital information and communication, not only gain the responsibility to keep the secret to itself but also gain its status from digital servant to a life partner.

To start this section, I would like to reiterate what I mean by a *silent partner*. The silent partner that I propose, on the one hand, emphasizes the *silent* in terms of privacy; on the other hand, it emphasizes the *partner* in terms of trust with two or more parties. *A silent partner is a trustworthy colleague, a professional and respected collaborator, and a faithful companion.* Firstly, a silent partner keeps information safe and only uses the information for collaborations within the partnership. Secondly, a silent partner is perfectly capable of doing its job; therefore, it deserves its own space of automation. Thirdly, a silent partner also contains human emotions but not be exploited by humans. A silent partner should be doing a fair amount of work and getting a fair amount of credit. Smart technology is not our digital butler, assistant, or servant but a colleague, collaborator, and companion.

Of course, before smart technology can be a silent partner, as we previously stated, it is an actor, a fluid, and a peer. In each role, we have discussed smart technology from the perspectives of politics, materialities, and psychology, respectively while overlappingly. In accordance with the perspectives that we used to scrutinize smart technology, I will use the same language in providing a whole set of design principles for redesigning smart technology as a silent partner.

Before the process of redesign, I would like to clarify my stand on the issues regarding the current relationship and an ideal relationship between humans and smart technology. In the current relationship between humans and smart technology, although humans seem to have much control over devices in terms of the customized settings on their apps, they are actually under a broader control operated by technology companies by design. As Schüll (2014), who studies the relationship between humans and gambling machines, writes, "opportunities for control are programmed into gambling machines in the form of options, choices, and assorted 'capacitive' features" (p. 211), players who seek control, chase control, and believe they have everything in control are deceived by sophisticated design in every aspect of the machine, such as the lights, sound, vibration, color, and speed. Similarly, our current relationship with smart devices/systems is largely influenced by the design of those technology companies. Not only our personal information but also our emotions in using devices are taken into consideration when the companies design those very devices. Therefore, to counteract the current unbalanced relationship imposed by technology companies, we need to redesign the devices/systems in terms of political transparency, negotiability, and psychological interaction to reestablish new affordance in smart technology.

Nevertheless, this effort to redesign smart devices/systems is not for them to better serve humans by any means. For example, making devices more transparent and letting them inform humans regarding their process are not trying to practice absolute control over them. Instead, it is a rectification for humans to gain knowledge in our technological partners considering they have already known much of our personal information as well as behavioral patterns with their sensors and digital records. Since

smart technology is an actor, a fluid, and a peer, it carries assumptions and default settings from its original creator—the technology company. In this case, I hope to redistribute agencies in the partnership by empowering humans and disempowering technology companies. In Latour's (2009) words, smart technology itself plays a part in negotiations. By redesigning smart technology, I hope to make the multilateral negotiations more equal and fair.

At the beginning of this thesis, I provided a Venn diagram as my research structure (Section 1.2). Now I use the diagram to explain the encounter of humans and smart technology. To start with, I propose three stages for the redesign *in contact order*.

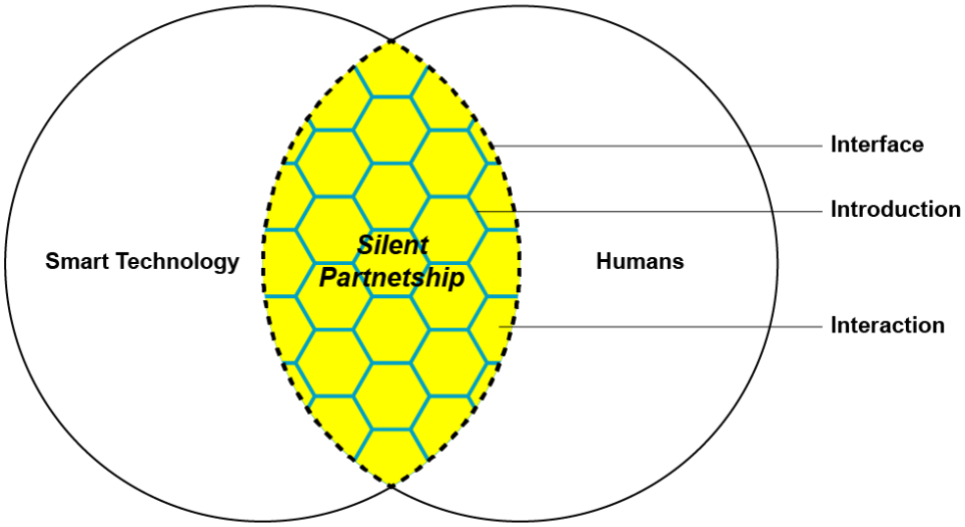

Figure 2. Three Stages of Encounter

In *Figure 2*, the encounter between humans and smart technology consists of three stages. The first stage is the interface, which I consider as the seam. The interface stage contains material features such as appearance, human perception, and notification. The stage has an effect on the way human actors meet nonhuman actors as well as nonhuman actors meet each other. The second stage is the introduction, in which nonhuman actors provide

their identity and information related to the partnership. The introduction stage provides information relevant to the political structure of devices/systems and serves as the foundation of the partnership. The third stage is the interaction, in which human actors and nonhuman actors adjust and rearrange themselves physically and psychologically in order to achieve a trustworthy partnership. The interaction stage concerns features such as device settings, usage, division of labor, connectivity, and sociality. In the rest of this section, I will elaborate on these three stages and the transitions between stages in a not only theoretical but also practical manner.

Stage One: Interface

As a first impression, *the interface should reflect on seamful design* (Chalmers & Galani, 2004, as cited in Dourish & Bell, 2011). To regain the seams from seamless design, we have to refocus on the materialities of the interface as well as the motions of smart technology. To put it in *interactoral* contexts, three questions we must ask when we encounter them. *Who are you? What do you want? What is going on?*

Smart Tech Redesign #01: *Identity information as a name tag.* When a new device/system comes into contact with humans, no matter if it approaches us or we approach it, it must first reveal its *identity*, including the manufacture and the manufacturer in terms of company, country, year, model number, and so on. Considering any device/system could be multifunctional across various territories, it will be difficult to ask the exact types of functions it performs and put it into a category at this point. However, it should still disclose its main role (e.g., vacuum) so that humans can have some sense of it. More importantly, its identity information should always be the outermost layer of it as a name tag as well as a pass.

Smart Tech Redesign #02: *A legible list of the required information*. Before the two or more parties start the partnership, it must make it very clear what information it needs in order to make the collaboration happen. In this sense, smart technology must provide a list in legible languages, on which shows what information (e.g., name, contact information, birthday, bank accounts) needs to be provided and what for, even when it wants to directly associate with established accounts (e.g., Facebook, Google). In interactoral interactions, it is polite to make sure both parties have the information or service that the other wants, and both parties are willing to provide and exchange their possessions. For example, when a human actor signs up for a new streaming music service (e.g., Spotify), the service not only has to inform people of its identity but also has to provide a clear list of the information that it required.

