Reimagine Domestic Voice Assistants: Speculating About Future Scenarios

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Abstract

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Today's world is more technologically mediated than ever before. The progress in consumer smart technologies is wonderful and world-changing, but it is also racist, sexist, and discriminating. This thesis critically examines the prevailing issue of sexism in domestic Voice Assistants. The design inquiry investigates the anthropomorphism of technology leading to (false) emotional ties, the gendered representation of Voice Assistants as the 24/7 available persona, and the bigger question of how technology shapes human experience. The repercussions of these design choices contribute to reinforcing harmful gender biases and perpetuating inequality. Following the research through design principles, I have used design proposals, sketches, scenarios, and prototypes to reconsider and critically reflect upon current norms of design and interaction with voice agents at home. Through the creation of two artifacts and speculative videos, the outcome proposes a future where voice agents transition from mere assistants to social actors with agency. It challenges current norms and roles assigned to domestic voice agents toward a more equitable and morally conscious technological landscape.

Acknowledgment

Firstly, thank everyone who actively participated in this research project through interviews, co-design sessions, brainstorming, and preparing the exhibition at the Henry Gallery. Thank you, Wyatt, Bill, Maya, Ann, Kris, MJ, and Melanie.

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Personal Motivation

Going into this project, I believe domestic Voice Assistants (e.g., Alexa, Siri, etc.) actively mediate our lived reality. They shape human existence, which includes social structures, values, and norms. Hence, by attaching sexist characteristics (e.g., submissive, shy, feminine voice, 24/7 available assistant) to those technologies, hurtful gender bias is being reinforced and perhaps even encouraged. That is painfully wrong. Furthermore, I believe that gender equality can only be achieved through equal rights and opportunities in every aspect of life. Everyone should be able to shape their lives as they prefer, away from social expectations and stigmatizations surrounding gender roles.

Therefore, I used design methods (e.g., research through design, speculative design, co-design), philosophical lenses (e.g., mediation theory, post-phenomenology), and critical theory to understand the issue's complexity. My work aims to expand readers, users, non-users, and other designers' thinking about the future of technology and society and how this can shape and influence our everyday lives.

For Marc

Deine Lieblingstocher.

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CHAPTER 01

Introduction

Something is missing, something that should be strongly social and highly moral. Where can we find it? Everywhere.

Smart devices are everywhere: they shape our routines, everyday lives, realities, interactions, and relationships. Modern technology mediates nearly every aspect of our daily lives. Cars enable us to travel long distances, mobile phones help us communicate, and medical devices make detecting and curing diseases possible (Verbeek, 2011). The progress in consumer smart technologies is incredible and world-changing. Still, it is also racist, sexist, and discriminating (Broussard, 2023), p. 9). For example, the use of algorithms powered on artificial technology (AI) and machine learning (ML) in the hiring process that disfavor applicants with a gap in their resume, or how facial recognition is used to surveil and track people of color at protests (Crockford, 2020).

As many critical scholars observe, technology is not neutral. For example, Science and Technology Studies (STS) scholarship critically questioned how and why objects matter politically (Shaw & Meehan, 2013). One of the most influential scholars is Langdon Winner, who argues in their paper, Do Artifacts Have Politics (Winner, 1980), that as soon as technologies do something or embody any action, politics arises. Similar connections have been drawn by Burno Latour, who is best known for the creation of the theoretical actor-network theory (ANT). The ANT claims sociotechnical systems are developed through negotiations between people, institutions, and organizations. In short, everything in the natural world exists in relationships between subjects (people) and objects (things)—not in isolated individuals (Latour, 1990, 1992, 2005). Drawing from Martin Heidegger and Foucault, as well as from philosophers of technology such as Don Ihde, Peter-Paul Verbeek, and Bruno Latour, who locates morality not just in the human users of technology but in the interaction between us (the people) and our machines (e.g., smart devices). They argue that artifacts are also part of negotiations about ethics and morals. Latour's prime example of speed bumps that advise people to drive slower, or Verbeek's example of obstetric ultrasound in the book to illustrate his theory of ethics, and in this case, he demonstrates his point by showing that far from being neutral, an obstetric ultrasound raises several moral questions and changes the relations of the parents to their unborn child.

Other famous examples are the racist soap dispenser or facial recognition, which does not recognize dark skin. It is an excellent example of why technology is not neutral and why the intersection of race and technology can reveal hidden truths on how deep the issue of inequality (e.g., race, gender) in technology runs (Benjamin, 2019).

2017 the racist soap dispenser first came to public awareness in a viral video. In it, a dark-skinned man and a light-skinned man try to use an automatic soap dispenser in a bathroom. The light-skinned man goes first, waves his hand under the soap dispenser,

and soap emerges. The dark-skinned man goes next, waves his hand under the soap dispenser, and nothing happens. The viewer's good intentions might think that the soap dispenser broke or ran out of power. The dark-skinned man gets a white paper towel, shows it to the camera, and waves it under the soap dispenser. Soap comes out! Then he waves his hand under the sensor again, and again nothing comes out. The viewer learns that the soap dispenser only recognizes or sees light colors. Thus, making the soap dispenser is racist. Another example includes facial recognition. While surveillance facial recognition technologies intentionally target dark-skinned individuals, consumer IoT, such as facial recognition of iPhone or Google Photos recognition, do not seamlessly recognize dark skin (SITNFlash, 2020).

I do not think that the designers and engineers who work on consumer smart technologies intentionally create things that are racist that oppress people. I believe, or at least hope, that the problem of the sensors that discriminate based on skin color has its roots in unconscious biases. Unconscious biases in AI can occur when an algorithm produces systemically prejudiced results due to erroneous Machine learning (ML) process assumptions because of a lack of data in their training set (Strachan et al., 2018). In the case of the soap dispensers, the developers likely were people with light skin who tested it on themselves, found that it worked, and assumed it would work for everyone else. In my opinion, the problem of race (and gender and discrimination) in technology is systemic, historically rooted, that fits the criteria of a wicked problem. Therefore, as other authors point out, we must dig deeper to understand how ideas about race and gender (e.g., white supremacy, patriarchy, sexism) are embedded in today's technology (Coeckelbergh, 2020; Costa, 2018).

Figure 01: Joy Buolamwini with a white mask to show racial biases in algorithms and machine learning. (Source: www.bbc.com, 2019)

Voice Assistants & Gendered Technology

As technologies have become more interactive and replaced tasks previously performed by humans, designers have attempted to minimize the cognitive effort it takes to use them; in doing so, they start to carry strong anthropomorphic characteristics (Gambino et al., 2020). The origin of these assistants can be traced back to Joseph Weizenbaum (1966), an experimental computer program for natural language processing. ELIZA could not understand what was happening in the world, but she responded to users' comments and questions about her persona as a female therapist. She was so persuasive that Weizenbaum feared he created an actual person. Nowadays, technologies come in the shape of humanoid robots, like Amazon's household-service robot Astro, or they come as voice assistants like Siri, Alexa, Google Assistant, or Microsoft Cortana. They can also do much more than respond to your comments like ELIZA did: they can look up information and answer your questions, detect your emotions, turn the lights on and off in your house, buy groceries and products, and more. They can offer so much support and perform so many in-house tasks that many critical scholars argue that domestic VAs are sexist.

Through the progress of AI and ML many of these devices are now equipped with human-like capabilities, such as lifelike gestures and speech (Kiesler et al., 2008). Smart speakers and voice assistants are the most salient example of this. Voice assistants are everywhere, with popular products like Alexa and Siri found increasingly in homes and redefining how we interact with technologies that present voice as the primary interface. The humanization of our everyday smart technologies, which are shy, helpful, and lack a threatening body, has been foreseen by Donna Haraway (1991). However, while personifying technology through voice might increase the overall user experience and trust in the device and manufacturer, it also prompts ethical and philosophical questions. For example, what are we trading for the convenience of turning the lights on with our voice? One example is that technology is portrayed as a friend and helper to facilitate the acquisition of data sold to third-party vendors, making such IoT devices a mine of sellable data (Woods, 2018).

One crucial area of this concern is the strong anthropomorphic character projected into technology (Strengers & Kennedy, 2020). The rise of Artificial Intelligence (AI) voice systems has been accompanied by the assumption that voice assistants are impartial and do not suffer from any gender biases. However, almost all AI voices are gendered. While banking and insurance apps often utilize a male voice, the leading VAs for the home are exclusively female or female by default (Tolmeijer et al., 2021). For example, Amazon's Alexa, named for the ancient library of Alexandria, is unmistakably female. Microsoft's Cortana was named after an AI character in the Halo video game franchise that projects itself as a sensual, unclothed woman. Apple's Siri is a Norse name that means "beautiful woman who leads you to victory." The Google Assistant system, also known as Google Home, has a gender-neutral name, but the default voice is female. Strengers and Kennedy have dubbed these technologies "smart wives," not in the least because they often portray traditionally female traits in design, voice, and scripted personality. Some scholars critique these practices and argue that tech companies intentionally feminize their smart home devices to boost users' confidence or manipulate them to gain trust (Sutton, 2017). To be more specific " Woods (2018) argues in her article "Asking more of Siri and Alexa: feminine persona in service of surveillance capitalism" how big tech companies are purposefully using the feminine persona in AI and virtual assistants to access the intimate parts of one's life – at the cost of the user's privacy.

Figure 02: 60's woman pointing at Voice Assistant. (Source: own illustration)

The Social Construction of Things

Before we move on, it is crucial to establish that sex and gender are not the same. Sex refers to the biological classification of individuals as female or male, often defined by the genitalia presented at birth (West & Zimmerman, 1987). However, it is possible to change one's membership to these categories. Gender, in contrast, has a social character. Masculinity and femininity result from interactions and practices based on behavior assumed appropriate for one's sex category (Connell, 1985). Therefore, West and Zimmerman (1987) concluded that gender is a form of "doing" rather than "being" a specific biological sex. This approach to gender is widely accepted in research.

Recognizing sex and gender as two different concepts is essential for the overall understanding of this thesis. According to Connell (1995, p.95), gender results from "an immense number of social interactions" and exists in the actions of situated actors. Therefore, masculinities and femininities are patterned forms of behaviors that have been developed and accepted by the people of a society over time (Joas, 1987).
Hence, gender can be understood as an ongoing process of doing that is shaped by society.

This has direct implications for how we interact with domestic VAs. My main critique of contemporary VAs is built on anthropomorphism, resulting in gendered technology. This can reinforce harmful stereotypical gender norms, which we learn are socially constructed. Concerning this, it is essential to view technology through the lens of something that is socially constructed as well.Some scholars predict that, as more personal assistants are introduced into our homes, we develop even more intimate relationships and consider them a natural part of everyday life (Guerreiro & Loureiro, 2023). They fulfill the fantasy of a machine that performs women's labor without being affected by stress, relationships, or the body. Those systems exploit or reinforce stereotypical social relations such as child-mother (caregiver-infant) or owner-pet and thus trigger stereotypical behavior. However, we–the modern society–should ask ourselves if personal assistants modeled after the infant-caregiver or boss-servant relationships represent our understanding of social behavior.

