



You, Me, and IoT: How Internet-Connected Home Devices Affect Interpersonal Relationships

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ABSTRACT

Recent press articles have reported that Internet-connected consumer “IoT” devices can impact interpersonal relationships among home residents and visitors. However, academic research into the variety and extent of these effects remains limited. In this study, we conduct semi-structured interviews with individuals from multi-occupant households in order to understand how home IoT devices have affected their relationships. Our results will illustrate the interpersonal costs and benefits of home IoT devices and inform recommendations for the design of future IoT technologies.

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CSCW '19 Companion, November 9–13, 2019, Austin, TX, USA

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ACM ISBN 978-1-4503-6692-2/19/11.

<https://doi.org/10.1145/3311957.3359489>

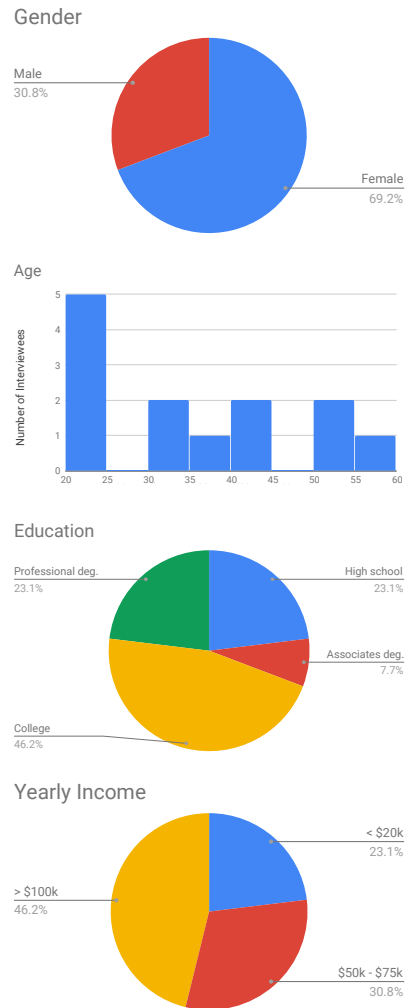


Figure 1: Demographics of first 13 interviewees recruited through Craigslist.

INTRODUCTION

Internet-connected consumer products, often called Internet of Things (IoT) devices, have greatly increased in popularity over recent years. These devices are often designed to replace existing home appliances or to introduce new effort-saving features into homes.

Unlike their non-networked counterparts, IoT devices often have a range of remote control functions and always-on sensors that record data about in-home activities. Although these devices provide many conveniences, the press has begun to report that IoT devices are disrupting household relationships in often unexpected ways – from replacing a spouse as an attentive conversation partner [3] to being used by domestic abusers to exert control over others in their homes [2].

Despite these reports, academic research into how home IoT devices affect interpersonal relationships and household dynamics remains limited. The closest studies were conducted in 2019 [7, 8] to investigate multi-user interactions and shared control of IoT devices in smart homes. Other home IoT user studies have focused on different research questions, including purchasing decisions [6], privacy concerns regarding entities external to the home (manufacturers, governments, etc.) [9], privacy expectations of devices themselves [1, 4], and how friends and experts influence IoT data collection consent [5].

This study seeks to improve our understanding of the effects of IoT devices on interpersonal relationships and household dynamics across socioeconomic statuses, living situations, and technology familiarities. We have thus far conducted semi-structured one-on-one interviews with 13 American adults living in multi-occupant households with home IoT devices. Our interview questions focus on whether and how the participants' home IoT devices have impacted their household relationships from a variety of perspectives, including spouse/partner/roommate dynamics, parenting decisions, and interactions with guests.

Based on the interviews conducted to date, we hypothesize that home IoT devices often cause interpersonal conflict as a result of 1) differing interests in technology, 2) differing privacy opinions & priorities, 3) facilitating non-malicious surveillance, 4) reducing face-to-face interaction, and 5) requiring new parenting decisions. We also hypothesize that home IoT devices often improve interpersonal relationships by 6) inspiring playful behavior, 7) providing accessible user interfaces, and 8) simplifying common household tasks. We expect these hypotheses to evolve as we conduct additional interviews and analysis.

