Improvement of Home Surveillance Cameras

Analysis of Ring's Market Dominance

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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

Regarded as a haven of security, the home is supposed to be representative of the boundary that keeps you safeguarded from the outside world. Despite this conception, certain statistics indicate that approximately 49 million Americans have fallen victim to package theft within the last 12 months, while the Department of Justice has reported a startling 2.5 million household burglary cases in 2017 ("2022 Package Theft Annual Report," 2023; Morgan & Truman, 2018). Given this concerning trend, homeowners must proactively safeguard their property. Accordingly, the implementation of a comprehensive suite of security devices emerges as an effective strategy to monitor residential premises for any untoward activities.

In line with the objective of increasing security, I propose the development of a surveillance camera that will be able to reliably track any living subjects. The system's performance will be enhanced by pairing a visible light camera with a thermal one, as well as being motorized to follow a subject and cover a wider area. In order to successfully design a viable product, it is necessary to understand the priorities and concerns of each of the stakeholders that are involved in this technology. As such, I will be using the STS framework of SCOT to evaluate some of the most popular smart home security systems like Ring. My goal is to emphasize how those companies became part of a billion-dollar industry not by providing the highest quality product in an objective sense, but one that addressed the concerns of the manufacturers, users, and even non-users.

Taking into account both the technical and social dimensions of this challenge yields a more impactful approach to solve the sociotechnical predicament at hand and it is therefore an essential part of the analysis. The findings of my exploration will serve as a guideline to develop the proposed system in a comprehensive manner that will satisfy all the stakeholders. In the next

two sections, I will further expand on the two main ideas proposed thus far. One will be the technical project that consists of the improved surveillance camera and the other one will be the STS project that evaluates the social aspects in this context.

Technical Proposal

Currently, there are several companies that offer surveillance cameras with every functionality imaginable. However, depending on the customers' constraints, such as their budget, they could be compromising by choosing to go with one option over the other, so it can be a challenge to find something affordable that will satisfy them. For instance, according to Ring, one of its most popular cameras is the "Stick Up Cam," ("Ring Best Sellers," 2023) which goes for $99.99, and it includes many features such as easy set-up, cloud storage, and motion detection ("Stick up Cam, 2023"). In contrast, there is the Samsung Hanwha, a higher-end model that retails for around $4,000 and it provides more comprehensive features like thermal imaging, albeit at the expense of usability and setup ("Samsung Hanwha," 2023). Each of these products come with their limitations that make it difficult for customers to get an all-encompassing system. Despite the Ring camera's affordability and user-friendliness, it is still limited due to the lack of thermal imaging, which diminishes the effectiveness of tracking intruders, especially in low-light conditions. On the other hand, the Hanwha's main drawback is its high price and the added cost of professional installation that will amount to several hundred dollars (Grupa, 2023). Some of the limitations presented by both is the lack of motorized functionality, which essentially forces the customer to buy more cameras than what would be necessary for a given area. Moreover, the absence of a spotlight feature for targeted illumination is also a limitation. Some cameras come with floodlights, but these inconvenience neighbors and could be deemed as a legal nuisance by certain United States courts (Farkas, n.d.).

Through the development of my product, the customer will not need to accept compromises between certain feature sets and financial constraints. Achieving that goal will involve drawing from the most advantageous features of existing surveillance cameras to develop a single system that balances the interest of the users and manufacturers. In this process, the most essential features will be meticulously integrated into the final design while taking the cost implications into account. This approach will incentivize more people to invest in security for their homes and increase the overall sense of security in residential communities.

In order to effectively carry out the design and development of the proposed product, it will have to be divided into four subsystems that make up each fundamental part of the project: structural hardware, embedded hardware, software, and electrical system. The structural hardware will consist of the housing and mechanism that will hold all the components together and allow the cameras to pan and tilt. Most of the parts will be 3D modeled in CAD software and produced through additive manufacturing. The embedded hardware, which includes a microcontroller and motor drivers, will be responsible for the movement of the camera while the software will process the camera feeds and provide a user interface that offers many functionalities to the user. The embedded system will be programmed with C while the image processing will be written in Python. Finally, to power it all in one compact solution is a circuit board that will take one input power and distribute the appropriate voltages to each device in the system. I will be employing circuit design techniques as well as use PCB layout software tools to help me accomplish this task.

