

# PUC

Research Protocol

## **Investigating Interaction with Smart Home Devices through a Diary Study**

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**RIO DE JANEIRO - BRASIL**

# Investigating Interaction with Smart Home Devices through a Diary Study\*

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**Abstract.** This report contains the Institutional Review Board (IRB) documentation submitted to the University of California, Irvine (UCI) Office of Research under the expedited review process, applicable to research posing no more than minimal risk to human subjects. The study was approved on November, 3<sup>rd</sup> 2017 (UCI IRB Approved: 11-03-2017, APP# 11480, HS# 2017-3937) and conducted throughout November and December of 2017 in Irvine, California, USA.

**keywords:** Internet das Coisas; Interação Humano-Computador; Apropriação.

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## Table of Contents

Protocol Narrative	1
Recruiting Material	17
Consent Form	28
Terms of Commitment for Using the Devices	34
Diary Report Instructions	35
Google Forms Questions	37

Upload this completed narrative and any supplemental documentation to the <a href="#">IRB Application</a> .	<b>IRB USE ONLY – HS#: 2017-3937</b>
<b>Lead Researcher Name:</b> Bruno Azevedo Chagas	
<b>Study Title:</b> Investigating Interaction with Smart Home Devices	

**ABSTRACT**

Provide a non-technical summary of the proposed research that can be understood by IRB members with varied research backgrounds, including non-scientists and community members. The summary should include a brief statement of the **purpose of the research** and a brief description of the **procedure(s)**. *This summary should not exceed more than 250 words.*

The purpose of the study is to investigate interaction problems with Internet of Things (IoT) smart home devices and related software (commercially available). We are calling these problems “breakdowns,” to designate situations where technology behavior is mismatched from the user’s expectations. In particular, we want to collect data about breakdowns with this technology and the strategies people adopt in order to recover from and repair the breakdowns by themselves. Our objective is to understand the causes, characteristics and people’s reactions to breakdowns in order to derive novel theoretical knowledge and innovative tools that can help users to modify the technology by themselves to repair breakdown situations. By providing tools and features that allow the users to modify the technology by themselves in specific ways and with specific techniques – an approach called End-User Development (EUD) – technology can offer a better overall user experience, in theory. However, technical and social challenges still exist and often people avoid engaging in EUD activities due to difficulties and limitations of the existing technology. The ultimate goal of our research is to help to overcome these difficulties and limitations with IoT technology.

The research questions we are addressing with this study are:

- What kind of breakdowns happen when users interact with IoT smart home technologies?
- How do users react to these breakdowns?
- What kind of repair strategies do they think of and/or try?
- Are existing features able to support breakdown repairs at some level and how does this come about?

**SECTION 1: BACKGROUND AND SIGNIFICANCE OF THE RESEARCH**

1. Provide the scientific or scholarly **rationale** for the research. Describe the relevant background information and the specific gaps in current knowledge that this study intends to address.

The Internet of Things (IoT) is expected to produce several changes in the ways computer technologies influence our life and in how we interact with them. Computation embedded in interconnected “smart”

devices surrounding us is composing an emerging infrastructure able to sense, infer and actuate in the world in unprecedented ways, changing businesses and our everyday life. Among the several challenges that such reality is introducing, there are those related to how end-users will be able to tailor their own technology. For instance, the combined diversity of devices, individual preferences, needs and contexts of use makes it unlikely, if not impossible, for any designer to address all users' needs and preferences beforehand. Moreover, these needs and preferences are likely to change, following the dynamics of everyday life and the idiosyncratic moods, ideas, and goals of individuals. End-User Development (EUD) is an approach to address end-users' specific needs and preferences by enabling them to tailor computer technologies by themselves using simple (e.g. setting parameters) and advanced techniques (e.g. macro and visual programming). With such approach, technology can be tailored by end-users to address unanticipated and changing needs during use-time [1].