The results of this study are important, as technology companies are typically disinterested to examine how their products disrupt users' relationships. We hope that by uncovering and categorizing these effects, our results will suggest design recommendations to reduce the interpersonal costs and increase the interpersonal benefits of home IoT technologies.

Participant ID	Num. in Household	Home IoT Devices
P1	4	Smart TV, 6 security cameras, smart watch
P2	2	Amazon Echo
P3	2	Gaming consoles, Amazon Fire TV, Apple Watch
P4	4	Amazon Echo, Amazon Dot, Google Home, FitBit, Apple Watch, Sonos speaker
P5	2	Amazon Echo
P6	3	Google Home
P7	2	Smart TV, Amazon Echo, Amazon Fire Stick, Ring doorbell, WiFi refrigerator, WiFi washer, WiFi dryer
P8	2	Amazon Echo, security cameras, smart TV
P9	3	Roku TV, Fitbit
P10	2	Google Home, August smart lock
P11	2	Amazon Echo, Amazon Show, smart TV
P12	5	Amazon Echo, Ring doorbell, Roku TV
P13	3	Amazon Echo, smart TV, iRobot Roomba, smart outlets

Table 1: Household sizes and home IoT devices owned by our first 13 interviewees.

INTERVIEW METHOD

We are conducting semi-structured interviews to understand how home IoT devices are affecting interpersonal relationships in multi-occupant households.

Recruitment. We are recruiting participants by advertising the research study as a “computer gig” on Craigslist in the Central New Jersey and Pittsburgh, Pennsylvania regions. The advertisements indicate that “Researchers at Princeton University and Carnegie Mellon University want to better understand your interactions with smart (Internet-connected) home devices and appliances.” They also specify that participants must live in a home or apartment with at least one other person and at least one smart device. Interested individuals meeting those criteria are asked to fill out a short screening survey. We are also using “snowball” recruiting, asking interviewees to recruit their friends, family, and acquaintances to take the screening survey.

Screening Survey. The screening survey asks respondents to provide the number and relationships of people living in their household, the number and types of IoT devices in their household, and how they acquired these IoT devices. It also includes a series of demographics questions (age, gender, income, education, occupation, and technology background). This allowed us to select the first 13 interviewees with a range of demographics (Figure 1), living situations, and IoT devices (Table 1).

Interviews. All interviews are being conducted in a one-on-one semi-structured format by the first author. The interviews are being conducted remotely over Zoom video conferencing with audio recording. The interviewer guides the interviews using a prepared script with questions about specific aspects of participants’ IoT devices and interpersonal relationships, following up on topics that arise naturally in discussions with each participant (which have varied widely depending on the person interviewed, devices owned, and household composition). All interviewees are compensated with a \$25 Amazon gift card.

Response Analysis. We will transcribe interview audio recordings using NVivo’s automated transcription service and manually review the transcriptions, making corrections as necessary to ensure accuracy. We will then perform structural coding on the transcriptions to identify recurring themes. One of the authors will act as the primary coder, creating and updating the codebook. This author will begin with a set of structural codes derived from the question categories in the interview script and identify subcodes from the interview transcripts. Each interview will then be independently coded by a different author.

We will then compare the prevalence of specific effects on interpersonal relationship across participants with varying demographic and technical backgrounds. Unlike previous work, we intend to

focus on how IoT devices are causing or ameliorating conflict between individuals living together in a household as well as between household members and occasional visitors.

Ethics. This study has been reviewed and approved by the Princeton University Institutional Review Board. All participants have provided their informed consent to participate in the screening survey and the interviews, to have their voice recorded, and to have the recordings transcribed by a third-party.

CONTINUED WORK

This study is a work-in-progress. We have already conducted interviews of the first 13 participants recruited through Craigslist and are continuing to recruit new participants at the time of writing. We hope that the results of this study will help inform designs of future Internet-connected products to avoid negative impacts on interpersonal relationships and benefit household dynamics.

ACKNOWLEDGEMENTS

We thank our interviewees for their participation in this study. This work was funded by NSF Award CPS-1739809.

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