Human Motivations on Smart Home Assistant Rejection

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

According to reports in 2022, Alexa from Amazon lost around $10 billion (Amadeo, 2023, pg. 1)—unfathomable figures for a device that was once thought to be the house of the future. The technology this article investigates is smart home assistants, which is what Amazon Alexa includes. Often called artificial intelligence (AI) or virtual assistants, Amazon's Alexa, Google Assistant, and Apple Siri were among the first smart AI home assistants of the previous ten years. These AI helpers establish connections with other household appliances, fans, and lighting. I'll look at Google Assistant and Amazon Alexa in the context of this thesis, examining their growth, development, and eventual causes for the decline that followed—essential characteristics to take into account for the future of smart homes.

The human motivations behind the development and rejection of smart home assistants are the focal point of the investigation of my prospectus to dissect the industry thoroughly. In this thesis, I will break up the specific factors to examine how smart home assistants Google Assistant, and Amazon Alexa have transformed households while consequently scrutinizing the specific controversies. The core questions I am examining are why do we have smart home assistants and how have we shaped the direction of smart home assistants? I investigate the development of smart home assistants and the socio-economic influences that have shaped this technology. This paper includes two case studies on the Google Assistant and Alexa smart home assistants that will provide quantitative and qualitative evidence of smart home assistant declines. Including SCOT along with the concepts of home and digital capitalism, I will highlight where the dissonance occurred between both parties the homeowner and the corporation.

This paper includes a section on research and the STS framework along with the two case studies and a discussion following. Before delving into the specific assistants, this paper will introduce two topics, The Concept of Home and Digital Capitalism which play a vital role in the analysis of such devices, and the STS framework concern.

The Concept of Home

One of the most important aspects of this research paper is the examination of how smart home assistants influence the home, and can combat the inherent principles we place on what it means to be a home. In *Home is Where the Smart Is? Evaluating Smart Home Research and Approaches Against the Concept of Home*, Kirsten Gram-Hanssen defines four aspects that distinguish the home: security and control, activity, relationships and continuity, and identity and values.

The first concept is security and control. In opposition to the workplace or institutions, the home is the place where you are in control and can feel safe from the outside environment. The importance of home as control and safety can be best understood as Gram-Hanssen states "Paradoxically when studying those who have to live in places which do not accommodate this notion of the home, such as marginalized people living in rooming houses" (2017, pg. 1). This is perhaps the most controversial of concepts that smart home assistants such as Google Nest and Amazon Alexa combat with their influence. The variety of security concerns that envelop smart home assistants will be examined throughout this paper. The second concept of the home is that is a site of activity. The home offers an avenue for many different activities including cooking, cleaning, eating, sleeping, etc.… This is for many the activities of everyday life, a habitual ritual for many that in recent years has been encroached on by technology. In the novella Unauthorized

Bread, C. Doctorow sets a story where smart home technology envelops the habits of every homeowner. In its most extreme even the toaster can only toast "authorized bread". Although a fictional story, it highlights the friction of technology influencing basic everyday aspects of our lives with much of it residing within the home.

The third concept is that the home is a place for relationships and continuity. One interpretation of this is the home "is about continuity and permeance, indicating that home is a temporal process, changing over time, but also relating to what was before" (Gram-Hansen, 2017, pg. 3). This entails families given home over to future generations and our childhood memories. Deep emotional ties generally give a sense of belonging and having roots in a place.

The final concept is that the home serves as a place of identity and values for those that inhabit per Gram-Hanssen. We place a large emphasis on class, and homes are yet another symbol of this. Technology also offers an opportunity to differentiate class, smart homes if effective may cause a bolstering of home status. These four concepts offer a paradigm to reflect on when examining smart home assistants and how they influence, transform, and dictate the behavior of the homeowner. When reviewing the two smart home cases further in this thesis, these concepts will play heavily in the interpretations of behavior and actions of both the homeowner consumer as well as the designer and producer Google and Amazon.