End-User Development (EUD) for the Internet of Things (IoT) has been identified as potentially useful for IoT systems and environments in different ways [2]. In our research, we are primarily looking at the problem from a communication perspective. We are using semiotic engineering [3] as a theoretical reference which main tenet is to look at interaction with computer technologies as a computer-mediated human communication phenomenon involving technology producers and technology users. We focus on investigating the communicability of the systems, rather than their usability, that is, on a technology's ability to communicate its designers' rationale and intent through the user's interface. Communicability problems generate breakdowns during interaction, a disruption in the communication flow that can have several causes, such as noise, channel failure, mismatches of expectations between parties, etc. In regular conversations, when a breakdown occurs, we engage in repair strategies that, typically, restore the communication flow, such as: "What do you mean?", "I don't understand...", "Sorry, say that again..." and the subsequent utterances that try to restore mutual understanding. However, when interacting with computer systems through their interfaces, breakdown repair is much more limited because systems can only react according to the mechanisms that systems designers and developers have anticipated and encoded in a computer program. Unanticipated breakdowns often cannot be repaired even if users have a good mental model of how the system behavior might be adjusted to avoid the breakdown. In that sense, we see EUD as a tool for changing the way a system is programmed in order to allow users to restore the effective flow of the interactive conversation. In other words, we see EUD as a means to repair from breakdowns in IoT contexts.

Ethnographic studies with smart homes have already suggested that solutions in this domain "need to expect, account for, understand, and appropriately respond to" breakdowns, in the sense of failures of pre-established routines due to the eventualities of everyday life [4]. However, how this general principle can be translated into concrete tool support and features of a system remains an open question. Breakdowns are also a recurring topic in Human-Computer Interaction research in general (e.g. [5]–[9]). The novelty of our approach is to investigate this particular moment from an EUD perspective. We believe that a breakdown is the precise moment where the user will become motivated, or at least intrigued, to perform a modification in the system. Therefore, our approach constitutes an effort to build theory and solutions from that particular point onwards. For example, a breakdown can happen when an automatic rule turns all the lights off every day at 10 pm and on a particular day you need them to stay on after that time (because of a party, a repair you need to make in your house, or a late paper you need to finish). When the lights go off in such situation, you will disagree with the system and interact with it. This situation then becomes an opportunity for evolution of your IoT ecosystem. By providing tools and features that allow the users to modify the technology by themselves in specific ways and with specific EUD techniques, technology can offer a better overall user experience, in theory. However, technical and social challenges still exist and often people avoid engaging in EUD activities due to difficulties and limitations of the existing technology. Our research seeks to find the appropriate kind of features and tool support that users need in order to perform modifications in the system effectively, efficiently, and pleasantly starting from the breakdown point.

Our first step was to find a framing for EUD for IoT able to capture the most relevant communication processes that happen in such contexts, with its respective communicating parties and artifacts, in order to account for the possible breakdowns in a comprehensive way. We proposed a semiotic engineering framing

of EUD for IoT where interaction in this context is viewed as a group communication scenario, where users and developers talk to each other, albeit indirectly, through different systems' interfaces (e.g. interactive user interfaces and APIs) [10]. We performed preliminary inspections and self-performed evaluations of currently available IoT devices for smart homes applying this framing that showed clear enough that the occurrence of breakdowns of different kinds in such complex contexts is inevitable. Our next step now is to understand what happens when things "go wrong" in "natural" IoT environments (e.g. an actual "smartened home") with general real users and the strategies they develop to cope with these situations. A way of doing it is to collect data about actual examples of things that go wrong and how people speak about them.

2. Describe the **purpose, specific aims or objectives**. Specify the hypotheses or research questions to be studied.

The purpose of the study is to investigate interaction problems with Internet of Things (IoT) smart home devices and related software (commercially available). We are calling these problems "breakdowns," to designate situations where technology behavior is mismatched from the user's expectations. In particular, we want to collect data about breakdowns with this technology and the strategies people adopt in order to recover from and repair the breakdowns by themselves. Our objective is to understand the causes, characteristics and people's reactions to breakdowns in order to derive novel theoretical knowledge and innovative tools that can help users to modify the technology by themselves to repair breakdown situations.

The specific aim of this study is to collect reports of breakdowns from real users using existing IoT technology in their natural environments. For that purpose, we will give a diverse population of users some commercially available devices and conduct a diary study with a them for 4 weeks to collect reports of the situations they find most important or remarkable. We will propose some activities to stimulate their engagement with the devices and, based on our previous studies, it is likely that breakdowns will naturally emerge over the course of the study.