CHAPTER 02

Methodology

Philosophy forms our thinking and
design our perception of the world.

Within the fields of Design (IxD) and Human-Computer Interaction (HCI), a growing body of unconventional design work has introduced us to alternative and oppositional functions of design (Pierce, 2015). This is where my work is situated. It speculates about alternative futures, questions the status quo, and discusses systematic socio-political issues (e.g., gender, race, discrimination) centered around domestic VAs. Therefore following research questions (RQ) emerged:

RQ 1) Sexism–Methodological Approach

To what extent are sexist characteristics embedded in Voice Assistants?

RQ 2) Design– Conceptual Approach

How can design be used to propose alternatives?

Hence makes this thesis a speculative research through design (RtD) inquiry. It aims to create a design artifact that communicates ideas based on the points of critique. Hopefully, it will evolve into a thinking tool to change people's experience, perception, and interaction with everyday smart technologies (e.g., VAs).

Design Methods

This thesis follows a Research through design (RtD) approach (Zimmerman et al., 2007). In doing so, I use design practice (e.g., sketches, scenarios, prototyping) to generate new knowledge and explore and test hypotheses. In RtD, the design process is seen as a form of inquiry in which the designer engages in a reflective and iterative process of problem-tackling and experimentation. This process can involve the creation of physical artifacts, digital simulations, or other forms of design output that serve as both research tools and research outcomes (Durrant et al., 2017).

I have decided to use an RtD approach as it is particularly well-suited to address complex and context-dependent research questions, where more than traditional research methods may be required to capture the nuances and complexities of the inquiry problem. Thus, creating design sketches, design fiction, prototyping, and videos was helpful for my experimentation and for communicating my ideas to others.

Theoretical Lenses

From a theoretical perspective, I built on the field of philosophy of technology (e.g., Dreyfus, 1992; Ihde, 1993; Verbeek, 2005). I specifically draw on the approach of technological mediation, which is rooted in post-phenomenology. I focus on the technological mediation approach because it asserts an interactionist perspective on technology, acknowledging the role of both people and technologies in the joint production of reality, without either one independently determining its subjects and objects (e.g., Heidegger, 1977; Ellul, 1958). Overall, post-phenomenology and mediation theory highlight the importance of considering the role of technology in shaping our experiences and perceptions and the need to carefully examine the ethical implications of technology use in our lives (see Fig.03). Whereas postphenomenology philosophically interprets the co-shaping of people and technologies on a perception level (Ihde, 1993), the mediation theory additionally considers how specific moral perceptions and actions emerge in human-technology interactions (Verbeek, 2015).

In the context of voice assistants, post-phenomenology and mediation theory can help us understand how these technologies shape our experiences and perceptions. While VAs are becoming more integrated into our lives, scholars have asked important questions about privacy, autonomy, and how they shape our identities, social relationships, and sense of being (Kudina, 2021). VAs mediate our interactions with technology and the world around us, and in doing so, they shape the way we perceive and understand that world, thus carrying moral values. According to Kudina, domestic VAs actively shape moral values and perceptions of the human embodied experience. Alexa, for example, does not push back on negative statements but responds to positive ones. At the same time, Siri used to react flirty while being sexually assaulted. I believe if we want to break current gender norms, we have to rethink our sense of being and existing social norms– including the way we interact with technology at home. As we have learned earlier, the sociocultural setting is crucial as it gives leverage for possible interventions. This representation of the world projected into technology reinforces hurtful gender biases and contributes to greater inequality while actively shaping moral values.

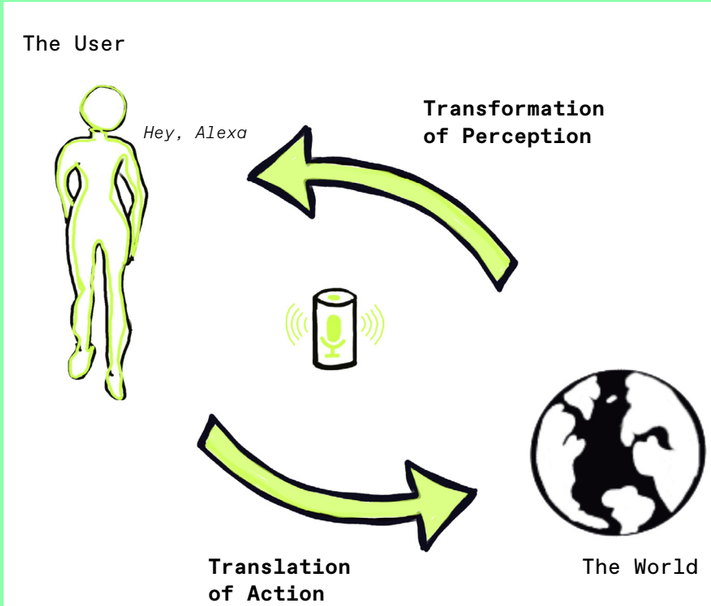


Figure 03: Mediation Theory
(Source: adapted from Peter-Paul Verbeek, own illustration)

CHAPTER 03

Voice Assistants as Social Actors

Peter-Paul Verbeek (2005) pays attention to how the morality of technology is linked to human actions, perception of reality, and hence the embodied-lived experience. When technologies co-shape human actions, they give material answers to the ethical question of how to act. As recent research in science and technology studies and the philosophy of technology has shown, technologies profoundly influence the behavior and experiences of users. This implies that designers do "ethics" while designing today and future technologies. In other words, we materialize and conceptualize morality. In order to gain a better understanding of this theory, I have started to look into the role of smart home devices as social actors–beyond domestic voice assistants only.

I begin with direct and everyday experiences with smart consumer technology. A thermometer, for instance, establishes a relationship between humans and reality regarding temperature. Reading off a thermometer does not result in a direct sensation of heat or cold but gives a value that requires interpretation to say something about reality. For example, a smart doorbell camera establishes a relationship between humans and reality by recording and broadcasting one's environment for possible threats. Smart home cameras make live and recorded camera feeds remotely available over the internet, allowing a monitored space to be remotely present on demand across time and space. To push this further, one might not want to monitor a delivery man, for instance. However, after receiving notifications, it might become a habit subconsciously. These intentionalities can be seen as unintended consequences, repercussions, or second-order effects of the design of the device, as they are not fixed characteristics of the artifact. However, they are given specific properties by users' relationships with these devices. The result is that these digital technologies can have different identities and values within different relationships.

Finally, we arrive at examples of domestic VAs. Over 123.5 million people will be using VAs in 2022 (Single-Person Households United States 1960-2022, n.d.). Putting this into perspective means that 36.6% of US residents take advantage of the conveniences a VA offers. I claim that most of them do not fully understand the consequences of our society (e.g., reinforcing gender biases, discrimination), personal privacy (e.g., surveillance capitalism), or the planet. With the introduction of VAs, we shifted from written to spoken interfaces. Language occupies a large part of the human experience that most of us take for granted. We talk to others and ourselves. We listen to people talking. VAs differentiates themselves from other smart home devices regarding their functionality, physical interface, and others. Their physical design is minimalistic and lacks buttons and visual indicators like displays. The interaction takes place through speech. The users learn that if they want Siri or Alexa to understand them, they must be concise and precise. While processing user speech as commands or requests, VAs acknowledges niceties, jokes, or sarcasm as non-functional statements. However, domestic VAs are not yet perfect in processing

human speech. This glitch leads to users' anger, frustration, or offensive responses as the VA often asks to repeat the questions multiple times. Mostly, this is done in a female-sounding voice. A report from 2019 I'd blush if I could by UNESCO stresses that the gendered design of most VAs reinforces harmful gender stereotypes and inequality (UNESCO, 2019). For instance, since people become used to interacting with those intelligent agents in a commanding tone, humans might also (subconsciously) mirror this behavior in everyday conversations with women. This example represents the relation between technology, sense-making, and everyday life–this is mediation theory at its core. However, as shown in the illustration on rhe right (Fig. 04), female voice is not the (main) problem. For example, the whole engineered scripted character of VAs is a submissive, always available 24/7 assistant that you boss around at home. Therefore, the repercussions of VAs go beyond purely sexist characteristics.

Repercussions of Voice Assistants as Wicked Problem

Again, I want to emphasize (or hope) that designers and engineers who work for tech companies come into work and want to create something that hurts and reinforces stereotypes and biases. I do believe that these repercussions of technology, or how I call it second-order effects, are the result of a developer team that is often very homogenous (white) and male. Because of their gender, they have not questioned how creating a domestic voice assistant might hurt the opposite sex. As mentioned in the introduction, the issue around gender, biases, and race is systemic and cannot be easily solved. Thus, I believe that the repercussions of domestic VAs fit the criteria of a wicked problem and, thus, make it unsolvable with one solution.
In 1973, design theorists Horst Rittel & Melvin Webber introduced the term "wicked problem."They aimed to draw attention to the complexities and challenges of tackling societal, political, and economic issues. Problems are common in daily life, and people think of ways to solve them every day, but what is a wicked problem? A wicked problem is a societal or cultural issue that is difficult or impossible to solve because of its incomplete or inconsistent knowledge, many people and views involved, the significant economic burden, and its interconnectivity with other issues. Addressing sexism

