

Thesis Project Portfolio

The Smart Fan

(Technical Report)

Human Motivations on Smart Home Assistant Rejection

(STS Research Paper)

An Undergraduate Thesis

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Technical Project

The technical project for this portfolio is *The Smart Fan*. This project addresses the many limitations of conventional cooling fans on the market today. One of the main advantages of this project is its convenience, it is designed to provide a full 360° range of cooling through three thermal cameras. Unlike traditional axial fans, this project design is of a dyson fan design which is a more energy efficient application compared to its counterpart.

As global temperatures climb due to climate change, more households are turning to air conditioning systems for relief. However, this growing reliance on air conditioning comes at a cost. On average, households see their electricity bills increase by 35% to 42% when they use air conditioning. Surprisingly, approximately 20% of the world's total electricity consumption is now devoted to air conditioning, exacerbating our overall energy consumption, and placing significant stress on the power grid. This device is able to provide a suitable substitute for air conditioning within a room environment for an individual.

All mechanical movement and functionality of the fan is pre-programmed through a microcontroller, with power distribution set through a personally designed printed circuit board. The printed circuit board primarily is designed to modulate the power distribution between the microcontroller and the two motors. The two motors in use are a stepper motor and a DC brushed motor which control the horizontal rotation of the fan as well as the 3-D printed fan blade for cool air. *The Smart Fan* is intended to be a portable desk device, with all the hardware and electronics embedded within the base of the fan. Due to the unique properties including a 360° range of motion, the rotating bodies including the sensors and thermal camera are able to be wired and rotating with the use of a slip ring within the center of the

fan's mount. The non-hardware components including the base, rotating body, and fan head are all 3-D printers with PLA plastic, offering robust and heat-resistant material.

The duration of this product design, testing, and fabrication took place in the fall 2023, and was worked on collaboratively with a total team of four engineers consisting of both computer and electrical background.

STS Project

The senior thesis *Human Motivations on Smart Home Rejection* examines the failures of both Amazon Alexa and Google Nest assistants and their respective hardware. Detailing an extensive case study from product development in 2014 to present day economic failures and mass layoffs, this paper examines what were the core issues and how there was a dissonance between the motives of the homeowners as well as big tech corporations Google and Amazon.

Alexa and Google Assistant are some of the first AI helpers with goals of establishing connections with other household appliances, fans, and lighting and the homeowner. This paper reflects on 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 this paper. The core questions that are examined are why do we have smart home assistants and what is the direction society has shaped the development of these smart home assistants? This paper includes two case studies on the Google Assistant and Alexa smart home assistants that will provide quantitative and qualitative evidence of the smart home assistant declines. This paper will detail the development motivations from both tech giants along with studies on user interaction and controversies relating to personal security.

These case studies are analyzed through the lens of the SCOT framework, placing an emphasis on the actors that shape the direction of technology and subsequent declines. The two actors scrutinized in this paper include the consumer (homeowners) and the producer (Google and Amazon). An assessment on the rejection of the homeowner actor and the motives for such rejection are detailed in the paper in contrast with the motives of both Google and Amazon.

This paper details the motives of each party through the concept of two philosophies that both actors follow within the lens of smart home technology. One concept being Digital Capitalism and its influences on big tech. The other philosophy being the Concept of Home which lays the motivations of the homeowner and what defines a home. Both philosophies illustrate the conflict and decline of smart home assistants and provide analysis for the ultimate rejection of both Alexa and Google Assistant.