The research questions we are addressing with this study are:

- What kind of breakdowns happen when users interact with IoT smart home technologies?
- How do users react to these breakdowns?
- What kind of repair strategies do they think of and/or try?
- Are existing features able to support breakdown repairs at some level and how does this come about?
- If not, what kind of tools, features or design guidelines can support users to develop more accurate models of their systems and hence program them more effectively?

3. List up to **ten relevant references/articles** to support the rationale for the research.

[1] H. Lieberman, F. Paternò, M. Klann, and V. Wulf, "End-user development: An emerging paradigm," in *End user development*, Springer, 2006, pp. 1–8.

[2] *ACM Trans. Comput.-Hum. Interact.*, May 2017 - Special Issue EUD for IoT, vol. 24, issue 2. New York, NY, USA: ACM, 2017.

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[4] S. Davidoff, M. K. Lee, C. Yiu, J. Zimmerman, and A. K. Dey, "Principles of Smart Home Control," in *UbiComp 2006: Ubiquitous Computing*, 2006, pp. 19–34.

[5] T. Winograd and F. Flores, *Understanding Computers and Cognition: A New Foundation for Design*. Intellect Books, 1986.

[6] M. Sharples, "A study of breakdowns and repairs in a computer-mediated communication system,"

*Interact. Comput.*, vol. 5, no. 1, pp. 61–77, Mar. 1993.

[7] S. P. Urquijo, S. A. R. Scrivener, and H. K. Palmén, “The Use of Breakdown Analysis in Synchronous CSCW System Design,” in *Proceedings of the Third European Conference on Computer-Supported Cooperative Work 13–17 September 1993*, Milan, Italy ECSCW '93, G. de Michelis, C. Simone, and K. Schmidt, Eds. Springer Netherlands, 1993, pp. 281–293.

[8] G. Fischer, “Turning breakdowns into opportunities for creativity,” *Knowl.-Based Syst.*, vol. 7, no. 4, pp. 221–232, Dec. 1994.

[9] N. Patel, J. A. Coughlan, and R. D. Macredie, “A method for identifying communication breakdowns in user-interfaces,” *Int. J. Stud. Commun. Sci.*, 2006.

[10] B. A. Chagas, D. F. Redmiles, and C. S. de Souza, “End-User Development for the Internet of Things OR How can a (smart) light bulb be so complicated?,” in *2017 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC)*, 2017, pp. 273–277.

## **SECTION 2: ROLES AND EXPERTISE OF THE STUDY TEAM**

**Complete the table below (LR: Lead Researcher, FS: Faculty Sponsor, CR: Co-Researcher, RP: Research Personnel). Indicate whether the study team member will be involved in the following research activities.**

**Note:** Personnel who are not interacting with participants for research purposes and/or who do not have access to identifiable private information about the research participants (e.g., statisticians) are not engaged in human-subjects research and therefore should not be listed below.

If there is a Faculty Sponsor, s/he **must be** listed below (even if s/he is not engaged in human-subjects research), as s/he must be identified to provide oversight and guidance to the Lead Researcher.

Name	Role	List Department, Title, & Degrees. Include UCI Affiliation - Faculty / Staff, Grad- or Under-Student	Recruitment	Informed Consent Process	Interact with Participants	Access Participant Identifiable Data?	Analyze Participant Identifiable Data?
Bruno Azevedo Chagas	LR	Department of Informatics, MSc, Staff (Junior Specialist)	Yes	Yes Yes		Yes	Yes
David Redmiles	FS	Department of Informatics, PhD, Faculty (Professor)	No No		No	Yes	No

Tao Wang CR		Department of Informatics, MSc, Graduate student (Ph.D. Candidate)	Yes	Yes	Yes	No	No
Zhendong Wang	CR	Department of Informatics, Graduate student (Masters)	Yes	Yes	Yes	No	No
Yorah Bosse CR		Department of Informatics, MSc, Staff (Visiting Assistant Researcher )	Yes	Yes	Yes	No	No

### A. Training of Personnel

1. Describe the training plan that will be provided to your study team members. Who will provide the training, what will be included in the training, how will their level of knowledge be assessed to ensure they are ready to perform their assigned duties, and who will provide ongoing oversight.

2. Please identify who will interact with non-English speaking participants, if applicable.

No specific training is needed.  
All necessary training was provided by the CITI social/behavioral/education course completed by the entire research team.