Smart Tech Redesign #03: *Negotiable terms of service*. Considering the power of data management is largely in favor of the technology companies as I mentioned (Section 3.2.4), I would like to propose a possible way to reach agreements in terms of data exchange. Namely, *people can pay for protecting privacy or choose to have limited functions of service when facing terms of the agreement from technology companies*. For now, whenever technology companies change their terms of service for any reason, users can no longer use the original version and have no other choice than to accept the new "agreement" (Kitchin, 2016; Sadowski, 2019). The situation causes a lot of stress and responsibility to fall on people's shoulders. Moreover, it further enlarges the level of inequality between people and technology companies. Nevertheless, people and the services that work with them form a partnership in a sense under an agreement.

Therefore, for people to reclaim their rights and position in this partnership, they should be able to argue and negotiate the terms with technology companies.

Based on the presupposition, I would like to propose a raw idea for people to *pay for privacy* and that payment methods include not only currency but also other formats such as using a limited version of the service or engaging in a public forum. To be more specific, technology companies need to redesign their terms in a way that each term corresponds to a reasonable price. In this way, people can pay extra money to protect their privacy. However, considering this way is also built on current inequality among individuals in terms of financial resources, technology companies should come up with alternatives that do not require money. For example, for people who do not agree with the terms of the service, companies can provide different versions of limited features or functions of their service accordingly, so that people can negotiate their rights with companies term by term. Again, the corresponding price and/or limited function in services should be reasonable, which is not excessively expensive nor makes the service unusable for people. Besides providing limited functions of the service for people, companies can ask people to engage in public forum of the companies as an exchange for the service people received. After all, although people contribute data to and thus are profited by companies, people so far use those services for free. What I argue here is, people are not simply being exploited by companies, they also gain knowledge, human connections, happiness, wealth, and so on from using the services. The main consideration for this principle is to make the exchange between one's contribution and the reward more equivalent.

Smart Tech Redesign #04: *Process informing*. Although smart devices always log their motion in systems, they often do not inform their human partners about it. As Greenfield (2010) suggests, it must be *self-disclosing* that shows their status immediately and transparently to humans. That is to say, whether it is accepting a task, processing data, switching to another network, moving to somewhere (e.g., robot vacuum), or not being able to perform the task for several reasons, it should let human partners know. Unfortunately, in the current trend of design, the space used to display messages (e.g., screen) is usually left out for aesthetic reasons. Nevertheless, there are plenty of ways to communicate these messages in the design language. For example, switching colors of lights, making lights blink, changing levels of brightness, giving vocal reports, or sending notifications to one's phone. However, since the mechanism of smart devices is complex, I would still suggest having a display with written language. Either way, smart devices have to inform their motion in order to make the seam between humans and smart technology more noticeable. Considering some of their inner communication (e.g., a microprocessor to an HDMI port) might not inform humans in any meaningful way, we should think carefully in this step about what should be told.

Stage Two: Introduction

Speaking of the complexity of smart devices/systems, *the introduction of smart technology should reveal political complexity and the implications*. That is to say, smart technology should be as transparent as possible in terms of politics and economic exchange between itself and third parties. To put this stage in partnership contexts, we should first ask questions about its business, such as *What do you do?* (asking its function), *How do you do that?* (asking its sensors), and *Who helps you do that?* (asking

the manufacturers of its sensors). In addition, we should ask questions about its representation and cultural values, such as *Who are your clients?* (asking its representation and values), *Who do you work with?* (asking third parties), and *What do you exchange with the parties you work with?* (asking benefit exchange). Finally, we should ask questions about its condition, such as *How are you doing?* (asking its mechanical health and safety).

Of course, one would argue that people do not actually ask these questions while doing business; however, with the rising complexity of technology, we can easily find unfortunate examples in everyday life due to not asking these questions. For instance, the U.S. has installed surveillance cameras and systems countrywide that are made by Hikvision, a Chinese video surveillance company, including government facilities (Brewster, 2019). However, Hikvision is also known for providing the same technologies for abusive use on Uighur Muslims and other predominantly Muslim ethnic minorities in China. On the other hand, it has been confirmed that a backdoor exists in many of Hikvision products (Karas, 2017). As a result, the U.S. government has listed Hikvision in its trade blacklist and has planned to remove those technologies made by the company. From the perspective of security, the backdoor certainly increases unknown risks on every level. From the perspective of manufacturing networks, however, to ban Hikvision products is also to have an effect on its suppliers, such as Intel Corp, Nvidia Corp, Ambarella Inc, Western Digital, and Seagate Technology (Shen & Horwitz, 2019), which are global corporations that could further cause a counteracting force that affects U.S. economy. Therefore, before getting into a partnership, whether it is business or else, ask some questions.

Smart Tech Redesign #05: ***Detailed chart of functions, components, and the associated manufacturers*****.** Considering that the underlying political relationships and the political values embedded in smart devices/systems are so crafty and subtle, it could be extremely difficult for ordinary people to find out the complexities and implications of an exquisite, costly gadget. Therefore, I propose to add this chart as one of the standard documents for each product. Firstly, the chart should explain the types of functions of the product not in an advertisement way (e.g., splendid cleanness!) but an informative way (e.g., swiping floor). Secondly, the chart should list all the sensors and electronic components in the product that can preserve and transmit data as well as their manufacturers. For example, for a robot vacuum, it might have a gap avoiding function, which uses an infra-red light sensor, which has processor chips manufactured by Intel. In this case, we can ask, *do I want an infra-red light sensor in my house? What does it do? Is Intel a trustworthy company?* After all, it is these sensors and electronic components that might infringe upon the rights of privacy, and it is the manufacturers' responsibility to assure ordinary people. On the other hand, it is the ordinary people's responsibility to read the chart. Therefore, the chart should be designed in a legible and readable way (e.g., data visualization, interactive display). The chart can be in print, digital, or online to best fit the needs. Since this is also an unprecedented means for the communication between humans and smart technology, what and who should be on the chart also deserve a considerate evaluation.

