

An Exploration on Sharing Smart Home Devices Beyond the Home

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ABSTRACT

We conducted a web-based survey with 19 smart home users to gain insights into their thoughts on sharing their smart home devices with people outside their home. We aim to find whether or not users would like to share particular devices, and why. We also studied the motivations and factors which affect their decisions. We found that most people would prefer to share their smart camera, security system and locks with family members and friends to allow them to access their home for emergencies and to monitor and take care of their property.

CCS CONCEPTS

• Human-centered computing~User studies • Human-centered computing~Empirical studies in HCI

KEYWORDS

Smart Devices; Internet-of-Things; Smart Home; Access Control; IoT Sharing

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1 Introduction

The possibilities of sharing smart home Internet of Things (IoT) devices beyond the home are endless, and warrant further exploration on how such user interfaces should be designed. To expand this body of knowledge and to identify possible design opportunities for smart home device sharing, we posed the following high-level research questions:

- **RQ1:** Which smart home devices are users willing to share with people outside of their home and for what purpose?
- **RQ2:** With whom are smart home users willing to share access to their smart devices and what factors affect their decision?

To address these questions, we conducted an online survey of

smart home users. Thus far, we conducted a pilot study with 19 adults on Amazon Mechanical Turk. In this position paper, we provide an introduction of relevant work, our empirical methods, and preliminary results.

2 Background

Smart home IoT devices can collect and analyze data within homes, relay information to users, and enhance the potential for managing different domestic systems (e.g., heating, lighting, entertainment) [2]. Most smart home IoT devices offer some form of access control among users within the home. However, these smart home IoT devices also have the capability to share control with anyone over the Internet. While this technical capability exists, research on whether and how people would want to share these devices is lacking.

He et al.[3] found that home IoT users desired different access control capabilities for different functionality within a single device. However, they did not explicitly explore whether and how users would want to share these devices with people not located within their home. Bahirat et al. found that “who” and “what” are the most significant parameters in users’ decision to allow or reject IoT based information collection [1]. Therefore, we asked smart home IoT users with whom *outside of their homes* they would like to share their existing smart home devices and for what purpose. We also inquired whether participants would want others to share their devices with them. As such, the novel contribution of this work is examining use cases for sharing smart home IoT devices *beyond the home*.

3 Methods

The user study consisted of an online Qualtrics survey where each participant was a smart home device user. The study was approved by the Institutional Review Board. The survey questions were designed to explore the sharing preferences of real smart home device users with a focus on devices, device capabilities, and sharing those capabilities with others outside of one’s home. We recruited using Amazon Mechanical Turk and word-of-mouth. The participants were adults residing in the United States. The 12 participants recruited from Amazon Mechanical Turk were paid \$1 upon completion of the survey.

4 Preliminary Results

The survey respondents owned an average of 7.07 smart home IoT devices with a standard deviation of 5.4 devices. Age of

respondents varied from 23 to 48 years, the mean age being 34.79 years.

4.1 Smart Home Devices Owned and Willingness to Share

The most common smart home devices were smart TVs (15), video streaming devices (12), smart speakers or personal voice assistants (12), smart cameras (12), motion/contact sensors (10), smart displays (10), smart lights (9) and smart thermostats (7). Out of the 19 people surveyed, 14 people were willing to share their smart home devices with people outside of their home.

4.2 Devices Shares and with Whom

The most common devices participants indicated they would want shared with people outside of the home were Smart Camera (6 shares), Security Alarm (4 shares), Motion Sensor (4 shares), Flood Alarm (3 shares) and Smart Lock (3 shares). Most people who were willing to share their smart home devices outside of their home wanted to do so with their family (40%) and friends (21%). Others wanted to share with a partner or spouse who lived outside the home (15%), co-worker (12%), and acquaintance (12%).

4.3 Reasons for Sharing Smart Home Devices

The participants provided various reasons for sharing their smart home devices with people outside of their home. The most common theme was allowing access to the home for emergency situations and monitoring the home when they are not home. These cases often involved sharing of smart locks in case of emergencies, such as:

P1: "Access to the house and know if someone breaks in."

Another commonly stated reason was taking care of pets when their owners are not home:

P2: "If our house was on fire, I would hope someone would try to save our dog."

The sharing of smart cameras was always data sharing rather than remote control. People wanted to share access to their cameras to trusted family and friends so that they can watch over their homes when they can't themselves. One person provided the following reason for sharing her camera with a family member who lived out of her state.

P4: "So that she can access my camera time to time and ensure my house is safe even when I am there or not."

She justified sharing her smart doorbell with her family member who lived out of state as follows:

P4: "For the safety purposes. She can inform me if someone is at my door when I am out for a vacation. I can then act accordingly."

4.4 Reason for Not Sharing Smart Home Devices

Five people indicated they would not share their smart home devices with anyone outside of their home. Two persons who

owned more than 15 smart home devices did not want to share them with anyone outside of their homes because they felt no need to do so:

P5: "People that watch my house do not need remote access at the moment, they can access via codes on the devices on site. Also, we do not leave the home often enough to worry too much."

Another person said he would only share devices with people who don't live in his house when they are visiting:

P6: "The only time I would likely share access to my smart home devices with people who do not live in my house will be when they are visiting for a prolonged period of time. For example, if I have a guest staying over, I will provide access to their lights, fan and smart speaker in the guest bedroom. They can issue voice commands to control most devices when they are in home, but that does not mean they will be getting their own account or login."

The other participants were primarily concerned about privacy and security breaches, even from the device manufacturers themselves:

P7: "I don't want anyone spying on me; I especially don't want Amazon or the government spying on me!"

4.5 Reciprocal Sharing

In terms of reciprocal sharing, most people stated that they would prefer access to a family member's or friend's smart camera, security system and locks to be able to access their home for emergencies and to monitor and take care of their home and pets.

5 Conclusion

We are exploring end users' perceptions of smart home sharing beyond the home. Our pilot results indicate that there are reasons people desire and can benefit from this sharing. We are conducting a full survey with more participants to gain additional insights.

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