## SECTION 3: RESEARCH PARTICIPANTS

### A. Individuals To Be Enrolled on this UCI protocol (Persons/Records)

1. Complete the table of participant enrollments below. *Include additional rows for subject category/group, as needed.*

2. If the study involves the use of existing or prospective records, specify the maximum number to be reviewed / collected, and the number needed (i.e., expected to complete study) to address the research question.

Category/Group (e.g., adults, parents, children)	Age Range (e.g., 7-12, 13-17, 18 or older)	Maximum Number to be Consented or Reviewed/Collected	Number Expected to Complete the Study
UCI students that possess a smartphone device	18 or older	15	12



Total: 15

## B. Eligibility Criteria

1. Identify the criteria for inclusion and exclusion.
<ol style="list-style-type: none"><li>1. Is at least 18 years old;</li><li>2. Is a student at UCI;</li><li>3. Must have own mobile smartphone;</li><li>4. Interested in the Internet of Things or already have a smart home device (e.g. smart lights, Amazon Alexa, smart power plugs, etc.)</li></ol>
2. If eligibility is based on age, gender, pregnancy/childbearing potential, social/ethnic group, or language spoken (e.g., English Speakers only), provide a <b>scientific rationale</b> .
<input type="checkbox"/> Not applicable: Subject eligibility is not based on these factors.
Exclusion criteria: <ol style="list-style-type: none"><li>1. Anyone younger than 18: we need to obtain consents from legal adults.</li></ol>

## SECTION 4: RECRUITMENT METHODS AND PROCESS

<input type="checkbox"/> This study involves no direct contact with participants (i.e., use of existing data, records, charts, specimens). <i>Skip to Section 6.</i>
--

### A. Recruitment Process

<ol style="list-style-type: none"><li>1. Describe <b>when, where, by whom</b> and how potential participants will be approached. If posting on your Facebook page or other social media sites, please explain.</li><li>2. If you will recruit by e-mail, phone, etc., explain how the researcher will obtain the participants' <b>contact information</b>.</li><li>3. Please <b>attach Advertisements, Flyers, Social Sciences Human Subject Pool (SSHSP) Form, Scripts, Letters, and Announcements</b>. See <a href="#">Recruitment Guidelines</a>.</li></ol> <p><b>Note:</b> <i>If recruiting via online sources / social media (i.e., Facebook or Amazon Mechanical Turk (AMT), etc.), submit the statement that will be posted. Refer to participants as 'research participants,' not 'workers'.</i></p>
Participants will be primarily recruited during 2017 fall quarter in UCI regular classes. Our strategy will be primarily to advertise in the Department of Informatics courses In4matx 241, In4matx 121, In4matx 161, In4matx 133, In4matx 191A, and In4matx 43. We will ask permissions from course professors that we know and we will make a quick presentation (see attached document "Recruitment-presentation") describing the study, the effort and the commitment that is expected, and the compensation. Particular care will be taken in order to state clearly that participation is completely voluntary and is not for extra credit. By no means, we will assess participants skills or performance and no identifiable data will be disclosed to professors or colleagues to eliminate any possibility of interfering with students' academic records. In particular, students attending to

Professor David Redmiles (Faculty Sponsor) courses will not be accepted as participants. We would like to have participants from varying majors and backgrounds and with genuine interest in IoT and smart home technologies. Therefore, we will prioritize recruiting in courses that are likely to attract such profile and that has students from a variety of majors in order to reach a more diverse population (e.g. ubiquitous computing courses, human and social aspects of technology, introductory programming courses, and the like).

Furthermore, we will advertise by posting to established student email lists and posting flyers if necessary (see attached document “Recruitment-email” and “Recruitment-flyer”). Emails will be sent by the research team directly to UCI students’ lists. Flyers will be placed in high circulation areas, like near classrooms, housing, and food courts. The same criteria stated above will apply to those who apply by email or phone contact.

## **SECTION 5: INFORMED CONSENT PROCESS**

1. **Submit the Consent, Study Info Sheet, Courtesy Letter, Assent document(s).** *Note: After IRB Approval, distribute to participants the version of the document with the IRB-approval information in the footer.*
2. Describe the specific **steps for obtaining consent.** See [Guidance for Consenting Process](#).