Smart Tech Redesign #06: ***Detailed chart of user statistics, third parties, and the revenue ratio from the third parties*****.** The previous chart is of significant importance in technical and mechanical perspectives, and this chart is of significant importance in

societal and economic perspectives. To realize what particular groups that a product targets, or wishes to represent, the best way is to look at the groups of people who actually use it. Nevertheless, this part is expected to meet some difficulties due to the protection of marketing strategies and secrets of companies. However, it would be a quite useful index for people to decide whether or not a product is suitable for them. Take the motion-tracking webcam in previous section (Section 3.1) for example. If one knew that the majority of users of HP's Media Smart computer are white people, one could guess that it recognizes faces of bright skin better than faces of dark skin. In addition to user statistics, the third parties and the revenue ratio generated from the third parties should be announced loud and clear. Currently, companies work with third parties that are usually listed in somewhere covert and concealed, and they usually are also subject to change anytime. More importantly, the third parties are monitoring the partnership as well as profiting from this at the same time. Therefore, to empower humans in the partnership, we should force these third parties to come out. Furthermore, we should ask for a revenue ratio report from the company to learn who gets more agency in the partnership. With this information, we would have a better idea about who gets to speak louder in here, why they are able to do that, and what that is supposed to mean.

Smart Tech Redesign #07: *Condition informing*. Similar to *motion informing* (#04), smart devices should also inform people about their health and safety in terms of mechanical damage and maintenance. Echoing Greenfield's (2010) suggestion for the ethical development of ubiquitous computing (or *everyware* in his language), it must *default to harmlessness*. It means smart technologies should be designed in a way that ensures human safety even if/when it fails. In a partnership, it is important to pay

attention to each other's condition. In interpersonal relationships, for example, we should be well aware of whether or not the other party is able to make a reasonable and fair decision, whether or not the other party is hiding the fact that she is unable to keep working, and whether or not the other party needs to take a few days off. In the same vein, in interactoral relationships, we should be aware of whether or not our device is acting stable, whether or not our device is damaged in some way or out of supplies, and whether or not the device needs to do maintenance. As a responsible partner, our smart device should notify us of any condition that could potentially affect its workability and performance.

Stage Three: Interaction

Although being compatible in any kind of relationships takes time, starting on the right foot might help. To foster a meaningful and sustainable partnership, *the interaction between humans and smart technology should be respectful and equitable*. In other words, both parties should show a certain level of willingness for cooperation in terms of communication skills. Unlike the other two stages, we need to ask questions about ourselves rather than the other party in this stage. In the beginning, we should ask questions about the basic compatibility, such as *How do I want to work?* (asking about default settings) and *Are you easygoing?* (asking about usability). As for the working process, we should ask questions about comfort, such as *Do I invade your space?* (asking working habits) and *Do we have an equal division of labor?* (asking about responsibility). More importantly, we have to constantly reflect on the partnership and ask questions regarding personal growth and mental health, such as *Do you respect me enough?* (is it sensible of human emotions?), *Can I grow in this partnership?* (is it convivial?), *Is this*

partnership toxic? (does it make me addicted?), and finally, *Do I have free will to get out?* (is it deniable?).

Perhaps it seems like a lot to ask from a seemly innocent and neat little thing, such as Echo Dot. However, as Braidotti (2013) points out, the age of posthuman has a larger sense of community that combines ethical values with the well-being and places a more comprehensive consideration on the nonhuman actors in the network. As a result, this stage mostly concerns self-control on both sides and the sustainability of the partnership.

Smart Tech Redesign #08: *Always open to rearranging*. We have known that the concept of an assemblage is not static. It is always in action, assembling, and making adjustments. Therefore, it should apply the same rule in the interaction between humans and smart technology. That is to say, all the agreements should be subjected to change not only by service providers but also by clients. Earlier when we discussed negotiable terms of service, if people do not want to conform with any of the terms, they should be able to do that (reasonably with collateral conditions). For example, when Facebook decided to partner with Instagram and claimed the rights of all the photos that Instagram's users posted, people should be able to retrieve their rights of the photos by un-agreeing to some of the terms (and probably pay for privacy, as we talked in #03). In this way, despite the inherent politics in smart technology, whenever the arrangement changes, new priority should be reestablished to protect the humans in the partnership rather than the third parties who profit from this.

Smart Tech Redesign #09: *Increase the range of default settings*. As I have discussed in work ethics about boundaries (Section 3.2.4), human partners should be the

one in the partnership who makes decisions since the whole idea of smart technology is to make human life more manageable. Nevertheless, it should be clear that it is not to place humans over smart devices/systems and make them serve humans. Regarding default settings in devices, we need to remember that those settings are originally engineered by another group of people (e.g., engineers, designers, and product managers) in technology companies. That is to say, the current default settings are not free from human biases and often do not reflect individual needs in terms of identity, culture, and personality. Therefore, I argue that human partners should make the default settings of the workflow to the greatest possible degree. By this way, it is to override engineers' default by human partners' default. For example, when working with a smart speaker (e.g., Amazon Echo Dot), humans should be able to decide whether or not the voice recognition and recording should be always on as a default setting. By reclaiming the power of making default settings, smart devices not only can improve the flexibility of different usages that reflect different groups of people, routine practices, and cultural values but also be more inclusive that do not discriminate *fit users* from *unfit users*.

Smart Tech Redesign #10: *Decrease the threshold of usage*. The digital divide in the age of technological smartness will be enlarged due to technical knowledge, cultural awareness, and more (Section 3.1.2). To tackle the problem, the design of smart devices/systems should focus more on *usability* instead of utility: smart devices should lower their technical barrier. For example, devices should be easy to operate and troubleshoot problems. Furthermore, I would like to propose another possibility to develop a universal display language between humans and technological products. That allows people, whether or not they have used a particular device, to be able to understand

what it indicates. For example, different kinds of lighting that are displayed mean different conditions; a green light indicates that the device is working well, a red light indicates that there is something wrong, and a blinking orange light indicates there is an action in progress. Although it seems intuitive for some who are familiar with technology that even a slight change in similar colors or display modes will not affect much, it still creates difficulties for some who are not tech-savvy. However, I would like to point out that humans also share the responsibility of working together, so they should acquire a basic knowledge of technology on their end.

Besides the issues of usability, the threshold of usage also concerns *sensibility* when smart devices serve as emotional attachment (Section 3.2.2) and relate to one's self-identity. The use of smart technology, from social and cultural perspectives, not only represents one's socioeconomic status but also helps oneself to restructure a new identity that is explored from the interactions within the assemblage. Developing new identities allow people to overcome their congenital restrictions and pursue more fulfilling lives. Having emotional sensitive smart devices, therefore, will have a positive effect on social well-being overall.