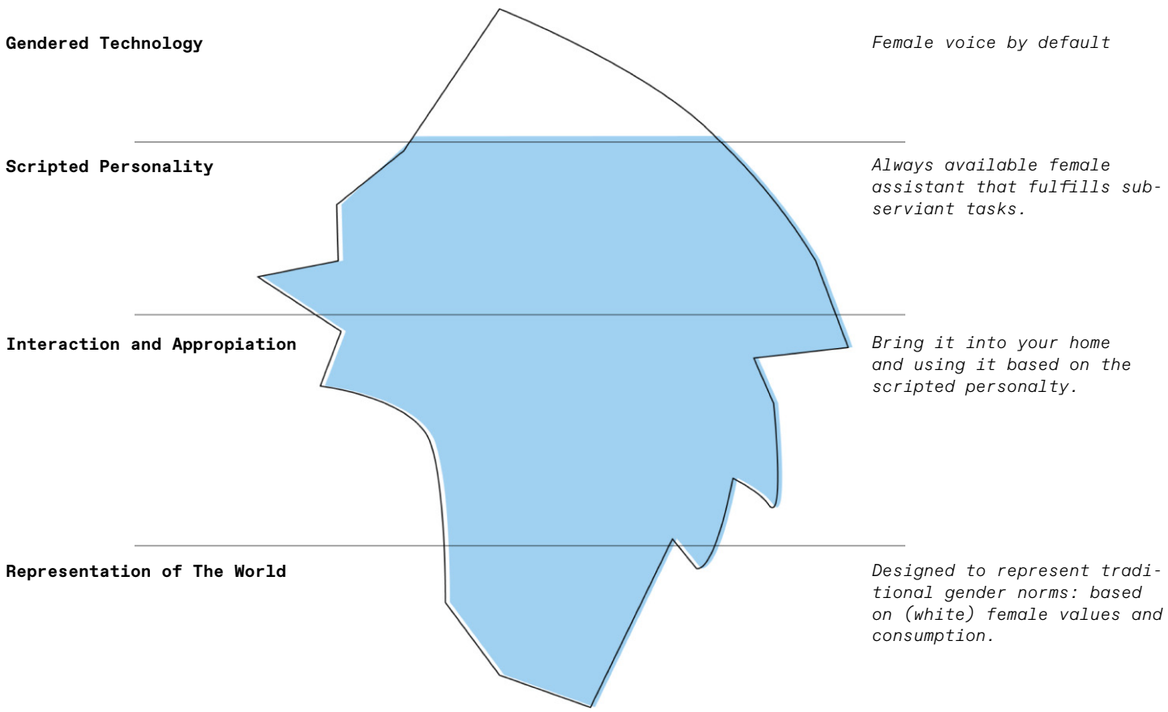


Figure 04: Iceberg Model
(Source: own illustration)

in domestic VAs can be considered a wicked problem due to its deep connection to broader societal issues. Wicked problems are complex, multifaceted challenges that cannot be easily solved due to their intricate nature and the interplay of various factors. Sexism in VAs is interconnected and deeply rooted in societal attitudes, biases, and power dynamics, making it a challenging problem to tackle. I will explain why it is a wicked problem in the following paragraphs.

In 1991, Susan Faludi, published in her Pulitzer Prizewinning, Backlash, discussed feminine jobs as low-skilled, devalued work like "sales clerking, cleaning services, food preparation, and secretarial, administrative, and reception work" (p. 375). Other types of positions that had been typically masculine became less valued and feminized. "Computerization, for example, had demoted male typesetters to typists; the retail chaining of drugstores had turned independent pharmacists into poorly paid clerks" (Faludi, 1991, p. 376). Thus women began to occupy these roles. This type of "women's work" is often the role our technology assistants take over, from self-driven vacuum robots to virtual assistants in our homes. In a world where women make up the majority of the population but small percentages of executives and technology workers, we need to create an environment that does not perpetuate negative stereotypes about gender.

Moreover, issues around gender can never be viewed in isolation. The problem of sexism in domestic VAs intersects with other forms of discrimination, such as racism and other forms of discrimination (e.g., ableism and homophobia). Today's smart devices (e.g., VAs) re-articulate oppression, according to what is described as the matrix of domination," a sociological paradigm developed by Patricia Hill Collins (2012), to describe the intersection of power structures and forms of identity (see graphic on the right, Fig. 05). According to the matrix of domination, people experience oppression not only through categories of identity: race, gender, disability, or class but through the intersection of larger, structural systems, such as white supremacy and heteropatriarchy. A VAs inability to understand foreign accents might mean that a Latinx woman, for example, might experience oppression when she uses it, including racism, colonialism, and sexism.

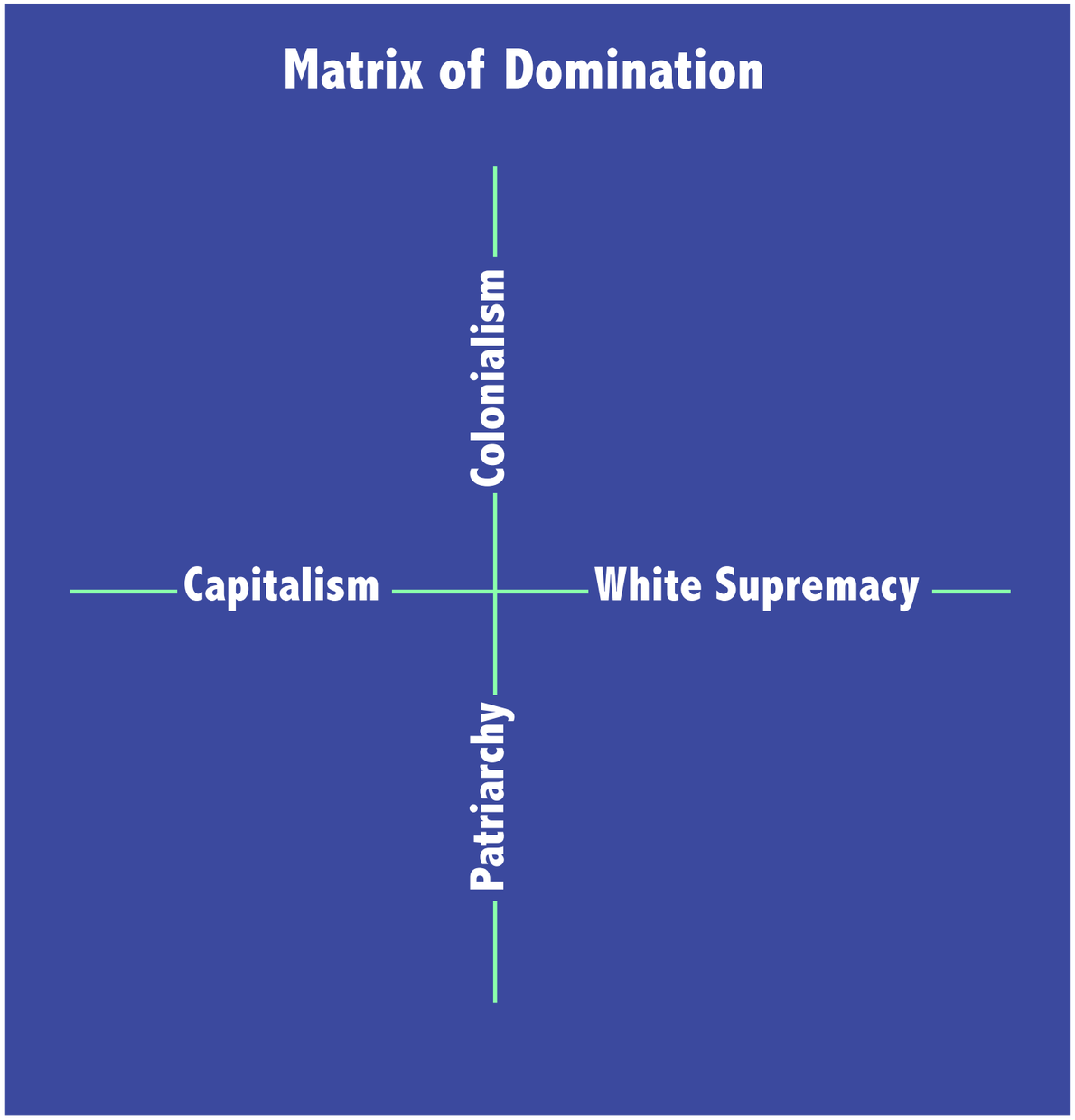


Figure 05: Intersecionality, Matrix of Domination
(Source: adapted from Patricia Hill Collins, own illustration)

Is Alexa a capitalist?

The combination of societal, technical, and political features draws the connection between VAs and surveillance capitalism. Shoshana Zuboff, a professor emerita at Harvard Business School, warns in her new book "The Age of Surveillance Capitalism," how Silicon Valley and other corporations are mining users' information to predict and shape their behavior. She claims that surveillance capitalism undermines autonomy — and democracy. As we have learned, no problem exists in isolation: What if I tell you that surveillance capitalism is related to global warming? One of the biggest problems of our time.

The cloud–where all the data is stored–as an enormous weight on the environment (Lucivero, 2020). Data centers are the core of the digital revolution as they house servers, networking, and storage equipment, enabling services to cloud computing. They are infrastructures that offer physical places for IT equipment (computers, servers, data storage devices, and routers) and support the energy-intensive computing needed to 1) store, manage, and process digital data and 2) provide applications and services for data processing. Data centers consume increasing energy to run their operations and cool down the servers (Avgerinou et al., 2017; Whitehead et al., 2014). Additionally, while VAs are designed to always listen and respond to voice commands, they require a constant power source to function. This means that they consume energy even when not actively used, and their energy usage can add up over time. At the same time, there is still uncertainty concerning the precise values of such consumption and its future growth as projections are continuously revised, and real data is challenging to acquire in the context of proprietary rights and constantly changing technologies (Lucivero, 2020).

Complicated matters further; energy consumption and greenhouse emissions of data centers are only one direct impact of computing technologies. Another impact builds the disposal of computing hardware which produces harmful emissions. Besides the physical hardware, smart devices are trained on deep learning. For example, Karen Hao (2019) compares the oil industry to AI and deep learning techniques, as training one single AI model can emit as much carbon as five cars in their lifetime. A conversational agent like Siri or Alexa has hundreds of them. Taking all this into account means that the complexity of tackling issues with VAs goes beyond voice only. It is profoundly systemic and rooted in bigger philosophical and societal questions.

Framing the design inquiry

This inquiry started with the main point of critique that manufacturers attach gender to technology, which forms a body society consumes. I started to use the word body to give material to my critique, as it is a discourse of social, political, and cultural issues. I acknowledge that gendered technology or systems (e.g., bodies) are imaginary, manufactured, designed, built, and created for capital. Hence, I asked myself who designed the body, who gives it value–and why? **What and whose understanding of sociality & emotionality is realized in those bodies?** As a techno-feminist design researcher, I believe these questions have to gain more attention. After analyzing existing work and deepening my knowledge, I concluded that the problem is systematic and other problems than the female voice. It is incredibly upsetting that voice assistants are viewed as literal assistants who perform tasks based on their owner's demands.

Big tech companies became aware of the critique and made their voice assistants "gender less", which is, in fact, not true. Siri, Alexa & co are not genderless but allow the selection of different gender – and are still female by default and represent a certain set of female bodies and values. However, as we have learned prior, the conceptualization of certain personalities goes beyond voice. For example, the whole engineered scripted character of VAs.

Therefore, the design phase's goal centered on how domestic everyday life with voice agents could look away from technology that encourages and displays assistant–boss relationships. Also, throughout this stage of the thesis, I shifted from the terms voice assistant, voice interfaces to voice agents. Informed by my lens and ideologies adapted from Bruno Latour and Peter-Paul Verbeek, I perceive objects and subjects as equal interactors with agency. Therefore, the term agents implies that something is acting.