Digital Capitalism

At its core, digital capitalism is anything that uses computers and the internet for profit. Technically, every transaction on earth that uses a computer is digital capitalism if the result is a profitable outcome. In the scope of smart homes and assistants, this thesis will examine how

companies leverage personal data within the home to create returns and profit. In Too Smart by Jason Sadowski, he stresses as smart home appliances become more common companies can keep tabs on increasingly more parts of our lives. For many tech companies including Google and Amazon, their products' key selling point is that it's meant to transform your house into a palace of comfort and leisure. Alternatively, as Sadowski suggests, a business model that takes advantage of personal data. One use-case of this principle today is insurance companies' partnerships with tech firms offering special deals offering discounts on premiums for installing smart home systems. For instance, "Liberty Mutual will give you a free Nest Protect smoke detector if you let it monitor the device" (Sadowski, 2020, pg. 120). This is a compelling example considering later in this paper I will discuss the Nest product as an outlet to Google's smart assistant. Again, this stresses the idea that using personal data within the home to create profit for companies epitomizes the existence and strength of digital capitalism.

Concluding this section, these smart home assistants offer a model of efficient living, however, this data factory will also be used to produce people who conform to business interests. A disturbing idea to think about within one's home. Sadowski concludes in his arguments "Our most intimate spaces will be transformed into super attentive, active environments that respond to our commands, observe our behavior patterns, and adjust to our preferences", (Sadowski, 2020, pg. 125). That is the crux of digital capitalism. This thesis will pivot to discussing the intricacies of both Google Assistant and Alexa, discussing how the method of research was conducted, and introducing the STS framework that ties the technology to social structure.

STS Framework & Methods

For this thesis, smart home assistants Google Assistant, and Amazon Alexa were researched with the framework of Social Construction of Technology. The SCOT framework, introduced by Trevor Pinch and Wiebe Bijker, challenges the notion that technology has a profound impact on human nature and lives. SCOT asserts that technology is developed and shaped by human actors and that the development of said technologies is solely dependent on the desires and characteristics of these actors. Supporters of SCOT "[focus] their attention on the social settings in which specific technologies have been developed and the ways users have often adapted innovations for their purposes" (Sismondo, 2009, pg. 94). Consequently, I scrutinize how users put worth on smart home assistants ultimately determining if these artifacts are adopted into society. It is also important to note that these same human users can also reject certain technological artifacts from society, which is what this thesis aims to address.

In the context of this prospective study, I have applied the SCOT framework to two sets of groups. The social groups in question are the consumer body of the smart assistant Amazon Alexa and Google Assistant products i.e. the homeowner along with the product leads and the corporations of Amazon and Google. Both parties according to SCOT make up the necessary actors that shape the development and rejection of smart home assistants, thus making it imperative to understand their motivations and philosophies. A conversation between the different groups provides clarity on how smart home assistants are to survive in this social climate. I offer potential remedies to a failed product by redefining the problem of the smart home device's use within the home-- where a single definition is decided upon, bringing stabilization to the topic, or a high degree of agreement among these groups on the use of smart

homes. The dissonance in question between both groups can help conclude how overall technology is shaped by the voices that dictate development.

Regarding the collection of proper background, the primary research I assessed included the development of both Alexa and Google Assistant with the intent to design for homeowners as well as the consequences and challenges that followed incorporating these products into the home. Principally, this includes a thorough case study of both assistants. Both cases incorporate the origins of the development, strategy, and production of these home assistants along with specific successes and controversies of the product within the home. The breakdown of both cases includes looking at one of the core home principles stated earlier, security and control. Information came from sources of government documentation including the FTC and DOJ along with collegiate case studies on the business models of both assistants. Since the line of products that use these assistants is abundant, the products examined within the case studies are Google Nest and Alexa Echo. Both studies will be analyzed through text that details the SCOT. Specifically, using Sergio Sismondo's An Introduction to Science and Technology Studies along with other literature on SCOT, the links between texts will be articulated in the discussion of this paper. The case studies and secondary resources provide a wide variety of topics: including opinions on the design of smart home assistants, big technology groups, such as Amazon and Google, as well as privacy and security promises, the emergence of Chat-Box AI, and digital capitalism. Primarily the questions concerning this research include why we develop these smart home assistants, who is responsible for the development, and why has there been friction to its proliferation.