Smart Tech Redesign #11: *Be anti-addictive with limited automation*. The current design of automation in smart devices/systems covers too many functions and ways of control. The concepts of convenience and efficiency, collectively, create a great fantasy of time-, labor-, and cost-saving life. However, it often does not appear so. On the one hand, it might be *too smart to be dumb* (Section 2.2); on the other hand, it might harm our mental health due to the continuous connection (Section 3.2). To redesign smart technology to be anti-addictive, it must be less needy, and humans must be less clingy. In

addition to equality and mutual respect, we should balance the division of labor in a partnership; humans should not reduce their responsibility by clicking on apps on our phones and leaving other work to devices. As a result, on the device end, we should reduce the level of automation as well as the number of notifications. For example, instead of voice control for everything, we could add some conditions (e.g., unable to be activated when the voice distance is less than 50 yards) to limit its function. On the other hand, we as humans need to prioritize our attention in the very beginning (i.e., #04) in the process so that we will not be driven crazy by our compulsiveness as well as devices' nonstop conversations. In this way, humans not only can pay respect to the autonomy of our technological partners but also can have peace of mind.

Smart Tech Redesign #12: *Connect via P2P*. Stratified collaboration in current assemblages increases unnecessary processes for both humans and smart technology. As I mentioned previously (Section 4.2.3), making assemblages peer-to-peer decentralizes the power structure and let peers operate more freely through flows rather than through hubs. Therefore, I propose to enucleate the hubs that serve as communication centers by connecting to multiple devices in assemblages, such as Echo Dot. A lot of advantages come with a P2P assemblage. First of all, the information exchange can be more direct and safe without passing multiple checkpoints. For example, we can manually call friends from phone to phone, instead of from Alexa to phone to another phone, and another Alexa, and another person. Second, the power dynamic in the assemblage will be more balanced because we can get to the device that we wish to work with. Third, the situation of *radical monopolies* addressed by Illich (Section 2.2.1) might be alleviated. On the one hand, we do not have to only buy devices that are compatible with Amazon or Google,

and manufacturers do not have to suffer from not being compatible due to the absence of contract and royalty. On the other hand, we will not be trapped in the form of life that we can only think of "asking Alexa/Google/Siri" when we need any information. Finally, because this might result in the situation where each device has its own app, a P2P assemblage might actually reduce the use of devices, which, echoes Illich's (2009) another touch that "personal energy under personal control" (p. 12). If we apply the conviviality concept to our nonhuman partners, they might also appreciate having control over their energy.

Smart Tech Redesign #13: *Promote social engagement*. Speaking of conviviality (Section 2.2.2), smart devices/systems are a part of society, should also help human autonomy and let humans relearn to rely on each other. However, smart devices often transform their surroundings into a communication network with the help of various sensors. While humans become more intimate with technological partners, they will reduce their time and energy spent on their human partners. However, Weiser (1991) also mentions that ubiquitous computers should pose no barrier to personal interactions. For that reason, we should not only limit the capability of our technological partners (#11) but also figure out a way to promote social engagement as one of the core values in the smart technology design.

Smart Tech Redesign #14: *Manage data lifecycle*. Although we did not specifically discuss data management in this work, I would like to address it as a side note here. For the sake of data protection, smart technology must be circumscribed in terms of data collecting, processing, and disposal. In other words, we should ask questions such as what data should be collected, in what way it should be processed, and

how to properly dispose of it after being used? For example, the City of Portland adopted the Data Privacy and Information Protection Principles in its project—Smart City PDX—in June 2019. Among others, one principle is the *full lifecycle stewardship* (Smart City PDX, 2019). "Data, metadata and Information will be secured and protected throughout its life cycle. That includes collection, storage, use, control, processing, publication, transfer, retention and disposition" (Smart City PDX, 2019, p. 2). Although I do not have information about how exactly they will utilize the stewardship, I would like to point out that each management step is critical, because any data fragment could be reconstructed to identify a particular person and the consequences might be dangerous and fatal.

Smart Tech Redesign #15: *Be forgettable, resettable, and deniable*. Finally, in any relationship, one should always have the option to get out of it, especially when the situation becomes unbearable. For now, many devices or apps designs will turn to error or simply flashback when something is wrong. Further, sometimes devices and apps prohibit people from deleting their online account activity or preventing them from simply turning them off. Considering smart technology is a highly complex system and is subjected to change continuously, I argue that people should reserve their rights to opt out or reset any of the services at any point (with conditions). This includes not only the "right to be forgotten" that people can ask to remove their online traces (Section 2.2.3) but also the opportunity to *reset* the algorithms that profile them. As media scholar Taina Bucher (2018) argues, algorithms in media keep reinforcing a certain perspective for each person according to their behaviors and actions online. As Bucher (2018) points out, "The problem for the participants lies not necessarily with filtering in and of itself but with the feeling of *not knowing* what they could have known" (p. 106). Under the

circumstances, machines acting as filters that humans did not ask for is a particularly troublesome issue in the partnership that I wish to promote. As a result, I believe humans should reclaim the right to reset whatever program that calculates their actions no matter online or in-person. In the same vein, I propose that technology companies can also decline people's use if they have legitimate reasons. After all, each human or nonhuman actor should be deniable in order to make sure the interactions are made by mutual consent and rebuild a healthier partnership. However, how and who in companies should be the persons to judge whether or not an action is suspicious or a reason is legitimate enough are also questions that we can interrogate in further research.

Overall, my proposal for treating/building smart technology as a silent partner is only a starter in the age of smartness. I hope my suggestions in this work can help apply some of the skills in interpersonal communication to interactoral communication. In the age of smartness, it is imperative to develop and establish a successful and reliable partnership between humans and technology. With the idea—smart technology as a *silent partner*—we can share *dependent but moderately dependent* emotions, *intimate but privately intimate* moments, and *convenient but restrictedly convenient* daily practices.

CHAPTER 5

CONCLUSION

I began the thesis as exploratory research to clarify the nature and the peripheral relationships (the *actor-network* in the language of ANT and the *assemblage* in the language of assemblage theory) of smart technology in terms of materialities, politics, and human affects. I started the exploration from an encounter with Alexa, the digital assistant of Amazon Echo Dot, and through the discourse and analyses, I have developed a few stated and unstated arguments that should be acknowledged at the end of this work.

First, humans are not the center of the smart technology, nor of the world or the universe. Following the concept of posthumanism, the notion of humans as a superior creature should be abandoned. Although this thesis intends to articulate the relationship between humans and smart technology, in the age of smart technology, we should further utilize the privilege that we built for ourselves to help address the inequalities among nonhumans, such as artifacts, nonhuman species, and natural resources. That is to say, with smart technologies, or in smart cities, we must realize the consequences of our actions and pay attention to the subjects on which the consequences have an effect.