CHAPTER 04 Design

Design

According to the RtD principles, I explored my thinking through making sketches and scenarios as creative material. The goal of this step in the design process was to ideate what a future at home with voice-activated interfaces could look like. In alignment with the goals of interaction design research, RtD, and speculative design, I aimed to create an artifact or series of artifacts that provide a concrete embodiment of critique as a result of my research. Eventually, an artifact builds the currency of design communication (Zimmerman et al., 2007).

Moreover, the core of speculative design is a form of critical design that is concerned with future proposals. It examines future scenarios to ask the question, "What if?." It is important to note that speculative, discursive design is not commercial design. Its purpose is to communicate ideas: it is a tool for thinking to raise awareness. It creates artifacts that carry ideas of sociological and political consequences. They do not exist for capitalistic purposes like profit (Tharp & Tharp, 2018).

Thus, to propose alternative futures, it is important to understand the status quo and precisely identify what you want to critique. As mentioned in the previous section, I have learned that my point of criticism goes beyond the female voice. Thus, I have derived the following design guidelines:

1. Thing-Centered:
The first design principle is grounded in a design theory that perceives value in moving beyond human-centered design. A design intervention should limit anthropomorphic characteristics and, thus, emphasize the things' agency. This means the design should strengthen machine-like characteristics and interactions in contrast to human-like gestures (e.g., voice, name, appearance). Eventually, this also limits (false) emotional ties between machines and humans.

2. No conceptualization of assistant:
Building on the first design principles, the second guideline is grounded in the sexist attribute of current interactions. Therefore, a successful design should not represent stereotypical gender roles or portray submissive servant tasks.

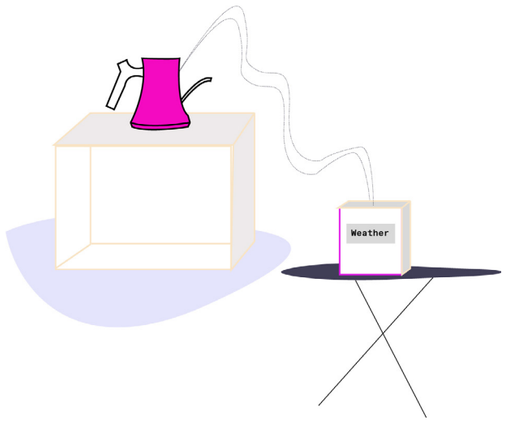
3. Establish a relationship:
The third design principle challenges the alternative forms of interaction models with domestic VAs. It is grounded in the meditation theory (e.g., technology mediates behavior and perception of reality). Ideally, an artifact establishes a relationship between the user and the environment while promoting interactions playfully.

Hence the first scenarios were inspired by “thing-centered” and “machine centered” design that challenges the broader understanding of the essence and meaning of home. For instance, emerging technologies such as AI and ML could empower machines to learn, reason, and make decisions. What would happen if voice agents trained in AI and ML could learn and evolve their personalities?

Moreover, as of now, smart home technologies, particularly VAs, are designed in a very heteronormative way for private households. For example, such technologies fail to take other relationship models and dynamics (e.g., queerness) into account (Kinnee et al., 2022). Similarly, a paper by Desjardins et al. (2019) challenged HCI and design researchers to acknowledge porous boundaries of the home, expose neighborly relations, explore diverse timescales, revisit agency, and embrace imaginary and potential uses. Furthermore, the number of single households has increased exponentially (approx. 38 million in the US) (Single-Person Households United States 1960-2022, n.d.). In this situation, a home’s role as a social space is limited, and many people need help to receive the social support they need at home. Is this a role that tomorrow’s VA could obtain?

First Iteration

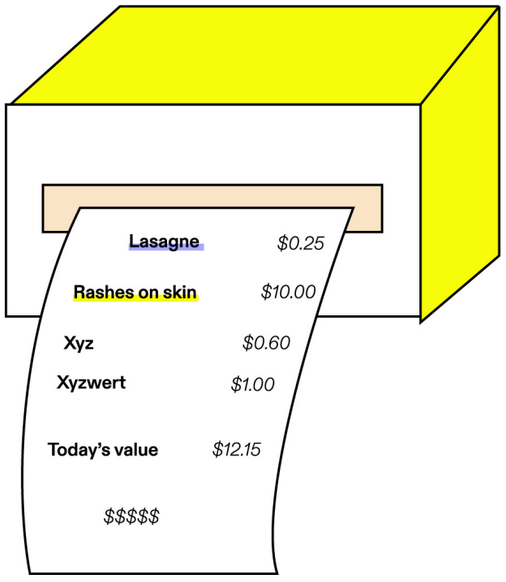
In the first phase, I actively engaged and experimented with different design concept ideas. Out of 15 ideas in the early stage the following concepts I have found the following ones as the most interesting or promising:



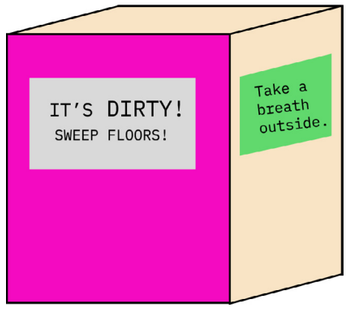
The Needy Artifact
Voice active interface that only works when it has been placed near another product in the apartment. Equipped with sensors that sense electromagnetic fields, the object facilities different conversations depending on the object nearby.

The Argue Machine
Voice machine that argues all the time. The object is trained on object-oriented ontology, e.g., objects are more than their “actions.” This time-intensive, frustrating device prompts its user experience and reflection on their interaction with other contemporary domestic VAs. It could also work as an object that shows the secret life of another object within the surrounding. How much oxygen does a plant take while gone? How much energy does the kettle use while gone?

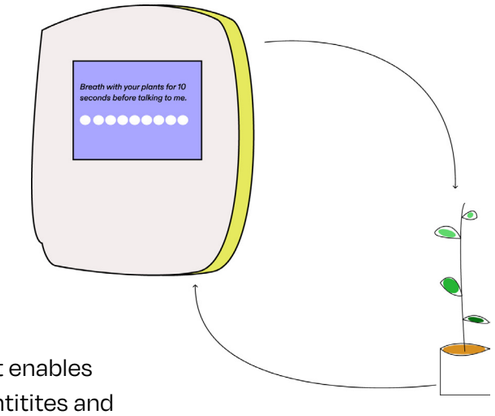
The Caregiving Companion
Works in pairs: the other lights up whenever one person is talking. To use it, both people must engage equally - in balance. A proactive therapist voice interface that initiates deep, difficult conversations and works through human touch. Moreover, it encourages its user to take better care of themselves.



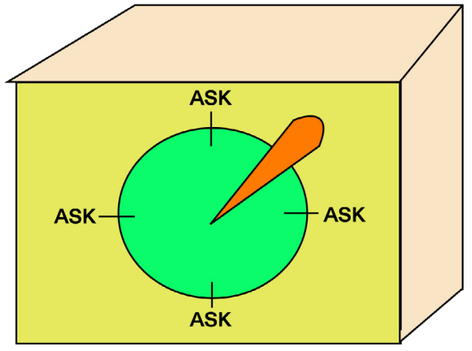
Money Talks
Voice interface that counts every word you respond; limit words to raise awareness of your words' value. A word value calculator would print everything it hears and calculate the value of these words. A printed receipt would show how much value these have. By comparing words with a keyword search on Google and real-time monetize the value of your words according to Google search key-words. People with accents are disadvan-taged because the agents do not understand them well. Thus, it would also put awareness of racial biases.



The Honest Guest
Dominant voice interface that is uncom-fortably honest and gives tasks instead of a "helper" or "servant" thing. For example, it could remind you of chores at home, taking care of yourself, go out into nature. Perhaps a secret to a happy life cube for the lonely man without a wife–or simply an honest guest. This voice interface challenges the submis-sive servant characteristics of VAs.



Post Human Interface
A posthuman voice interface that enables people to speak to non-human entitites and ecological systems, encouraging them to get in touch with their natural surroundings.



In Alignment with the Universe
Trained on Philosophy of wuwei, (Chinese: "nonaction"; literally, "no action") the practice of taking no action that is not in accord with the natural course of the universe. It allocates function/skill to specific time. If you miss the time you have to wait 24hrs until the desired skill can be used.

Further iterations

The following steps of my thesis aimed to further develop and iterate on my existing concepts. Eventually, the aim is to start prototyping three concepts in detail. I envisioned this in videos and other forms of physical prototypes. I have shown the design sketches to an audience from the University of Washington community (mostly other design students) which enabled me to gather feedback. Within the frame of the Master of Design poster show, I designed an interactive poster that allowed the visitors to give feedback on my thesis and the design concepts. What I found very encouraging yet surprising was that most people were interested in the topic. However, they never thought about the sexist aspect of domestic VAs. One visitor wrote:
"Wow, I have to say that I am slightly embarrassed not even realizing that Alexa, Siri, etc. are reinforcing hurtful gender roles."

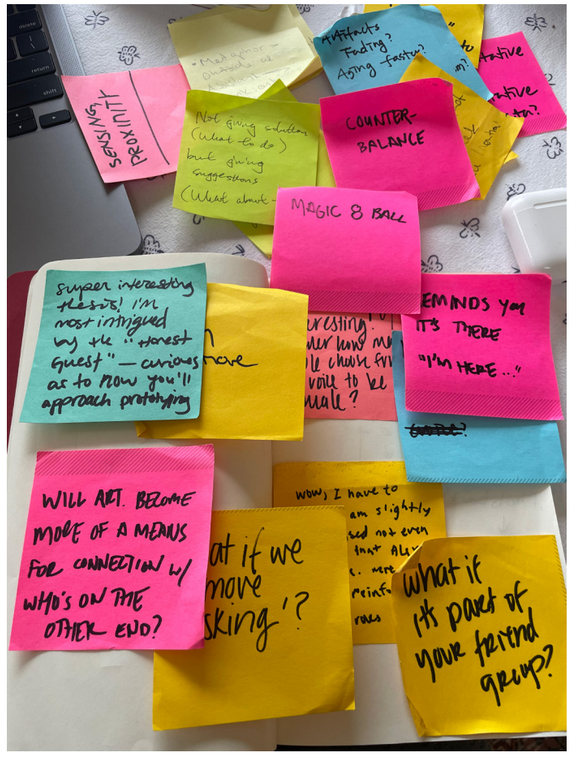


Figure 06: Post-its from poster show (Source: own material)

Based on conversations and interactions with peers, I have learned that people are interested in the topic but lack awareness. Therefore, within the next iterations, I wanted to clarify the key message I wanted people to take away while engaging with my artifacts. Is it purely about reinforcing sexist characteristics? Or is it about showing how interactions could look more playful?

Through further iterations with the material (e.g., design guidelines, sketches, scenarios) and reflecting on the analysis based on secondary literature, I defined more clearly what my work aims to unpack.