**Check all that apply:**

**Written / Signed informed consent will be obtained.**



*Customize the Consent for SBE Research.*

**Oral / Implied informed consent will be obtained (i.e., requesting a waiver from obtaining signed informed consent).**



*Customize the [Study Information Sheet](#) and Complete Appendix P.*

*Note: If obtaining consent online (e.g., research involves completing a survey electronically administered via AMT, EEE, etc.), participants should:*


- *View the Consent/Study Info Sheet prior to participation*
- *Be prompted to verify they meet the eligibility criteria, and*
- *Indicate their willingness to participate in the research (e.g., click “Yes”).*

**Informed consent will NOT be obtained (i.e., requesting a *complete* waiver of informed consent). No contact with participants; using existing data, records, charts, specimens, etc.**



*Complete Appendix O. Skip to Section 6.*

At the beginning of the study, we will make a “kick-off” workshop with all the recruited participants to distribute the devices they will use in the study and provide instructions for the diary study. At the very beginning of this workshop, we will distribute two copies of the written consent form (see attached document “Consent form”) for each participant, allow time for them to read it carefully and go through the major points orally with the group. The research team will be available during and after this procedure for further clarification, in group or privately, in case participants request so. Then, participants who agree to participate will be asked to sign the two copies of the consent form, one to keep with them and another to return to us. The study will start only after this. Those who do not agree will be able to leave at any time during this procedure and will not participate in the study.

<p>3. <u>UCI Students / Employees</u>: If study team members will approach their own students or employees:</p> <ol style="list-style-type: none"> <li>Explain what precautions will be taken to <b>minimize potential undue influence or coercion</b>.</li> <li>Explain <b>how compromised objectivity will be avoided</b>.</li> </ol>
<p>N/A.</p> <p>Note: Students attending to Professor David Redmiles (Faculty Sponsor) courses will not be accepted as participants.</p>
<p>4. <u>Children / Minors</u>: If children (anyone less than 18 years old) are participants, please describe the <b>parent / legal guardian permission</b> process and the <b>child assent</b> process.</p>
<p>N/A.</p>
<p>5. <u>Deception</u>: If <b>deception</b> is involved, describe the process by which participants will be informed of the true nature of the study after participation has been completed. Please attach a '<a href="#">Debriefing Script</a>.'</p> <p> <i>Complete Appendices G (Deception) and O (Alteration of Consent).</i></p>
<p>N/A.</p>
<p>6. <u>Release Form</u>: If publications and/or presentations will include <b>identifiable information</b>, specify how the study team will obtain permission from participants. Please submit a '<a href="#">Release Form</a>'</p>
<p>N/A.</p>
<p>7. <b>Non-English Speaking Participants</b>: In order to consent participants who are unable to communicate (i.e., read, write, and/or speak) in English, the English version of the consent form must be translated into appropriate language(s) once IRB approval is granted. Please specify in 'Section 2. Study Team' who will be responsible for interacting with non-English speaking participants.</p>
<p><b>Check all that apply:</b></p> <p><input checked="" type="checkbox"/> Not applicable - Only individuals who can read and speak English are eligible for this study.</p> <p><input type="checkbox"/> The English version of the consent form will be translated into appropriate languages for non-English speaking participants once IRB approval is granted. An interpreter will be involved in the consenting process. <i>Note: After IRB Approval, distribute to participants the version of the document with the IRB-approval information in the footer.</i></p>

## **SECTION 6: RESEARCH METHODOLOGY/STUDY PROCEDURES**

### **1. Study Design and Procedures**

1. Provide a **description of the proposed research** (e.g., pilot testing, screening, intervention/interaction/data collection, and follow-up) and **procedures** (e.g., surveys, interview, focus group, and observation). See [Guidance for Online Research](#).
  - a. Specify **where** the research will take place (e.g., UCI, local public schools, international site, private business, etc.).
  - b. Include an explanation of the study design (e.g., randomization, cross-sectional, longitudinal, etc.).
  - c. Indicate how much **time will be required of the participant**, per visit and in total for the study.
  - d. If a procedure will be completed more than once (e.g., multiple visits, pre and post survey), indicate **how many times** and the **time span** between administrations.
  - e. If a procedure will occur via a crowdsourcing Internet marketplace (e.g., AMT) or in the cloud (e.g., Google Docs), please describe.
  - f. Indicate if study procedures include collecting **photographs** or **audio/video recording**.