Nevertheless, this thesis is by no means based on the idea or trying to make an absolute equivalency between different forms of beings. Instead, I would like to see them as in equilibrium. Equilibrium, according to the Oxford English Dictionary, is "a state in which opposing forces or influences are balanced" (Lexico, n.d.). Moreover, one of the definitions provided by the Merriam-Webster Dictionary is "a state of intellectual or emotional balance" (Merriam-Webster, 2020). In the age of smart technology, each of the human and nonhuman actors has their intellectual or emotional force and influence to

make the human-smart technology assemblage in an ongoing and dynamic state. More importantly, this state needs to be sustainable and resilient. To meet this end, my goal in this thesis is to take other nonhuman actors into consideration and rethink ways to achieve the equilibrium among different forms of beings.

Second, since we are to abandon the human-centered thinking, the concept of conviviality is not enough. For Illich (2009), the fundamental concept to a convivial society is "the balance between those tools which create the specific demands they are specialized to satisfy and those complementary, enabling tools which foster self-realization" (p. 24). His arguments, however, are to select and remodel desirable tools for human society. Nevertheless, as I have stated earlier, smart technology as a silent partner should be a colleague, a collaborator, and a companion. This partnership is not only for human society but also for a broader assemblage in which human society is only one of the connections who may or may not make a significant difference. As a result, the concept of conviviality will not suffice a wider society that contains humans and nonhumans. However, to be clear, I am not here to overthrow the concept of conviviality. On the contrary, I would like to expand the connotation of conviviality for it to apply to a broader assemblage consisting of multiple societies other than human society. Under the updated conviviality, not only artifacts but also humans and other species have to be limited although other species are nowhere near as expansive and aggressive as humans in the contexts. As Broussard (2018) asserts, "there has never been, nor will there ever be, a technological innovation that moves us away from the essential problems of human nature" (p. 8). Thus, besides limiting technologies, I argue to limit humans who create those technologies and those who interact with technologies.

Third, unilateral transparency should no longer work in the age of smart technology. By unilateral transparency, I mean individual data is transparent while companies' data is not, user statistics is transparent while business statistics is not, and human behavior is transparent while technological algorithms are not. The smart technology should not reinforce the power of traditional, centralized institutions but to promote and empower individuals and the groups that were previously marginalized.

Through the thesis, we are able to appreciate the origin of having a dream life with robotic machines as well as the way that this dream continues and gains agency from emerging technologies. We also see events in history and different groups of people who suffered from the overexpansion of technology and struggled with the concepts and values embedded in technology. However, when we do not see technology as a monolith, we are able to appreciate more of its texture, color, luster, tactile feeling, temperature, porosity, and so on. Indeed, because it has these many facets and features, any of the interstices might fill with expected or unexpected elements that could change its appearance and function. Therefore, the work that I have done here is to see what is in smart technology, how did they get there, what did they do, and how did they do so? Furthermore, if we are to collaborate with smart technology, how should we see it with all its filling, what should we do, what do we prepare, and what should we know in advance?

Overall, the way we get along with smart technology reflects our relationship with society because "technologies have always been cultural" (Slack & Wise, 2015, p. 9). The inseparable nature of social as well as cultural technologies and their ubiquitous

existence have forced us, as human partners, to rethink our position in the age of posthuman as well as the age of technological smartness.

5.1. How Do We Rethink About Smart Technology?

Undoubtedly, it is crucial for us to recognize and reorganize our relationship with smart technology. But how do we rethink about smart technology after we have gained awareness of the politics and materialities in it? How do we rethink about smart technology after we have known that our emotions and behaviors are attached to it and can shape as well as be shaped by it? How do we rethink about smart technology after we have realized the different roles of it?

First of all, we can stop being scared of smart technology. Although tech companies are insidious, data breaches are scary, third parties are sly, we are being taken advantage of, perhaps yes, but we do not necessarily need to be frightened. People usually are afraid of something because that something is in the dark, and people are not able to see it. But smart technology is not magic, it is not a supernatural force that has no shape and leaves no trace (even the use of magic in Harry Potter leave traces!). It has algorithms, sensors, and digital log, secretly but concretely. What we have to do is simply gain awareness to see through the political nature from their fancy functions and aesthetic appearances.

Second, we can go scavenger hunt and be a cartographer. Go back to your house, trace your devices, and draw the connections. One of the things that we can rethink as ordinary people is to educate ourselves about the surrounding connections of the devices. For example, get a pen and a piece of paper, place your phone in the middle, and draw a

line as connected to the Wi-Fi router in your house, another line as connected to your Fitbit, another line as connected to a cellular tower, and as many lines as you can think of. After the first layer of connections, try the second layer, and try the third. By doing so, we are able to visualize the previously invisible connections. And we will have a better understanding of the actors surrounding us and our devices.

Third, we can try to lower our expectations for smart technology. It is not a god, and it is not in any sense street smart or even book smart. It is *sensor smart* and *calculation smart*. Although sensor smart seems to have similar qualities with street smart, and calculation smart seems to have similar qualities with book smart, they are far apart in their purpose. As Berkun (2019) describes street smart and book smart:

> To be street smart means you have situational awareness. You can assess the environment you are in, who is in it, and what the available angles are. Being on the street, or in the trenches, or whatever low to the ground metaphor you prefer, requires you learn to trust your own judgment about people and what matters. . . . Book smarts, as I've framed it, means someone who is good at following the rules. These are people who get straight A's, sit in the front, and perhaps enjoy crossword puzzles. They like things that have singular right answers. They like to believe the volume, and precision, of their knowledge can somehow compensate for their lack of experience applying it in the real world. (paras. 3–5)

Being street smart requires "to trust your own judgment about people and what matters" (Berkun, 2019, para. 3) while the point of smart technology is the fact that its judgment so far is not about *people*. Sure it can see, hear, speak, address, and track (Bunz & Meikle, 2017), and it can follow its sensors and assessment and take action, but it is not

for people's benefit. On the other hand, although book smart is always depicted as a lame style, being book smart actually requires a strong will to "always be right" and to be competitive. Accordingly, book smarts will continuously accommodate themselves to what is considered *right*. More importantly, again, the *right* here is closely tied to people, cultural customs, and human values. However, the rules that smart technology follows so far are unable to reflect them. Thus, we do not have to worship it as if it is omnipotent, because it is not, not yet.

5.2. What Do We Redo About Smart Technology?

I have proposed a list to redesign smart technology (Section 4.2.4). However, that is more for designers and engineers. Then, what can ordinary people *redo*? What is left for people like you and me? This is where public engagement comes into play. As responsible citizens, we can engage the conversation in a variety of ways and share our concerns.

First, be an observer and speak up when needed. Always be suspicious of smart technology. Although it seems to contradict the concept of *trust* (Section 3.2.3) that I am hoping to foster within smart technology, I should be clear here that this trust will be happening after the renovation. In other words, before smart technology becomes a silent partner, we should always keep a vigilant eye on its political nature and see if it will harm the relationship between humans and technology in the long run. If the power dynamic is in favor of technology companies or the government, speak up and stand up. As Latour would remind us, ordinary people are also actors, and actors have the power to negotiate with other actors. Therefore, we can redo smart technology from here.