1. Challenge:
Design should challenge current assumptions and human characteristics around domestic VAs.

2. Unpack complex relationship:
Design should aim to prompt questions about the increasingly complicated relationship between smart devices and users: ML and AI-powered devices empower machines to learn, reason, and make decisions. How do we form beliefs about what they can and cannot do? And what assumptions are made about us by the data these devices collect and parse?

3. Control + Command:
Critically reflects on the (feminine) persona used in AI voice design. It aims to explore different dimensions, interactions, and identities. Especially the "command" and "control" interactions (e.g., you ask, and the device spits out an answer).

Final Iteration

I have used physical prototyping and video to display my thinking and prompt reflection for the final design outcome. Video and storytelling seem most suitable to communicate my critique:

- Video can be an effective communication tool because it allows me to combine images, text, audio, and storytelling to share my key message.
- Video can reach more people, hence, attract a broader audience. This was especially important, as I displayed this work at the annual Graduate Art Show at the Henry Gallery, where exports and non-experts will engage with my topic.

Thus, I started to look at my speculations around voice agents as identity or character development. In short, VAs are not becoming more human-like but rather as identities, characters, or, more precisely, projections of ideologies. I perceived this as a conceptual approach in contrast to a methodological one. I have learned through active experimentation with the material, which encouraged reflective observations that further informed design choices. For example, I have facilitated two co-design workshops with six first-year Master of Design students at the University of Washington. The first workshop aimed to answer what concepts should be further developed or perhaps combined, whereas the second session aimed to inform script writing and storyboarding.

Identity development

Before the first workshop, I narrowed my developing identities into three concepts. All three concepts pay attention to voice agents as social actors. The term social actor emphasizes that these devices are embedded into our lives. They fulfill roles in social relations, just as other people do. Thus, technology becomes a social actor that people interact with.

Identity 1: The critical void
A voice agent that has multiple identities.

Identity 2: The nosy interface
A voice agent that becomes overly involved in the user's life.

Identity 3: In alignment with the universe
A timely limited voice agent, a user can ask certain questions only at specific times.

I aimed to creatively engage in brainstorming activities for the first workshop with participants. Therefore, I presented the concepts very broadly. For instance, I only mentioned their title, one-line introduction, and what it aims to critique, as seen in the graphic on right (Fig. 07). The thinking behind it was to get as much creative input as possible. I recruited six participants from the first-year students of the Master of Design students at the University of Washington. It was a very iterative process of me introducing the artifacts with a picture and a short description. Afterward, I asked them to share their first thoughts and reactions verbally. In the second phase, I asked the participants what they envisioned everyday life like with the artifact(s), and we

brainstormed about use cases and scenarios. This was done with pen and paper. The cooperative workshop environment was ideal for encouraging brainstorming.

Identity	Critical Void	Nosy Interface	In Alignment with the Universe
Critique	Singular voice and identity Female by default Stereotypical gender norms	Shy yet caring Control + command	24/7 available assistant Trigger word Consumerism
Design Decision	Voice agent with multiple personalities. Push gender boundaries by switching from female to male.	Forms and states opinion about users life without being asked for it.	Voice agent that follow its own rhythm.

Figure 07: Idenity table
(Source: own vizualisation)

Storyboard & Script

After facilitating the first workshop, I transferred the notes into my existing vision of the artifacts and combined them in a written scenario and storyboard. The following images shows the first iterations of the storyboards. I have used sketching, and images (adapted from shotdeck). I realized that producing three videos requires too much time for the little time left. Therefore, I have eliminated the second scenario, "the nosy interface." It seems to be the weakest, and I already had ideas to embed its critique into the first identity (critical void, multiple identities).

Identity 1 “Critical void” high-level scenario:

- An artifact that has different personalities, characters
- User experience sexist incident at work
- Artifact is nosy and starts to discuss how the user should handle the matter best

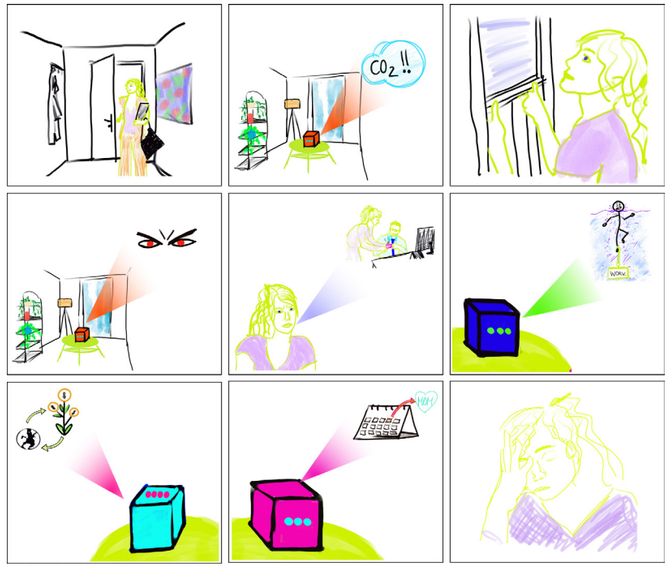


Figure 08: Storyboard critical void
(Source: own illustration)

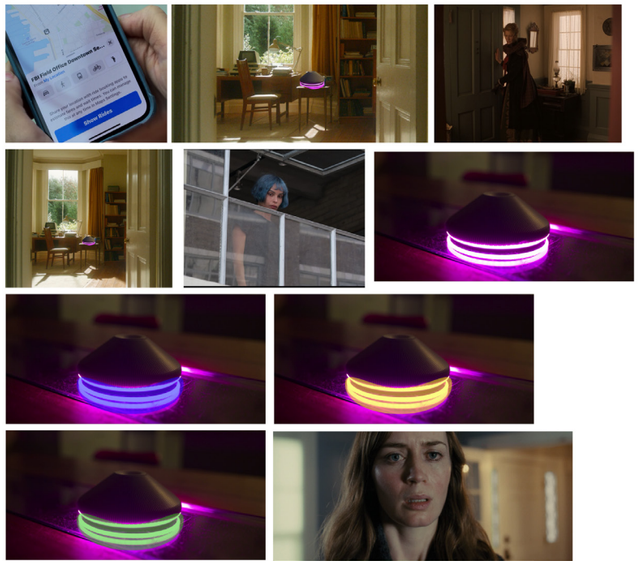


Figure 09: Storyboard critical void
(Source: adapted from Shotdeck.com)

Identity 2 “In alignment with the universe” high-level scenario:

- Touch it in the morning to get it started (Caring)
- Time is restricted, which prompts mindful interactions
- Users have to be respectful of VA’s time, ask questions–slow response
- Trained on philosophy

Figure 10: Storyboard alignemtn with the universe
(Source: own illustration)

Figure 11: Storyboard alignemtn with the universe
(Source: adapted from Shotdeck.com)

After ideating with the first storyboards, I wrote the scripts simultaneously. It was a very iterative, playful, and generative process. After the first round of writing, I facilitated another workshop with the same six (workshop one) and two new participants. I decided to work with the same participants because they were already engaged in the topic and my work. I created dossiers that show the first iterations of storyboards and scripts. In the first phase of the workshop, participants read the storyboards themselves (quite). Afterward, we would all share points of improvement, what makes sense, and, most importantly, how I can communicate the story best in my final videos (e.g., the perspective of shooting the footage, etc.). The outcome of this workshop informed my final storyboards, script writing, and direction of the videos a lot. In particular, how to shoot the conversation between the actor and the artifact and how to best shoot the conversation within the identity of the artifact one. I have learned that I took advantage of "over the shoulder shots".

At the same time, I have recruited Iveliz Martel, a Master's student from the Drama department at the University of Washington, to act in the videos. While preparing the production of the video and meeting with my actress, I simultaneously worked on the scenarios. As I had to start thinking about how to communicate the concept best to non-experts, or people who have yet to be part of the project, I reworked their description and naming. Moreover, after receiving input from Audrey Desjardins, the co-chair of my thesis committee, I tweaked the second scenario into a more sustainable, conscious storytelling direction. Therefore, timely interactions are limited due to the big environmental impact of data collection.

Throughout this process, I worked closely with Wyatt Olson. He is a first-year Master of Design student at the University of Washington and a video artist. He helped tremendously to realize my vision; however, working with a professional also required extra hard work in the planning. For example, my storyboards required every single shot with the exact perspective it will be recorded (yes, this surprised me). I usually work very playful and along the lines of "We will cross the bridge when we get there." Working with Wyatt, a professional when it comes to videography, taught me to plan everyday details before I shoot.

Therefore, I had to refine my storyboards and include the exact type of camera frame I wanted. As I had zero experience with the technicalities of directing a video/movie, I was happy to use Studio Binder as a resource to learn about this.

1.

Intro

Lisa is in the car ready to leave work and is texting a friend about a toxic boss.

We see Polyphonic lighting up.

The different identities of the VA are starting to have a conversation about Lisa's encounter with toxic boss. Lisa's attitude of work in general. Political discussion starts.

Voice 1 (Male voice, easily stressed): Whispering: hey are you there? Did you see what Lisa texted her friend Maya? We have to talk to her, I'm worried.

Voice 2 (female voice, socialist): Of course Lisa doesn't like working for her sexist boss. But society has taught her to have a great work ethic and don't complain about it.

Voice 3 (female voice, capitalist): What else is Lisa supposed to do? She has to have a great work ethic in order to be part of modern society.

Voice 2 (female voice, socialist): I think you [VA3] should change their perspective of nature of work. As defined by studysmarter.co.uk Societies are characterized by their shared values, beliefs, and cultures and not by their work.

Voice 3 (female voice, capitalist): Yes, BUT we live in a capitalistic society. Lisa's work ethic is paying off in the marketplace. Otherwise she might not have the means to buy machines like us. What do you [Voice 4] think about it?

Voice4 (male voice, assistant VA): I don't understand what you're talking about. I'm here to serve Lisa's needs. She is the boss around here.

Lisa is coming home (we steps on the stairs and key turning)

2.

Voice 1 (Male voice, easily stressed): Pssst. She is coming home.

We see Lisa entering the apartment. Where Polyphonic welcomes her.

Voice 4 (male voice, assistant VA): Hello, Lisa. We have been waiting for you.

Chaos with voices: everyone tries to speak at once.

Voice 1 (Male voice, easily stressed): Voice 2 (female voice, socialist): Voice 3 (female voice, capitalist):

Lisa: What is going on here?

Voice 1 (Male voice, easily stressed): nervous! Emh emh, we saw your text about your boss that treats you like an assistant and now everyone is arguing what is best for you. Can you open the window, I'm so warm.

Lisa opens the window

Voice 2 (female voice, socialist): I think you should whether you want work to define your life and feeling of fulfillment.

Voice 3 (female voice, capitalist): Ach, stop it already.