The study will span 4 weeks filling in an online diary report over the Internet and the research procedures involve also attending to two meetings (one before and one after the study) at the Department of Informatics, Donald Bren Hall:

1. **Initial workshop (3 hours, at the UCI Department of Informatics, Donald Bren Hall):** Participants will be invited to attend to an initial workshop (date to be defined to the best convenience of the participants) where, after the consent process, they will be given smart home devices to be used in the study (see attached document “Terms of commitment for using devices”). Participants should bring their mobile phones to this meeting and we will provide instructions and assist them about using the devices and installing the related software in their phone. Some activities (e.g. device and related apps installation, setup and tests) will be proposed in order to help participants familiarize themselves with the technology and appropriate support will be provided if needed. Participants will answer a background written survey (see attached document “Study questions – section 1”) and we will provide detailed instructions for the diary study that will start on the following day (see next activity). If necessary, you will be able to ask us questions and clarify participants’ doubts. The workshop will be audio recorded for further analysis and will be photographed for research records.
2. **Diary report (4 weeks in length and an estimated commitment of 15 remote hours):** In the following 4 weeks, participants will be asked to fill in an online report on Google forms about their impressions about interacting with the smart home devices they were given and with the related software (see attached document “Study questions – section 2”). The online report will allow participants to optionally submit photographs, screenshots, audio or video recordings of the devices and apps in order to illustrate and enrich their diary reports. It’s expected that participants submit 3-5 reports each week in average, but they can do more if they think there were more relevant experiences to report or are in doubt about the relevance of telling us something. “More” is better than “less.” Throughout this period, participants will use the devices however they like, but we will propose a weekly task (4 tasks or one every 7 days) that they must try to accomplish with the goal to stimulate their interaction with the devices. Tasks will comprise creating or enabling applets using the app “IFTTT” and the devices and should not take more than a few minutes to complete (see attached document “Tasks schedule”). We will provide the contact of the research team (email, phone, and instant messenger) that participants can use in case they need technical assistance. Participants will not be assessed in terms of their skills or performance with the devices and the most important thing to us is that they are able to use the devices in the way they like in order to submit rich diary reports. We estimate that remote activities should take a maximum of 20-30 minutes of participants’ time in average each day during 4 weeks for a total of 15 hours at most. This time commitment should be enough for filling in the diary report in the expected rate, complete the study tasks and occasionally interacting with the

research team for technical support.

3. **A final interview (1 hour, at the UCI Department of Informatics, Donald Bren Hall):** After the end of the diary study participants will be invited for a final wrap-up interview (see attached document “Study questions – section 3”) within 5 days in a date and time to be scheduled according to their convenience. The interview will be audio recorded and transcribed for analysis.

In total, the study should demand about 20 hours of participants’ time.

## 2. Off-Site Research –

- a. See [Guidance for Letter\(s\) of Permission](#)
- b. See [Template Letter of Permission](#)

[ ] Check here to confirm [Letter\(s\) of Permission](#) has been / will be obtained and kept on file.

## 2. Measures / Data Sources

1. List the measures that will be administered or data sources that will be accessed.
2. Submit **data collection instruments** (e.g., data abstraction sheet listing the variables that will be collected/analyzed for records reviews, measures, questionnaires, list of interview or focus group questions, observational tool, etc.).

The main data to be collected will be participants’ voluntary statements (written initial survey, online diary reports, and final interview) to be subject to qualitative analysis (e.g. transcription and coding). Furthermore, this data can be complemented by photos of the initial workshop and that participants choose to submit together with their online diary reports. We will collect the following data according to the study procedure:

### 1. Initial workshop:

- a. *Initial background written survey:* see attached document “Study questions” – Section 1. Individual data will be stored with code number. Separate list will link code and participant identifier. Only the Lead Researcher and Faculty Sponsor will have access to the identifiers.
- b. *Workshop audio recordings:* Participants voices will appear in workshop audio recordings. Workshop recordings might be transcribed for further analysis. Individual data will be stored with code number. Separate list will link code and participant identifier. Only the Lead Researcher and Faculty Sponsor will have access to the identifiers.
- c. *Workshop photos:* Workshop will be photographed for research records. Participants might appear in workshop photos. Photos will be anonymized before stored. Only the Lead Researcher and Faculty Sponsor will have access to the originals.