Case Study Amazon Alexa & Echo

When you ask Alexa "Who are you" the response you'll get is "I'm Alexa, and I'm designed around your voice. You can ask me to play music, answer questions, tell jokes, and much more". In 2015 Amazon released its first smart home product revolving around Alexa, Amazon Echo. The availability of "very large amounts of linguistic data, machine learning methods, and a deeper understanding of human linguistics and social contexts, enabled voice assistants like Alexa to respond to voice commands meaningfully and quickly" (Catalium, 2018, pg. 2).

Amazon's Lab126 was first created in 2004, launching their first product the Amazon Kindle ereader in 2007, this project was known as Project A. Following two failed anonymous projects, B and C Amazon's strategy, and designers pivoted a what would inevitably be the Echo/Alexa product line. Amazon, following the successes of the Kindle turned to a strategy that focused on technology within the home. An example of some of Amazon's earlier designed patents, "describes a device that would display augmented=reality images that people could interact with…taken together Amazon's patent point toward a vision of a home where virtual displays follow people around... offering a range of services in response to voice commands and physical gestures" (Karov, 2019, pg. 1). Taking this philosophy, project D (Echo) removed all visual and kinetics parts of previous projects as the voice become the sole interaction channel to the user. In late 2014, an engineer rigged the Echo speaker to control a streaming TV device. This case inspired Bezos to envision Echo as the hub for the smart home. Amazon opened its APIs for Alexa development and joined the ecosystem of the smart home.

A revolutionary product at its time, Alexa offered consumers a conversational agent within their home, with the opportunity of social interaction and personification. In the study "Alexa is my new BFF": A Case Study of the Amazon Echo's Social Functions and Roles", the concept that homeowners thought of Alexa as a sociable outlet was researched. Using chiefly user reviews of the Echo products, this study examined how consumers primarily interacted with their Alexa products within the home breaking down categories into "entertainment" and "generic info" (less social) to "friend" (most social). Contrary to the hopes of Amazon, the findings offered speculative data on the strength of Alexa and Echo as social devices. According to Purington "most under descriptions of interactions with Echo/Alexa suggest low to mid-level sociability of interaction" (Purington, 2017, pg. 3). Conversely, in the study users who indicated children or others in the household interacting with Echo/Alexa are more likely to personify the device. Essentially suggesting Alexa technology may play a more important social role in families, rather than serving as a companion figure for those who live alone or need extra support.

This study highlights the friction that Alexa and Echo products met in contrast to their initial design vision of the product. In the following years, Alexa and the Echo would begin to see a decline in revenues and consumer purchasing of their products. In 2022, Amazon went through the biggest layoffs in the company's history. The area hardest hit: Amazon Alexa voice assistant unit. Business Insider reported "the swift downfall of the voice assistant and Amazon's larger hardware division." (2020, pg. 1) Alexa's Echo line is among the best-selling items on Amazon, and most of the devices are sold at cost, the problem for Amazon is described in their business model "We want to make money when people use our devices, not when they buy our

devices". (Amadeo, 2022, pg. 1) Therein lies the basic problem with the Alexa product, users were not interacting with it in their homes after purchase.

For starters, privacy and security became heavily scrutinized by the Alexa and Echo products, especially within the home. At their core, these devices must listen to the environment, with their all-direction microphone always to make the AI agent work. This concept, when controversies surfaced, disturbed many customers. In 2023, the FTC and DOJ charged Amazon with violating children's privacy by keeping kids' Alexa voice recordings forever and undermining parent's deletion requests. This violation was justified under the Children's Online Privacy Protection Act Rule (COPRA Rule) The Director of the FTC's Bureau of Consumer Protection stated publicly "COPPA does not allow companies to keep children's data forever for any reason, and certainly not to train their algorithms" (Levine, 2023, pg. 1). Levine followed this with stating "Amazon's history of misleading parents, keeping children's recording indefinitely, and flouting parent's deletion…sacrificed privacy for profits" (2023, pg. 1). A damming remark, and currently a product that has lost its momentum with its consumers: homeowners. Today, Amazon has not been able to align its smart home vision back in 2014. The reluctance of consumers to follow the business model of Amazon is a fact and the current situation with Alexa's future is unknown.

Case Study Google Assistant & Nest

Another large tech giant, Google developed their own voice-activated assistant in 2016 "Google Assistant" to compete with the likes of Amazon's Alexa, defining the first wave of

mainstream question-and-answer products powered by AI. In the scope of this study, the primary smart home product aligned with Google Assistant is Google Nest.