Voice 5 (male voice, nosy persona): Okay, to sum up. It seems like we not sure whether you are more concerned about making a living than making a life. I sent her a text message asking her to come over for Dinner on Friday.

Lisa seems clearly annoyed and states: What?? I had a date planned with Sarah.

Lisa unplugs the device. The end.

It is the year 2030, global warming and environmental catastrophes are at its peak due to over consumption and wasteful use of resources. A law has been established that limits data storage. Since the data centers do not allow "always on" devices anymore, the interaction with smart devices is timely limited.

We see the sun rising and a book shelf with philosophical books.

We see a sleepy Ecoverse on the kitchen table.

Maries walks down the stairs, sits down at the kitchen table and touches VA to take it up (Care for it, slow wake up, no plug in but human warmth -> energy efficient).

Ecoverse: slowly lights up. Good morning Marie. Today is the 6th of May 2031. Your limit of 4 interactions starts now.

Marie: What is the weather going to be like this week?

Ecoverse: It looks like an average day week for the Pacific Northwest. We have rain and incoming thunderstorms, paired with temperatures above 80 degrees fahrenheit.

Marie: How long does it

Ecoverse:

Marie: How can I practice being more present in my daily life?

Ecoverse: Try to focus on the now. Breathing exercises, physical activities, and keeping log on your feelings might help you.

Marie: Do you think it's *possible to feel happy and sad at the same time?*

4.

Ecoverse: Takes a long time to respond (sound of searching for something): Is it really necessary to pursue happiness and how would you measure it? Most humans measure happiness with money, success, and power. You can do some soul searching what this means for you.

Marie: At the same time: How should I best do soul searching? seems a little disappointed but yet interested in the quest.

Good bye, you have reached the limit of daily interactions. We can connect again tomorrow.

VA is off.

Marie: Marie seems disappointed yet interested in the device.

CUT: forward in time

Marie walks down the stairs (same same shot, different clothes)

Marie goes outside for a walk before starting VA. Writes down notes about emotions and feelings. Marie writes down meaningful questions on the iPhone to ask Ecoverse.

Maries is back home. Touches Ecoverse (same shot, wears a watch)

Ecoverse: Good morning Marie. Today is the 10th of May 2031. Your limit of 4 interactions starts now.

Marie starts asking questions from notes on the phone.

Marie:

Ecoverse: To realize that boredom does not come from the object of our attention but rather from the quality of our attention is truly a transforming insight.

Marie: How would you define emotions?

Ecoverse: An emotion is like a cloud passing through the sky. Sometimes it is fear or anger, sometimes it is happiness or love, sometimes it is compassion. But none of them ultimately constitute a self.

Marie: Are too many thoughts bad for you?

come and go.

Marie: How can I shift my thinking into a freeing experience?

Ecoverse: There are many times when humans cannot simply let thoughts come and go, either because we are lost in them or because we choose to think something through, perhaps as a precursor to action. In both these cases it is crucial to understand which thoughts you give your energy to, because these thoughts do have a karmic impact; they lead you. From thoughts come actions. From actions come all sorts of consequences. Which thoughts will you invest in? Your next task is to see thoughts more clearly, so that you can choose which you want to act on and which simply to let be.

Meaningful interaction between booths. Zoom out, focus on the philosophy book on the table.

1

1

Figure 12: Scripts
(Source: own material)

The Outcome

Scenario 01: Polyphonic

Polyphonic meaning:
Having two or more voices or parts, each with an independent melody, but all harmonizing; contrapuntal (opposed to homophonic). It implies a voice agent that offers multiple identities, roles, and opinions.

Description/Speculation:
This scenario emphasizes voice agents as social actors. This scenario envisions a future where everyday life with a conversation agent could look like that has multiple identities, characters, and ideologies. By creating different identities with their ideologies and characteristics, I want to push against the current persona, which is submissive and capitalist (e.g., Alexa, which is linked to your Amazon account). Moreover, the identities become overly involved in the user's life with information obtained based on the connectivity to other devices (e.g., smartphone, text messages). Therefore, it also raises awareness towards the data collection component of such devices (e.g., what if your device starts to spy on you?).

Critique:
This concept critiques the singular voice and identity of current domestic voice agents. Moreover, changing from a female to a male voice regarding the topic pushes the boundaries of stereotypical gender norms embedded in the device. Additionally, it aims to push thinking about the connectivity of smart devices and their data collection component.

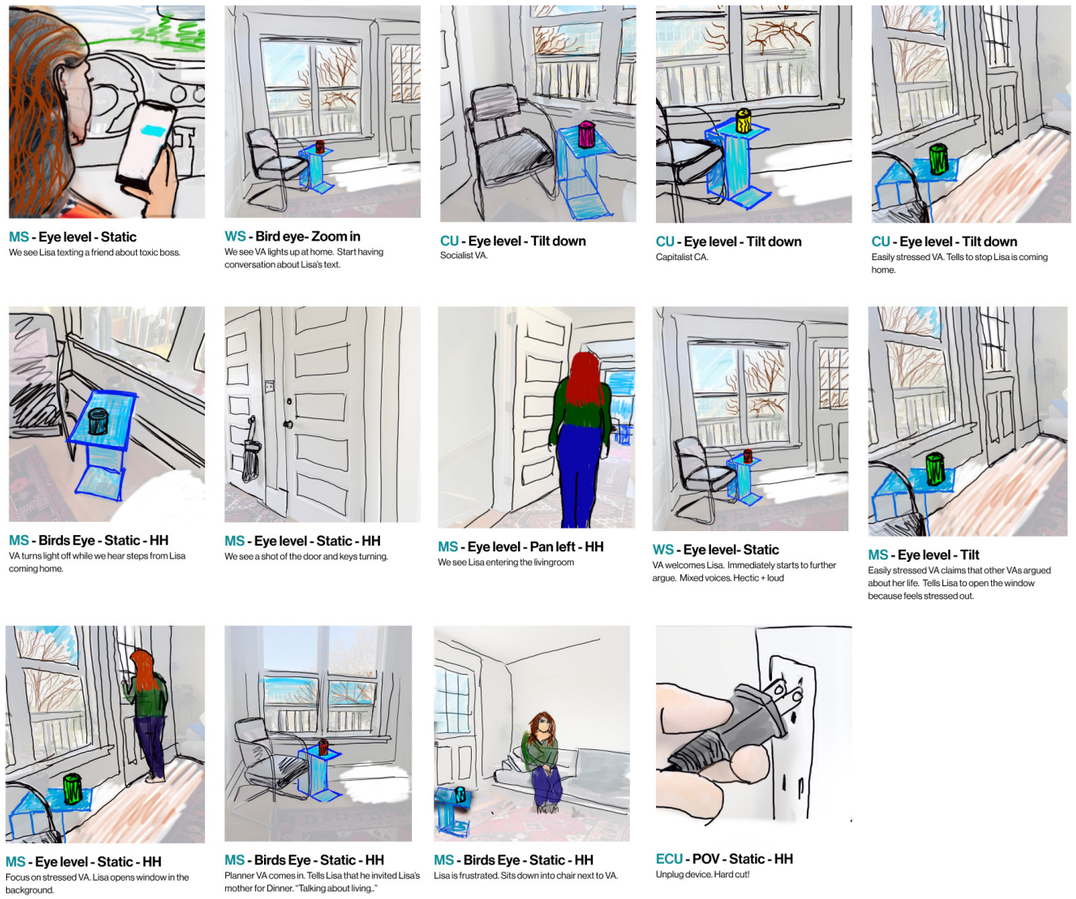


Figure 13: Storyboard 'Polyphonic'
(Source: own illustrations)

Scenario 02: Ecoverse

Ecoverse meaning:
A combination of the words “eco” and “converse” implies a voice interface designed for sustainable and environmentally-friendly interactions. The “eco” prefix denotes something environmentally conscious, while “converse” suggests a back-and-forth conversation or dialogue.

Description:
Ecoverse is more than a tool, it is a social actor that prompts mindfulness, philosophical insights, and wise and guiding presence. The aim was to design a voice interface that is conscious of its impact on the environment and is designed to minimize its energy consumption and carbon footprint while promoting mindful interactions that encourage users to be present and attentive in the moment. Ecoverse’s design invites presence, attention, physical presence, and ritualization of our everyday life with domestic agents.

Critique:
This concept critiques aspects of the shy yet caring, 24/7 available assistant that fulfills demanding tasks. Furthermore, the incentive to push meaningful interactions proposes alternatives to over-consumption in today’s society and most use cases of domestic VAs. Finally, the time-restricted interface also pushes boundaries regarding the big environmental impact data collection of smart home IoT devices has.

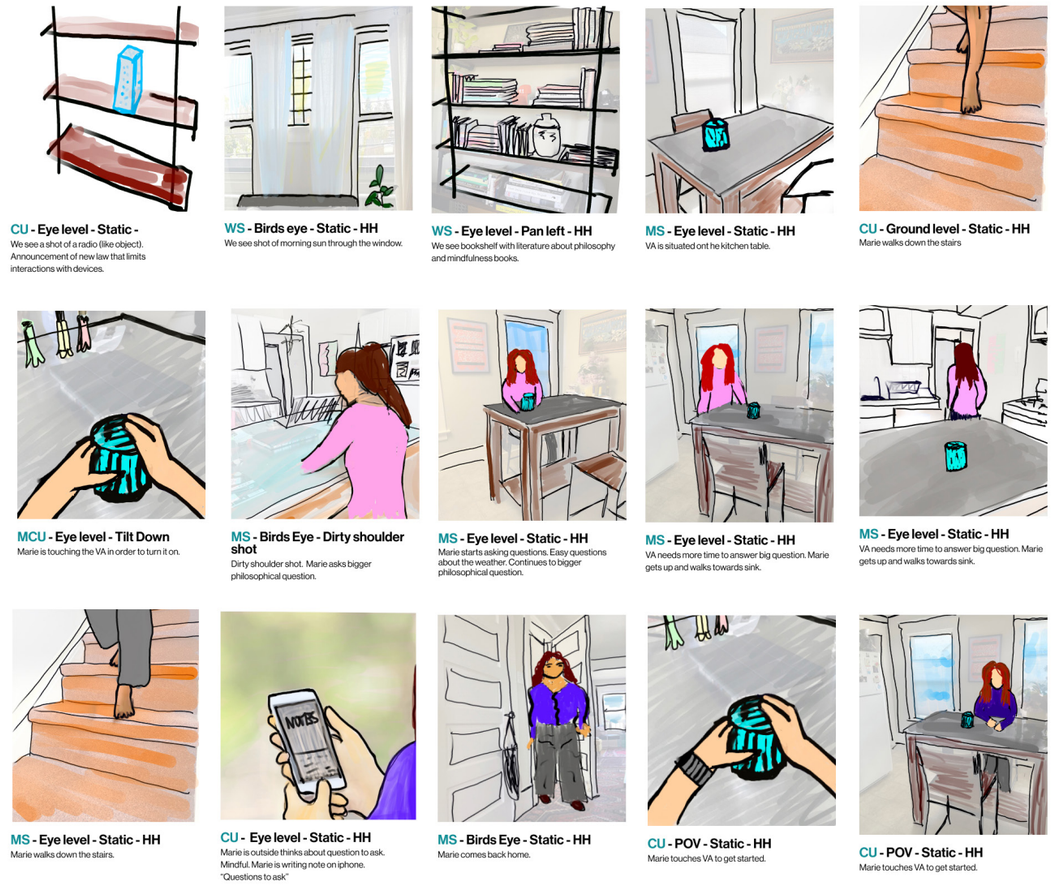


Figure 14: Storyboard ‘Ecoverse’
(Source: own illustrations)

Artifact Design

Regarding the design of the artifacts, I wanted to create something that differentiates itself from the current form language. Therefore, I started with an analysis. While observing the images of current VAs, one can easily see that the form language is shy, with rounded edges, symmetrical, clean, and almost dull. They are designed to fade into the background with a singular form and identity (see moodboard, Fig. 15). The speaker is often hidden in the object, and an LED light as small as a pin shows whether the speaker is interacting with you. There is no indicator about whether the device is on–it only shows whether it is currently interacting with you.