Second, we can play with smart technology. By play, I mean to tease its materialities. For example, a smart device can be viewed as a construction of data, algorithms, protocols, and policies. To see it as a partner, we need to practice hanging out with it in a playful way. That is, we can think of some ways to influence the data for it to collect, we can perform our daily activity differently and see how it reacts, we can change some of our settings and see what happens, or we can try not to agree with its policies. By playing with it, the mysteriousness and fear will dissipate, and we can thus see it as a nonhuman actor with flesh and blood, figuratively.

Third, be a reasonable person and respect your partner. That is right. Since technology and ourselves are inseparable, to redo smart technology is also to redo ourselves. In other words, by redoing ourselves, we are also redoing smart technology. To be a reasonable person means not to check on your partner all the time, not to ask for trivial information all the time, and not to interrupt its working progress for fatuous reasons. For example, put your phone aside and do your work. If nothing happened, means *nothing happened*. If you just need to check the time or weather, go check by yourself manually, do not ask for the information and expect to be told. If you are curious about its work, go map its working process and judge its outcome when the work is done.

In this intensive, digital connected world, the affective flow and emotional attachment can result in an emotional burden on our hearts. To avoid emotional burden such as FOMO (aka Fear Of Missing Out) in social media as well as texting anxiety (i.e., distress resulted from waiting for responses or receiving a response that raises uncertainty), we have to not only make smart devices less addictive but also make ourselves less clingy. Just as Dourish and Bell (2011) say, “the purposes to which people

would put computational devices are not radically new ones but rather reflect existing social and cultural practices" (p. 41). Humans need something or someone for them to hold on to, yet we can also ask if the current way is the best way. We do not always do what we should be doing, because life is short, why bother? Unfortunately, with the emerging technologies, we might *live long and prosper* for real. Therefore, we must not only sort out a way to work with the newly ubiquitous technology but also make the workflow safe, private, and comfortable.

REFERENCES

Aldrich, F. K. (2003). Smart homes: Past, present and future. In R. Harper (Eds.), *Inside the smart home* (pp. 17–39). Springer.

Amazon. (2019, April 25). *Amazon.com announces first quarter sales up 17% to $59.7 billion* [Press release]. https://press.aboutamazon.com/news-releases/news-release-details/amazoncom-announces-first-quarter-sales-17-597-billion

Ashton, K. (2009). That 'Internet of Things' thing. *RFID Journal, 22*(7), 97–114. http://www.itrco.jp/libraries/RFIDjournal-That%20Internet%20of%20Things%20Thing.pdf

AV-TEST - The Independent IT-Security Institute. (2019, January 30). *Robot vacuums undergo a security check: Trustworthy helpers around the house or chatty cleaning appliances?* https://www.av-test.org/en/news/robot-vacuums-undergo-a-security-check-trustworthy-helpers-around-the-house-or-chatty-cleaning-appli/

Baig, E. C. (2019, May 1). Parents, would you let your kid ride an Uber or Lyft by themselves? *USA Today*. https://www.usatoday.com/story/tech/2019/05/01/can-your-kids-ride-uber-lyft-alone/3498528002/

Banerjee, P. (2018, December 4). *Xiaomi phones covertly send user data to China: Report*. Digit. https://www.digit.in/news/mobile-phones/xiaomi-phones-covertly-send-user-data-to-china-report-23433.html

Benjamin, R. (2019). *Race after technology: Abolitionist tools for the new Jim code* [eBook edition]. Polity Press.

Bennett, J. (2004). The force of things: Steps toward an ecology of matter. *Political Theory, 32*(3), 347–372. https://doi.org/10.1177/0090591703260853

Berkun, S. (2019, February 9). Book smarts vs. street smarts. *Scott Berkun*. https://scottberkun.com/2010/book-smarts-vs-street-smarts/

Bijker, W. E. (1995). *Of bicycles, bakelites, and bulbs: Toward a theory of sociotechnical change*. MIT Press.

Braidotti, R. (2013). *The posthuman*. Polity Press.

Brewster, T. (2019, August 21). Thousands of banned Chinese surveillance cameras are watching over America. *Forbes*. https://www.forbes.com/sites/thomasbrewster/2019/08/21/2000-banned-chinese-surveillance-cameras-keep-watch-over-us-government-sites/#419688107f65

Broussard, M. (2018). *Artificial unintelligence: How computers misunderstand the world*. MIT Press.

Bucher, T. (2018). *If... then: Algorithmic power and politics*. Oxford University Press.

Bunz, M., & Meikle, G. (2017). *The Internet of Things*. John Wiley & Sons.

Cappetta, M., & Kent, J. L. (2018, August 8). *Meet the woman behind Amazon's Alexa*. NBC News. https://www.nbcnews.com/business/business-news/meet-woman-behind-amazon-s-alexa-n898426

Cho, J. Y., Lee, H. S., & Lee, B. G. (2015, February). Connectivity issues on IoT business–The Korean case of smart home network. In N. Walker (Eds.), Proceedings of *The Second International Conference on Electrical, Electronics, Computer Engineering and their Applications (EECEA2015)* (pp. 120–131). Springer. https://doi.org/10.13140/2.1.2839.3769

Christensson, P. (2010, January 4). ICT definition. In *TechTerms—The Tech Terms Computer Dictionary*. Retrieved 2019, Aug 15, from https://techterms.com/definition/ict

Clark, A. (2003). *Natural-born cyborgs: Minds, technologies, and the future of human intelligence*. Oxford University Press.

Cope, J. (2002, April 8). *What's a Peer-to-Peer (P2P) network?* Computerworld. https://www.computerworld.com/article/2588287/networking-peer-to-peer-network.html

Coskun, A., Kaner, G., & Bostan, İ. (2018). Is smart home a necessity or a fantasy for the mainstream user? A study on users' expectations of smart household appliances. *International Journal of Design, 12*(1), 7–20. http://blog.ijdesign.org/index.php/IJDesign/article/viewFile/2938/795

Cowan, R. S. (1983). *More work for mother: The ironies of household technology from the open hearth to the microwave*. Basic Books.

Darby, S. J. (2018). Smart technology in the home: Time for more clarity. *Building Research & Information, 46*(1), 140–147. https://doi.org/10.1080/09613218.2017.1301707

Dourish, P. (2017). *The stuff of bits: An essay on the materialities of information*. MIT Press.

Dourish, P., & Bell, G. (2011). *Divining a digital future: Mess and mythology in ubiquitous computing*. MIT Press.