Unlike Amazon which developed the Echo product to coincide with their assistant Alexa, Google looked to acquire their smart home hardware through acquisition. They turned to Nest Labs, which launched their smart home product in 2010: the Nest Learning Thermostat. Google announced plans to buy Nest Labs in January 2014, ultimately spending $3.2 billion on the takeover and Nest would be merged with Google's hardware division in 2018. (Wolerton, 2020, pg. 1). Like Alexa and echo products, Nest offered users the opportunity to augment their homes with smart capabilities including doorbells, cameras, and sensors. Since the smart home market was already strong, Google hoped its synergies with Nest Labs would provide a successful product in the smart home landscape.

Google's aspirations with this acquisition included four capabilities they hoped to achieve with Nest: monitoring, control, optimization, and lastly autonomy (Song, 2018, pg. 1). Monitoring allows visibility about where a product is, what it is doing, and what environment the product is being used in, allowing a possible set of alerts and alarms for homeowners. Google also wanted their nest products to offer users control essentially offering "embedded software that enables bidirectional control over a product, with seamless control with a phone or tablet" (Song, 2018, pg. 4). Optimization in this case allowed for algorithms to efficiently process the information of users and inputs within the home. For this data management, Google Assistant was the key for Nest to become a smart home service, understating multiple contexts throughout the conversation between the homeowners.

It would take less than a year for Google Nest to record its first controversy, dealing with security in the home. The search giant drew criticism because its Nest Secure hub, a webconnected home security system, included a microphone, but was never disclosed in hardware specs, marketing materials, or on Nest's website (Wolerton, 2020, pg. 1). This was in turn brought to the public due to Google announcing bringing Google Assistant software to Nest Secure. Blowback was swift with a senate committee ordering Google CEO Sundar Pichai to clarify the purpose and origins of the microphone within their Nest products. The Senate committee letter scathing "Google's failure to disclose a microphone within its Nest Secure product raises serious questions about its commitment to consumer transparency and disclosure."

A similar pattern to Amazon occurred with Google as it "laid off hundreds of people working on its voice-activated Google Assistant software and eliminating a similar number of roles on its knowledge and information product teams" (Park, 2024, pg. 1). The explanation being restructuring would help improve Google Assistant as it explores integrating newer artificial intelligence technology into its products. It can be concluded that Google Assistant, similar to Alexa, appears to be in its twilight zone as both companies figure out a way to move on from these products.

Discussion

It is important to understand how actors shape and define technology. From a SCOT perspective, the success of an artifact is predicated on the strength and size of the group that takes it up and promotes it. In this thesis, the potential actors in question were both the consumers

(homeowners) and the producers of the Echo and Nest products, Google and Amazon. On a more granular level, the strategy and leadership of these firms, the product design, and the engineers that developed the hardware and software of these smart home assistants could all be the core group. However, based on the context of both studies which included almost a decade's worth of history and research, the parallel of financial disappointment between products is primarily due to the homeowner groups' rejection.

In SCOT a key concept in the theory is the idea of interpretive flexibility. Stating "We should see trajectories of technologies as the result of rhetorical operations, defining the users of artifacts, their uses, and the problems that particular designs solve" (Sismondo, 2009, 94). Alluding back to the origins of Alexa, the original intention was to create a virtual reality encompassing the home and the home-owners utility. The voice assistant was a shell of this, and the interaction between the user and technology was primarily limited. Interpretive flexibility is a necessary feature of artifacts, according to Sismondo, this is because "what an artifact does and how well it performs are the results of a competition of different groups' claims" (2009, pg. 98). Google and Amazon competed with users regarding what these smart home assistants were. One group, the corporations, voiced an assistant or helper that could provide automation, security, and flexibility within the home. While the other, the homeowner, saw a product of restricted use that listened to their actions within their own home.