To aid with the design of this system, I will thoroughly research the characteristics that are currently present in other surveillance systems. This will involve going through patents as well as user manuals that detail the numerous features that one may find in a certain camera. The

next step will be to conduct an assessment to determine which are the best selling cameras around the world in order to understand what features make people want to buy them and how much they are paying. Finally, I will conduct a cost analysis that will help me ascertain the final list of features that will ensure market desirability and financial viability. As for demonstrating its viability, each subsystem will be extensively tested independently and then integrated into its final version. Subsequently, more tests will be conducted on actual residential settings to assess the effectiveness of the product in real world scenarios.

STS Proposal

Having faced imminent bankruptcy multiple times since 2013, Ring has emerged as the dominant company in the current market for smart home security cameras (and surveillance cameras in general). According to a Strategy Analytics report, Ring secured its spot as a top seller in 2021 by selling 1.4 million units, which surpassed the cumulative sales of all its competitors together (Narcotta & Ablondi, 2022). Ring's first product, a doorbell outfitted with a camera and two-way talk feature, emerged from the aspirations of the founder, Jamie Siminoff, who wished for a way to answer the door without actually needing to be there. Ring started experiencing some incremental growth a few years after its inception, but its recent trajectory has witnessed an unprecedented surge in sales. With that momentum, they were able to diversify their product portfolio, encompassing a wide variety of indoor and outdoor cameras. Due to its astounding success and potential, Amazon acquired Ring in 2019 and is now projected to keep growing and launching new products. The recent rise in the popularity of this product hasn't been exactly detrimental to its more traditional version in the form of Closed-Circuit Television (CCTV), but their market values do show an interesting disparity that highlights the dominance of Ring cameras and other similar devices. The CCTV market is valued at $11 billion per a

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Future Market Insights report, while the smart home camera market is already at $46.5 billion despite being several decades younger ("CCTV Camera Market," 2023; "Smart Home Security Market," 2022).

It wouldn't be inaccurate to suggest that Ring cameras have become a standard for the average consumer that is seeking to invest in a surveillance system for their home. They offer affordability and come packed with a wide array of features. Due to all the marketing of these useful features that are often used to appeal to potential buyers, the success of Ring is often attributed to the idea that they provide the most reliable and useful camera in the market, others also cite its collaboration with Amazon as a significant factor. While those may be true, they do not really explain the social factors that allowed them to reach such levels of success in the first place. To comprehensively assess the essence of its achievements, one must look back to its earlier development years and comprehend how the design process was influenced by the necessities of various stakeholder groups. As a result, one will be able to see how the Ring camera's design has been socially constructed. Which is why I now argue that the dominance of this technology stems from its adept handling of the concerns of all stakeholders.

To frame my analysis of the reason for Ring's success, I will draw on the STS framework, Social Construction of Technology (SCOT), which claims that designs are successful because they capture the interests of the relevant social groups that have a stake in the technology. Within the framework of SCOT, a design is said to possess interpretive flexibility (Bijker, 2002), which essentially means that the specific use for a product is not clearly defined and may change based on what the users need. This leads to several key points in the design process as inventors have design flexibility to respond to what users want. That cycle repeats numerous times until closure is reached and a design stabilizes once it addresses the most

concerns. As such, I will be examining how the development of Ring cameras demonstrated interpretive flexibility and how stabilization was eventually reached, if at all. To substantiate my argument, I will be conducting an in-depth evaluation of several statistics from consumer reports as well as news sources addressing the topic at hand. More specifically, I will delve into the specific methodologies employed by Siminoff, primarily focusing on how he carried out his customer discovery endeavors and eventually pushed forward a product that would be used by millions today.

Conclusion

Upon the completion of the exploration and analysis that will be performed, the deliverable for the technical project will be a fully functioning surveillance system that utilizes both a visible light and thermal camera to efficiently track any living subjects and shine a spotlight on them. As for the STS project, SCOT will be used to identify all the key points in the design process that led to the success of the Ring camera. My goal is that this endeavor will highlight the importance of addressing the concerns of all those who can find value in the technology. By doing that, smart home security systems will only keep improving, and address the overarching sociotechnical challenge of increasing the security of people's homes.

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