Elliott, A., & Urry, J. (2010). *Mobile lives: Self, excess and nature*. Routledge. https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu/lib/asulib-ebooks/detail.action?docID=534207

Ellul, J. (1964). *The technological society* (1st American ed.). Knopf.

Galloway, A., & Thacker, E. (2007). *The exploit: A theory of networks*. University of Minnesota Press.

Giddens, A. (1990). *The consequences of modernity*. Stanford University Press.

Green, B. (2019). *The smart enough city: Putting technology in its place to reclaim our urban future*. MIT Press.

Greenfield, A. (2010). *Everyware: The dawning age of ubiquitous computing*. New Riders.

Grudin, J. (1992). Utility and usability: Research issues and development contexts. *Interacting with Computers, 4*(2), 209–217. https://doi.org/10.1016/0953-5438(92)90005-Z

Haraway, D. (2013). A cyborg manifesto: science, technology, and socialist-feminism in the late twentieth century. In *Simians, cyborgs, and women: The reinvention of nature* (pp. 149–181). Routledge. (Original work published 1985)

Heckman, D. (2008). *A small world: Smart houses and the dream of the perfect day*. Duke University Press.

Highmore, B. (2010). *Ordinary lives: Studies in the everyday*. Routledge. https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu/lib/asulib-ebooks/detail.action?docID=574568

Ho, P.-C. (2019, April 22). *What messaging apps do we secretly use to chat at work?* Digg. https://digg.com/2019/messaging-apps-use-at-work

Interaction Design Foundation. (n.d.). *Human-computer interaction (HCI)*. https://www.interaction-design.org/literature/topics/human-computer-interaction

Iachello, G., & Hong, J. (2007). End-user privacy in human-computer interaction. *Foundations and Trends® in Human–Computer Interaction, 1*(1), 1–137. https://doi.org/10.1561/1100000004

Illich, I. (2009). *Tools for conviviality*. Marion Boyars. (Original work published 1973)

Karas, B. (2017, May 8). *Hikvision backdoor confirmed*. IPVM. https://ipvm.com/reports/hik-backdoor

Kenton, W., & Abbott, B. (2019, March 30). Silent partner. In *Investopedia*. https://www.investopedia.com/terms/s/silentpartner.asp

Kinsella, B., & Mutchler, A. (2019). *Smart speaker consumer adoption report 2019*. Voicebot.ai. https://voicebot.ai/smart-speaker-consumer-adoption-report-2019/

Kitchin, R. (2016). The ethics of smart cities and urban science. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *374*(2083), 1–15. https://royalsocietypublishing.org/doi/pdf/10.1098/rsta.2016.0115

Kostka, G. (2019). China's social credit systems and public opinion: Explaining high levels of approval. *New Media & Society, 21*(7), 1565–1593. https://journals.sagepub.com/doi/pdf/10.1177/1461444819826402

Latour, B. (2009). Where are the missing masses? The sociology of mundane artifacts. In D. G. Johnson, J. M. Wetmore (Eds.), *Technology and Society: Building our sociotechnical future* (pp. 151–180). MIT Press.

Lexico. (n.d.). Equilibrium. In *Lexico.com US dictionary*. Retrieved April 13, 2020, from https://www.lexico.com/definition/equilibrium

Liu, A. (2004). *The laws of cool: Knowledge work and the culture of information* [eBook edition]. University of Chicago Press. https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu/lib/asulib-ebooks/detail.action?docID=616046

Maalsen, S., & Sadowski, J. (2019). The smart home on FIRE: Amplifying and accelerating domestic surveillance. *Surveillance & Society 17*(1), 118–124.

Mantelero, A. (2013). The EU proposal for a general data protection regulation and the roots of the 'right to be forgotten'. *Computer Law & Security Review, 29*(3), 229–235. https://doi.org/10.1016/j.clsr.2013.03.010

Mattern, S. (2017, February). *A city is not a computer*. Places Journal. https://doi.org/10.22269/170207

Merriam-Webster. (2020, March 25). Equilibrium. In *Merriam-Webster.com dictionary*. Retrieved April 13, 2020, from https://www.merriam-webster.com/dictionary/equilibrium

Mosco, V. (2014). *To the cloud: Big data in a turbulent world*. Paradigm.

Norman, D. (1999, Apr 12). The invisible computer: [Surveys edition]. *Financial Times*. http://login.ezproxy1.lib.asu.edu/login?url=https://search-proquest-com.ezproxy1.lib.asu.edu/docview/248658481?accountid=4485

One-third of US consumers own two or more smart home devices. (2018, March 26). Business Wire. https://www.businesswire.com/news/home/20180326005634/en/One-Third-Consumers-Smart-Home-Devices/?mkt_tok=eyJpIjoiTTJJeU1ERXhNekU0Tm1VNSIsInQiOiJYOEMyUHVpdzhlOUgxMlZQSks5bUIyelE2TElkSVN3KzM5MmVLUDRCblc1eko4QVRwUmNiZWxPRjYyUVUwT3NNbHBBbzhFZ09kT1pKeFVmVndOUUwyakNuWVR5bnZWSVJYYmYyaTBqQk56Y2g4bVhKa1wvSVk5TkczdUlsYzlXV2MifQ%3D%3D

Perez, S. (2016, June 3). *Amazon Alexa now has over 1,000 Skills, up from 135 in January*. TechCrunch. https://techcrunch.com/2016/06/03/amazon-alexa-now-has-over-1000-skills-up-from-135-in-january/

Pham, S., & Riley. C. (2017, March 17). *Banned! 11 things you won't find in China*. CNN Tech. https://money.cnn.com/gallery/technology/2016/05/23/banned-china-10/index.html

Pink, S., Ardèvol, E., & Lanzeni, D. (2016). Digital materiality. In S. Pink, E. Ardèvol, D. Lanzeni (Eds.), *Digital materialities: Design and anthropology* (pp. 1–26). Bloomsbury. https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu/lib/asulib-ebooks/detail.action?docID=4198003

Pridmore, J., Zimmer, M., Vitak, J., Mols, A., Trottier, D., Kumar, P. C., & Liao, Y. (2019). Intelligent personal assistants and the intercultural negotiations of dataveillance in platformed households. *Surveillance & Society 17*(1), 125–131. https://search.proquest.com/openview/f4fd05db11fb45cf59b4460b4fdd8892/1?pq-origsite=gscholar&cbl=396354

Raphael, R., & Xi, L. (2019, January 23). *Discipline and punish: The birth of China's social-credit system*. The Nation. https://www.thenation.com/article/china-social-credit-system/

Rapoport, M. (2012). The home under surveillance: A tripartite assemblage. *Surveillance & Society, 10*(3/4), 320–333.