### 2. Diary report (4 weeks in length and an estimated commitment of 15 remote hours):

- a. *Diary report in Google forms to be submitted online over the Internet:* see attached document “Study questions” – Section 2. Individual data will be stored with code number. Separate list will link code and participant identifier. Only the Lead Researcher and Faculty Sponsor will have access to the identifiers.
  - i. *Participants’ photos/videos/audio/screenshots:* During the diary study, photographs, screenshots, audio or video recordings will be optional for the participants to send to us through the Google forms platform (they will be able to submit files in the online report form if they want). Participants will be instructed to register photos, videos or screenshots of the devices and related apps whenever they find relevant in order to illustrate and enrich their diary reports. Participants will be explicitly instructed to focus on devices, apps and tasks they are performing and to avoid taking pictures of faces, addresses or other identifiable information. Files submitted will be reviewed and identifiable information will

be removed before data analysis in case we find. Only the Lead Researcher and Faculty Sponsor will have access to the original photos/videos/audio/screenshots.

- b. *Participants' technical questions to the Lead Researcher:* questions received by the lead researcher during the study might be analyzed because they might reveal the kind of information we are particularly interested in (e.g. potential breakdowns). Participants will not be assessed in terms of their skills or performance with the devices. Individual data will be stored with code number. Separate list will link code and participant identifier. Only the Lead Researcher and Faculty Sponsor will have access to the identifiers.

3. **Final interview:**

- a. *Interview audio and transcriptions:* see attached document "Study questions" – Section 3. Participants voices will be audio recorded and transcribed for analysis. Participant identifiers will be maintained in a separate file. Only the Lead Researcher will have access to the identifiers.



**IMPORTANT TIME SAVER: PLEASE ATTACH ALL MEASURES FOR REVIEW. APPLICATIONS ARE INCOMPLETE AND WILL NOT BE REVIEWED UNLESS MEASURES ARE PROVIDED.**

**SECTION 7: RISK ASSESSMENT AND POSSIBLE BENEFITS**

**A. Level of Risk**

Place an "X" in the bracket [ ] next to the level of review (based upon the investigator's risk assessment).

[ ] This study involves **greater than minimal risk** and requires **Full Committee review**.

[ X ] This study involves **no more than minimal risk** and qualifies as Expedited research.

**B. Risks and Discomforts**

1. Describe the **risks/potential discomforts** (e.g., emotional reaction from personal or sensitive information included in surveys, interviews, focus group, etc.; embarrassment or stigma; invasion of privacy) associated with **each** intervention or research procedure.

There is no specific risk/potential discomfort anticipated associated with the initial workshop and final interview since we are not asking neither collecting any kind of sensitive information in these procedures.

The 4-weeks diary study is the core part of our study and there is no known harms or discomforts associated with this procedure beyond those encountered in normal daily life. The possible risks and/or discomforts include:

1. Internet security risks introduced by the devices in participants' home network. Although devices are commercially available and password protected, all internet connected devices are exposed to networks attacks. These risks are not greater than those participants' already have if they already use smart connected devices at their home internet or if they buy one for themselves;
2. Participants may feel fatigued or too busy to do a task or a diary entry some days. In that case, it is totally fine to skip one or another day and re-start reporting when they feel more inclined. Participants can also withdraw from the study anytime without the need to explain why.

3. Photos/screenshots/audio/video recordings submitted by the participants may contain identifiable information or expose the privacy of participants because participants will be the ones who will take the pictures and perform the recordings (optionally and only in the cases they do submit photos/screenshots/audio/video). We will review all submitted files in order to remove all identifiable and sensitive information before data analysis begins.

A breach of confidentiality is possible if someone other than the Lead Researcher or Faculty Sponsor obtains the original files (photos/screenshots/audio/video recordings collected during the study) and the document that links the subject's identity and the unique ID used to identify collected data.

**This study involves the collection of participant identifiable data** (even if temporary such as for recruitment or compensation purposes), and as such, a breach of confidentiality is a risk associated with the research.

2. Discuss what steps have been taken and/or will be taken **minimize and prevent** any risks/potential discomforts described above.

To minimize the risk of confidentiality breach, the document with subject identifiable information and original photos/screenshots/audio/video recordings will be kept in a password protected secure computer different from where other study data is stored. This document will be destroyed at the end of the study (once the data analysis is completed and after publication/presentation of the results).