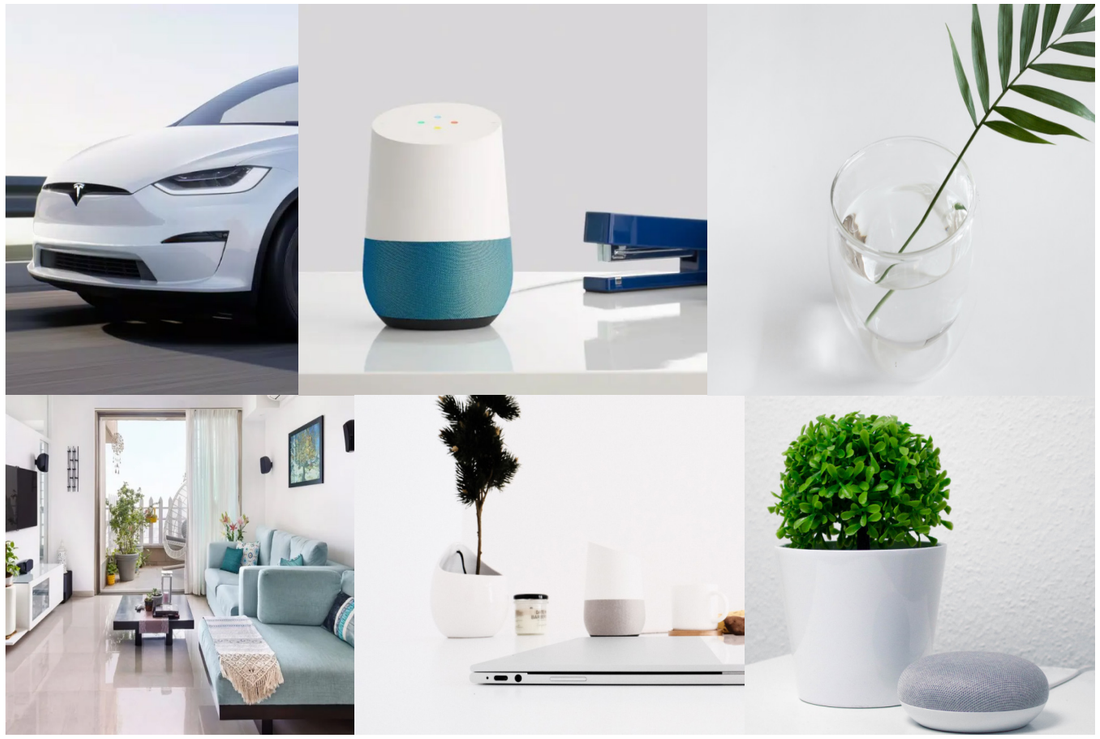


Figure 15: Moodboard current VA design
(Source: images adapted from the internet, own composition)

Therefore, I wanted to transform the current form of language into something that differentiates itself from the background. Bold Edges, geometrical, asymmetrical, and overall loud objects. Exploratory for people who do not live in generic apartments and who like modernist, edgy objects. Kris Brauer, a first-year Master of Design student at the University of Washington, helped me build and render the sketches in Rhino. Afterward, I 3D printed the prototype with PLA. The artifacts are only 3mm thin, so the surface is translucent. This was an important factor, as the LED lights have to shine through the object's wall.

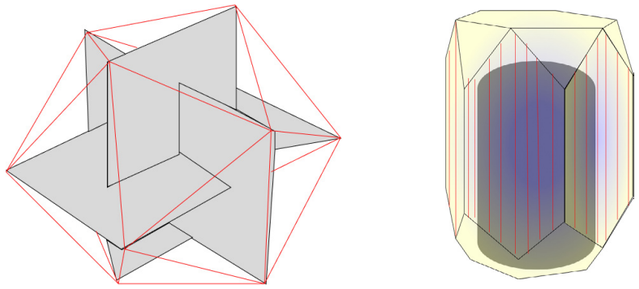


Figure 16: First sketches Polyphonic (right) Ecoverse (left)
(Source: images own illustration)

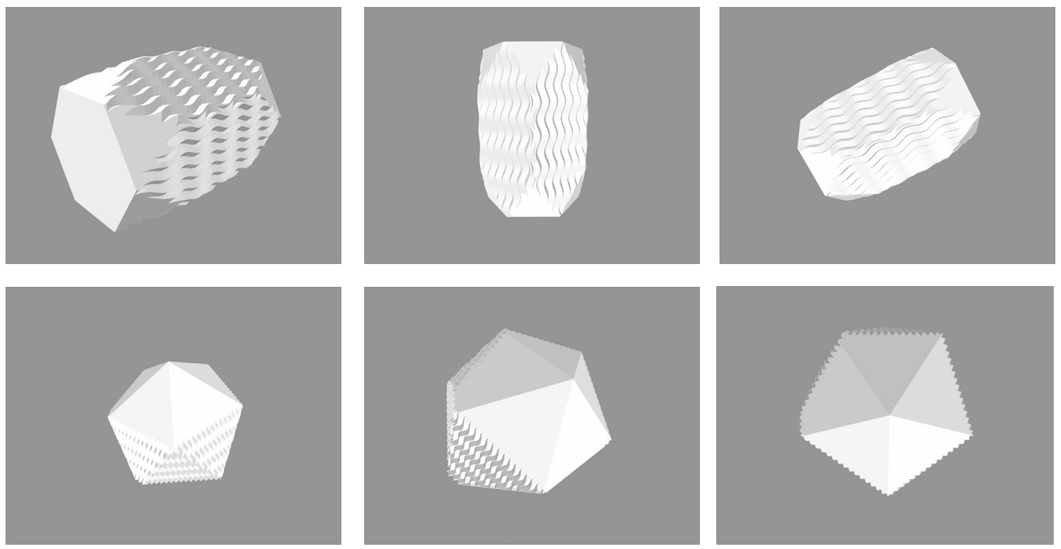
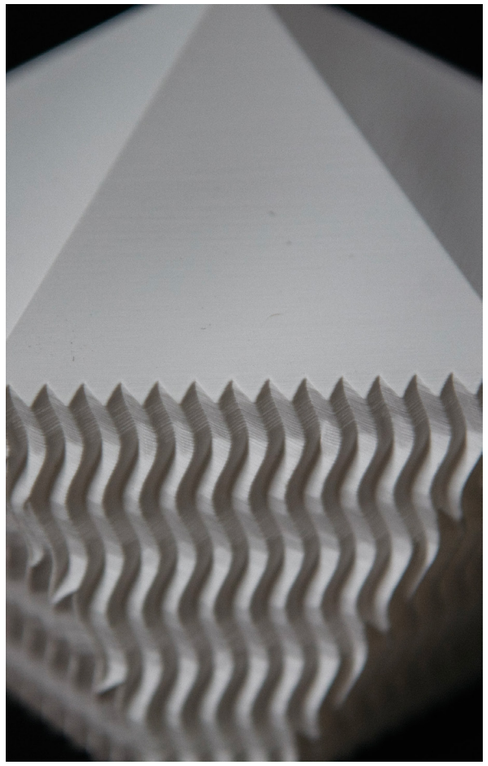
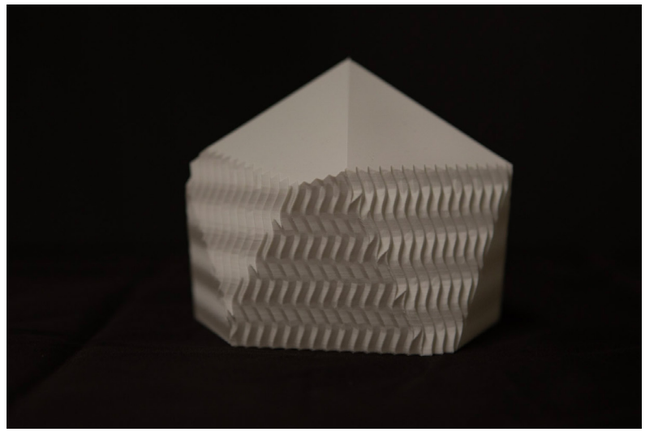


Figure 17: First renderings Polyphonic (bottom) Ecoverse (top)
(Source: own visulizations)





Polyphonic: I choose this geometric form because it resonates with the different multi-identity characteristics. The five surfaces that come together represent the identities. I also used a rifled surface to have a coherent design language.

Figure 18: Physical prototype 'Polyphonic'
(Photo credit: Wyatt Olson, 2023)

Ecoverse: As this scenario has a component where the user must care for it to get it started, the haptic and tangible aspect was very important. Thus, the design of a ruffled surface seemed very suitable.

Figure 19: Physical prototype 'Ecoverse'
(Photo credit: Wyatt Olson, 2023)

Final Video

The final outcome of all the points mentioned above resulted in two 2.5-minute videos. Click **here** to watch.

Polyphonic

Voice agent with multiple identities.

Figure 20: Stil from Polyphonic
(Photo credit: Wyatt Olson, 2023)

Ecoverse

Voice agent that has limited interactions.

Figure 21: Stil from Polyphonic
(Photo credit: Wyatt Olson, 2023)

Polyphonic

Figure 22: Stil from Polyphonic
(Photo credit: Wyatt Olson, 2023)

Ecoverse

Figure 23: Stil from Polyphonic
(Photo credit: Wyatt Olson, 2023)

Henry Gallery

Every year Graduate students from the University of Washington's School of Art + Art History + Design Master of Fine Arts and Master of Design thesis have an exhibition at the Henry Gallery. I displayed the artifact and the videos in my designated gallery space.