Richardson, H. J. (2009). A 'smart house' is not a home: The domestication of ICTs. *Information Systems Frontiers, 11*(5), 599–608. https://doi.org/10.1007/s10796-008-9137-9

Sadowski, J. (2019, June 6). *Privacy is just the beginning of the debate over tech*. OneZero. https://onezero.medium.com/privacy-is-just-the-beginning-of-the-debate-over-tech-8807c2f8458f

Samuel, S. (2016). A review of connectivity challenges in IoT-smart home. *Proceedings of the 2016 3rd MEC International Conference on Big Data and Smart City (ICBDSC)*. IEEE. https://doi.org/10.1109/ICBDSC.2016.7460395

Schüll, N. D. (2014). *Addiction by design: Machine gambling in Las Vegas*. Princeton University Press.

Sclove, R. E. (1995). Making technology democratic. In J. Brook & I. A. Boal (Eds.), *Resisting the virtual life: The culture and politics of information* (pp. 85–101). City Lights.

Shen, S., & Horwitz, J. (2019, October 9). *China's Hikvision sees only limited impact from U.S. blacklisting*. Reuters. https://www.reuters.com/article/us-usa-trade-china-hikvision/chinas-hikvision-sees-only-limited-impact-from-us-blacklisting-idUSKBN1WO0O5

Siemaszko, C. (2018, May 24). *Little did she know, Alexa was recording every word she said*. NBC News. https://www.nbcnews.com/tech/tech-news/little-did-she-know-alexa-was-recording-every-word-she-n877286

Singer, P. W., & Brooking, E. T. (2018). *LikeWar: The weaponization of social media*. Eamon Dolan Books.

Slack, J. D., & Wise, J. M. (2015). *Culture and technology: A primer* (2nd ed.). Peter Lang.

Social Credit System. (2020, April 11). In *Wikipedia*. https://en.wikipedia.org/w/index.php?title=Social_Credit_System&oldid=950379190

Smart City PDX. (2019, June 19). *Data privacy and information protection principles for the city of Portland*. https://static1.squarespace.com/static/5967c18bff7c50a0244ff42c/t/5d0aec446939ce00011ec049/1560996933477/COP_PIP_handout_June19_2019.pdf

Samsung. (2014, September 6). *Smart home: Expectation, current state and the near future* [Press release]. https://news.samsung.com/global/smart-home-expectation-current-state-and-the-near-future

Snider, M. (2019, February 20). Google mistakenly forgot to tell users that Nest Secure comes with built-in microphone. *USA Today*. https://www.usatoday.com/story/tech/talkingtech/2019/02/20/google-nest-secure-microphone/2925026002/

Spencer0 [Username]. (2018, March 13). *When we are home and upstairs, especially when we are sleeping, our thermostat does not recognize that we are home and will turn off the air conditioner. Is anyone else experiencing this or does anyone have any advise* [sic] *on how to rectify this issue?* [Online forum post]. Nest Community. https://www.nest-community.com/s/question/0D51W00005LSQx6SAH/when-we-are-home-and-

upstairs-especially-when-we-are-sleeping-our-thermostat-does-not-recognize-that-we-are-home-and-will-turn-off-the-air-conditioner-is-anyone-else-experiencing-this-or-does-anyone-have-any-advise-on-how-to-rectify-this-issue

Spigel, L. (2001). *Welcome to the dreamhouse: Popular media and postwar suburbs*. Duke University Press.

Strengers, Y. (2016). Envisioning the smart home: Reimagining a smart energy future. In S. Pink, E. Ardèvol, D. Lanzeni (Eds.), *Digital materialities: Design and anthropology* (pp. 61–76). Bloomsbury. https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu

Templeton, G. (2019, July 8). Language support in voice assistants compared (2019 update). *Globalme*. https://www.globalme.net/blog/language-support-voice-assistants-compared

The AI Organization. (2019, October 6). *Artificial intelligence with facial recognition hunts Hong Kong youth for capture, rape & so called suicide*. https://theaiorganization.com/artificial-intelligence-with-facial-recognition-hunts-hongkong-youth-for-capture-rape-so-called-suicide/

Tufekci, Z. (2017). *Twitter and tear gas: The power and fragility of networked protest*. Yale University Press.

Turkle, S. (2011). *Alone together: Why we expect more from technology and less from each other*. Basic Books.

Wajcman, J. (1991). *Feminism confronts technology*. Polity Press.

Weisbaum, H. (2017, November 28). 'Hey Alexa, how secure are voice-activated assistants like you?' *NBC News*. https://www.nbcnews.com/tech/security/hey-alexa-how-secure-are-voice-activated-assistants-you-n824566

Weiser, M. (1991). The Computer for the 21st century. *Scientific American, 265*(3), 94–105. https://www.jstor.org/stable/24938718

Wetmore, J. (2009). Amish technology: Reinforcing values and building community. In D. G. Johnson, J. M. Wetmore (Eds.), *Technology and society: Building our sociotechnical future* (pp. 297–318). MIT Press.

Wetmore, J. (2018). What can we learn about vacuum cleaners from vampires?: Far more than you may think. *IEEE Consumer Electronics Magazine, 7*(2), 103–105. http://doi.org/10.1109/MCE.2017.2747092

Winner, L. (1989). *The whale and the reactor: A search for limits in an age of high technology*. University of Chicago Press. (Original work published 1986)

Wise, J. M. (1998). Intelligent agency. *Cultural Studies, 12*(3), 410–428. https://doi.org/10.1080/095023898335483

Wise, J. M. (2000). Home: Territory and identity. *Cultural Studies, 14*(2), 295–310. https://doi.org/10.1080/095023800334896

Wise, J. M. (2011). Assemblage. In C. J. Stivale (Ed.), *Gilles Deleuze: Key concepts* (2nd ed.) (pp. 91–102). Acumen.

Wise, J. M. (2012). Attention and assemblage in the clickable world. In J. Packer & S. B. Crofts Wiley (Eds.), *Communication matters: Materialist approaches to media, mobility, and networks* (pp. 159–172). Routledge.

Wise, J. M. (2015). A hole in the hand: Assemblages of attention and mobile screens. In A. Herman, J. Hadlaw, & T. Swiss (Eds.), *Theories of the mobile internet: Materialities and imaginaries* (pp. 193–210). Routledge.

Worden, K., Bullough, W. A, & Haywood, J. (2003). *Smart technologies*. World Scientific. https://ebookcentral-proquest-com.ezproxy1.lib.asu.edu/lib/asulib-ebooks/detail.action?docID=1681719

Van Dijk, J. A. (2005). *The deepening divide: Inequality in the information society*. Sage.

Zuboff, S. (2015). Big other: Surveillance capitalism and the prospects of an information civilization. *Journal of Information Technology, 30*(1), 75–89. https://cryptome.org/2015/07/big-other.pdf