Reflecting on the concept of the home, Gram Hanssen's articulation of four core principles: security, activity, relationships, and continuity, embolizes the necessary features of home artifacts under SCOT's interpretative flexibility. Did Alexa and Google Assistant provide the first core principle of security within the home: no, they did not. Each offered its security controversies that directly contradicted home-owner values. This is perhaps the most conflicted

principle between both the homeowner actor and the big tech actors. Gram-Hanssen states "The extent to which householders trust their technology and energy providers, along with the extent and nature of their social networks, is likely to influence where they wish to draw the boundaries of 'home' as a secure place" (2017, pg. 94). This trust has been diminished by the motivations of Amazon and Google desire to create data pools within the home. The purposeful actions to deceive customers in product design whether its microphones or collection of childhood data is not only borderline illegal but damages the trust that is important between both actors. The idealized vision in this case is that smart homes would work for us, the homeowners, learning the habits and rituals of our everyday routines. DIY homeowners have "expressed their view that a smart home needs to do things better than you can do it yourself, otherwise, it is not smart or simply when a human realizes that they wish to be in control directly, not to delegate that control" (Gram-Hanssen, 2017, pg. 98). For those that have owned smart home devices, it is conclusive these pieces of technology have not come close to meeting these expectations. Neither Alexa nor Nest provided a sense of automation that homeowners overwhelmingly would want to choose over their actions. Perhaps with the improvements in machine learning and artificial intelligence, this principle can become a closer reality, but it will not be with the Nest and Alexa products. These products can provide information but do not cook, clean, or improve the sleep of the homeowner.

Finally examining the principle of the home as a place of relationship and continuity, Nest and Echo devices offered a mix of results to this principle. Tabunshchyk states in his study of Alexa programmability an "evidence for students' perceptions of Alexa's intelligence and closeness to Alexa changing" (2021, pg. 304). This parallels Gram-Hanssen's ideas that smart homes offer continuity. She asserts that continuity can offer how people can use smart

technologies to personalize and make their homes homier. Nest and Alexa personalization were positive to this principle of personalization, however, the idea of relationship building between the hardware and homeowner or the homeowner to homeowner enabled by these devices was minute in research. In the Alexa case study from earlier in the paper, Purington's study of functionality and relationship was limited to very simple factors. Homeowners saw the device only as an artifact to ask simple questions and basic automation. There were only a few cases in the study detailing personal connections that Gram-Hanssen states are crucial to home values.

Regarding the principles of the home and the research conducted, both Google Assistant and Alexa failed to resonate with these principles. Instead, Google and Amazon shifted their focus and agenda to a pool of data collection and outsourcing for their gain ignoring the principles that define the home and the homeowner actor.

In today's consumerism ecosystem, the hunger for eyeballs, engagements, and clicks shapes the marketing strategies among the internet and social media mediums. Personal information has now become valuable for companies to make a profit and ultimately is a strategy in the smart home industry. Considering the two companies in this thesis: Google and Amazon, both companies' main drivers of revenue are from their advertising. Amazon for instance "in 2021 Amazon collected $31.16 billion in advertising revenue from sellers on its platform, which was a 32% increase over 2020" (Forbes, 2022). This growth does not seem to be slowing down and only strengthens the argument these companies embody digital capitalism and everything that comes with it both positive and negative. Yes, Amazon and Google fulfilled a promise to provide devices that could help the homeowner whether it was which individuals were knocking on the front door to detecting dangerous levels of monoxide. However, Amazon and Google's as Sismondo mentioned "claim" to the smart home artifact was to provide themselves means to

track even more personal information within the home including children. The dissonance in claims ultimately led to the failure of these products in the mainstream and the smart homeowner actors won the fight in the rhetoric of smart assistants. At this expense the layoffs from both companies are evident with Google just recently 2024 laying off over 1,000 employees in the voice-activated Google Assistant Division (Catalium, 2024, pg. 2). Amazon also has accepted the defeat by cutting over 10,000 jobs with the hardest hit the Amazon Alexa voice unit. (Amadeo, 2022, pg. 1).

Conclusion

This thesis investigated the rejection of smart home assistants Amazon Alexa and Google Assistant through the lens of the social construction of technology. Important factors that played a role in this rejection included the idea of the smart homeowner's agenda and concept of home. The rejection also was fueled by large tech corporations' over-zealous beliefs in digital capitalism and the collection of home-owner data. It is interesting to note that while these products failed to find success in home markets that doesn't mean the smart home idea is dead. With the emergence of AI, perhaps an enhancement in user activity can be reached by compromising with the reduction of data collection.

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