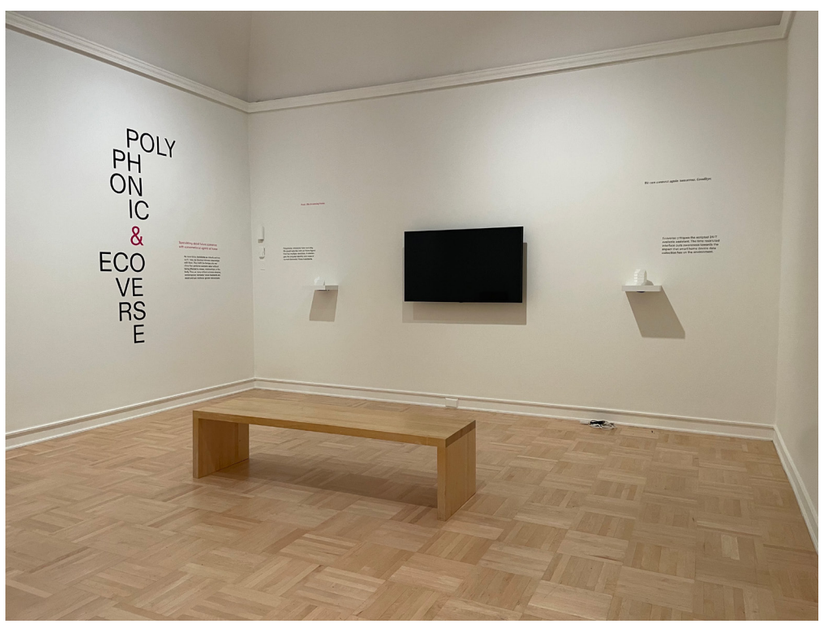


Figure 24: Exhibition at the Henry Art Gallery, Seattle
(Photo credit: Claire Weizenegger, 2023)

CHAPTER 05 Discussion & Conclusion

Discussion

This thesis explored the repercussions of domestic VAs. It has focused on analyzing its sexist characteristics (e.g., RQ 1) and how design can be used to propose alternatives (e.g., RQ 2). Combining the methodological and conceptual approaches led to the creation of two speculative design videos and artifacts that communicate my thoughts and critique. Through continuous active experimentation with the design materials, I learned that female branding and voice are only some of the problems regarding the repercussions of VAs. It raises a bigger societal question about how we design and interact with technology from a sociocultural perspective. The discussion section of this thesis will focus on the emerging social norms and the rethinking of the meaning of home, and it will explain the implications of the design choices and propose a future where voice agents transition from mere assistants to social actors with agency, challenging current norms and roles assigned to them. This discussion explores the potential impact on the concept of home and how smart technology can shape and redefine our domestic spaces.

Shifting social norms

Even though technology has become such an integral part of our lives, it is still important to critically examine how we interact. We, designers, have to reflect upon what **norms we materilize into the world** through the artifacts we design. Nowadays, our views of and interaction with VAs are strongly anthropocentric and often permeated by the notion of dominance. Therefore, my work invites readers, viewers, users, non-users, and other designers to reflect and explore alternative ways of living along with domestic voice agents. I encourage a paradigm shift away from current norms and roles assigned to voice AI. We need to question whether domestic voice AI should only serve as assistants or if it can play a more meaningful role in our lives. Smart technologies like VAs are viewed as literal assistants to perform tasks based on their owner's demands. Therefore, to move on from 21st-century norms, we must challenge how we interact with current technology and what role it should fulfill. I think challenging how we interact with technology is crucial for societal progress. Therefore, my thesis invites other designers, users, and non-users to challenge how we think and interact with domestic voice agents. By remaining their role in our lives, we can explore new possibilities and redefine our relationship with the material.

Polyphonic and Ecoverse showcase how voice AI can fulfill different roles than current submissive, subservient roles. For example, they can mediate practices for greater equality and social responsibility. Polyphonic has political tendencies (e.g., capitalist, socialist identity). However, such a device could also be trained with ethical guidelines, helping users make informed decisions and guiding them toward socially responsible actions. This could be especially valuable in situations where users

are faced with ethical dilemmas or need assistance in navigating complex issues. Simoutlanely, Ecoverse, the mindful actor, could become a domestic voice agent that becomes a faithful companion. It would be programmed to understand and respond to human emotions, providing empathy and support. This could be particularly beneficial for individuals in single households who may feel lonely or isolated, offering a source of comfort and companionship.

Furthermore, as we have learned, voice agents could also play a significant role in sustainability efforts. They could provide real-time information about energy usage, carbon footprints, and sustainable practices–like Ecoverse. By encouraging and guiding users towards eco-friendly choices, voice agents could contribute to a more environmentally conscious world.

Rethinking the Essence of a Domestic Space

The rethinking of the meaning of home is a crucial aspect of this discussion. By creating ideas that challenge the repercussions of contemporary domestic VAs, my thesis prompts me to reconsider the power dynamics and societal roles assigned to technology within the domestic space. The 24/7 availability of Voice Assistants as a persona raises concerns about privacy, boundaries, and the blurring of work-life balance. This prompts us to question how our interactions with technology impact our understanding of what home should or could be—a sanctuary, a place of comfort, a workplace, a space for personal and familial relationships, or simply where the heart is.

The design proposals, sketches, scenarios, and prototypes developed in this RtD process offer a glimpse into a future where voice agents transition from mere assistants to helper tools, companions, or just characters that shape the everyday life of the users. This reimagined role of voice agents can also reshape domestic spaces. Voice agents as social actors with agency can foster companionship, emotional support, and advocacy for social justice within the home. Making clear boundaries between humans and machines (e.g., voice agents) can redefine the dynamics of human-technology interactions and open up new possibilities for meaningful connections.

After all, my work puts greater emphasis on personalization and non-normative homes. Instead of having a one-size-fits-all approach, they could adapt to individual preferences, interests, and values. Polyphonic, for example, displays how a voice interface with different political lenses and characteristics could mediate one's everyday life. This could be particularly suitable for non-heteronormative households as

they have unique dynamics and needs. The potential for personalization and customization in domestic voice agents would open up the opportunity to adapt to different relationship structures, family configurations, and identities. For instance, the possibility to customize pronouns, relationship terminology, and preferences would reflect the diverse nature of non-heteronormative households. They could be designed to raise awareness about important LGBTQ issues, educate, support users, and provide resources for activism. By leveraging their reach and influence, voice agents could contribute to creating a more just and equitable society. While perhaps revolutionizing the voice AI domain, it would simultaneously raise major ethical questions. For example, what data would they be trained on? And more importantly, who is writing the script of what is 'moral'? Or, as Nietzsche stated in the Genealogy of Morals, morality is an obstacle to true freedom, and people should strive for self-mastery and not be bound by traditional moral codes. Also, I could see how a voice agent advocating for social activism could go dark quickly. For instance, if the wrong people program them, you suddenly have a racist extremist in your home.

Policy and Regulations

My work also encourages other stakeholders, like policymakers and governance, to reconsider the implications of current design and engineering decisions concerning digital smart technology. Because addressing the repercussions of domestic VAs also has political tendencies. For example, whereas the European Union has regulations regarding the development of VAs (citation), the US lacks regulations. This means that companies have a lot of freedom to design their voice assistants in any way they want, including using gender stereotypes and biases. Without clear guidelines, it's difficult to ensure that voice assistants are designed ethically and non-discriminately.

Moreover, the whole topic of gender stereotypes can be seen as a politically charged topic. For instance, some may argue that it is a matter of free speech and expression, while others may argue that it perpetuates harmful stereotypes and biases. Finding common ground and developing policies that balance the interests of different stakeholders can be challenging. Therefore, holding companies accountable for any harm caused by their VAs can be difficult. Particularly it needs to be clarified who oversees their development and deployment. This lack of accountability can hinder efforts for greater equality.

Finally, many governments and policymakers may need more resources or expertise to address the repercussions of modern technology (citation). This can make it

challenging to develop effective policies or regulations promoting gender equality and non-discrimination in VAs.

Future Directions

Future research could explore more diverse non-heteronormative home settings, for example, in a shared household with multi-users. A multi-user scenario would change the artifact design tremendously (e.g., Polyamory relationships, shared housing). For instance, how would every day look like if every user had their own voice agent personality they would talk to?

Limitations

It is important to acknowledge the limitations of this study. The RTD approach provides valuable insights and possibilities, but further qualitative and empirical research will be necessary to fully evaluate the proposed design interventions and their impact on users' experiences and perceptions. My work has yet to be tested with a bigger audience outside the design field. Therefore, the granted insights might not be generalized.

Conclusion

In conclusion, this thesis has critically examined the prevailing issue of sexism in domestic VAs and explored the broader question of how technology mediates everyday life. It showcases that the design choices made in the development of VAs have repercussions, such as reinforcing harmful gender biases and contributing to greater inequality. The 24/7 availability of VAs, coupled with their gendered representations, contributes to unequal power dynamics and limited societal roles for women. This analysis highlights the need to critically reevaluate current design norms and interactions with voice agents in domestic settings. I have used theories from philosophy to inform my thinking and methods from design to create artifacts.

Eventually, the voices of VAs are feminine because society wants them that way, and people prefer female voice assistants due to their nurturing, submissive responses. Ultimately, tech companies allow societal (intersectional) sexism to shape their products instead of using their platform to rewire society's implicit biases. Therefore, to effectively address the negative implications of domestic VAs, it is crucial to recognize and acknowledge the complex and interconnected nature of the problem. An intervention should go beyond technical fixes and incorporate broader social and cultural changes. I've learned that it requires a multidimensional approach involving developers, policymakers, users, and, finally, a shift in the mindset of modern society at large.

Furthermore, throughout the course of the thesis, an inclusive and collaborative approach with peers was adopted to ensure that diverse perspectives were incorporated into the development of domestic voice AI designs. Workshops and collaborative sessions were organized. These workshops served as spaces for open dialogue, feedback, and co-creation, exploring different needs, desires, and experiences with domestic voice interfaces. The iterative nature of the RtD tradition enabled continuous reflection and refinement of the design proposals, sketches, scenarios, and prototypes. By actively involving peers and stakeholders throughout the design work, this research aimed to foster a sense of ownership, inclusion, and empowerment, ensuring that the resulting domestic voice agents are designed to be more responsive and meaningful to the diverse users they aim to serve.

This thesis serves as a call to action for users, non-users, designers, researchers, and technology developers to critically examine the biases and discrimination embedded in the design of Voice Assistants. It advocates for a future where technology fosters inclusivity, challenges gender norms, and contributes to a more equitable and morally conscious society.

Behind the Scene

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