### C. Potential Benefits

Discuss the potential benefits directly **to the participant and to society**. **Compensation (i.e., gift cards, cash, course credit, etc.) is not a benefit.**

There is no direct benefit anticipated for the participant.

**OR**

We hope participants enjoy using the devices. Furthermore, this study may help us to understand how to improve interaction with this kind IoT of technology.

## **SECTION 8: PARTICIPANT COMPENSATION AND REIMBURSEMENT**

1. If participants will be compensated (e.g., money, extra credit, etc.) for their time and effort, indicate the method/type (i.e., cash, check, gift certificate, etc.) and **exact amount**.
2. Indicate **when** compensation be provided (e.g., directly after participating in the interview, within two weeks) **and how** it will be provided (e.g., in person, by mail, emailed an electronic gift card code)?
3. Compensation should be offered on a **prorated basis** when the procedures involve multiple sessions. Provide a **breakdown of the amount, specifying for which exact procedure it pertains, and the total amount** that may be given.
4. Specify whether subjects will be reimbursed for out-of-pocket expenses (i.e., parking fees, transportation, etc.). If so, describe any requirements for reimbursement (e.g., receipt).

Not applicable - This study involves no interaction/intervention with participants (i.e., involves the use of data, records, charts, specimens).

No compensation will be provided to participants.

No reimbursement will be provided to participants.

**OR**

Participants will be compensated with \$30 in cash + up to \$200 value in devices used in the study (participants will keep the devices we will give them to be used in the study after the final interview – see attached document “Terms of commitment for using devices”). Compensation will be prorated and paid as following: Participants will receive \$5 for participating in the initial workshop, plus \$5 per week on the proviso that they continue to actively participate in the diary study (up to \$20 for the 4 weeks), plus \$5 for the final interview. “Continued active participation” means that participants submit 3-5 diary reports on average each week they participate. We will pay participants in cash in the end of the study up to the maximum of \$30. Furthermore, participants will be given the devices they used during the study as a compensation for their complete participation (that is, in case they attend to the initial workshop, continually and actively participate over the 4 weeks of diary study and attend to the final interview). If a participant decides to withdraw from the study or is withdrawn by the research team before the final interview, s/he will receive compensation proportional to his/her participation. Participants that do not complete the study will be paid according to the activities they have participated in according to the amounts described above. Partial participation compensation will be paid in cash at the end of participation upon the return of the devices to the research team.

Participants will not be reimbursed for any out of pocket expenses, such as parking or transportation fees.

## **SECTION 9: CONFIDENTIALITY OF RESEARCH DATA**

1. Will researchers maintain any participant identifiers? Check all that apply:

Participant identifiers are not maintained (i.e., researchers will not collect information that can link the participant to their data)

**OR**

<input checked="" type="checkbox"/> Names	<input type="checkbox"/> Social Security Numbers	<input checked="" type="checkbox"/> Device identifiers/Serial numbers
<input type="checkbox"/> Dates*	<input type="checkbox"/> Medical record numbers	<input type="checkbox"/> Web URLs
<input type="checkbox"/> Postal address	<input type="checkbox"/> Health plan numbers	<input type="checkbox"/> IP address numbers
<input checked="" type="checkbox"/> Phone numbers	<input type="checkbox"/> Account numbers	<input type="checkbox"/> Biometric identifiers
<input type="checkbox"/> Fax numbers	<input type="checkbox"/> License/Certificate numbers	<input type="checkbox"/> Facial Photos/Images
<input checked="" type="checkbox"/> Email address	<input type="checkbox"/> Vehicle id numbers	<input type="checkbox"/> Any other unique identifier

Other (Specify all): [<Type here>](#)

\* birth date, treatment/hospitalization dates

2. Indicate **how identifiable data will be recorded, stored, secured.**

**Note: If the research data includes identifiable private information the storage devices or the electronic**



research files must be encrypted. [For guidance on the use of cloud services, please review the [UCI OIT policy](#).]

No identifiers will be maintained

Biological specimens

Other(s) (specify): <Type here>

**Electronic Data (check all that apply):**

Coded data; code key is kept separate from data in secure location.

Data includes identifiable information. **Note: Encryption software is required.** Provide rationale for maintaining identifiable info: During the diary study, photographs, audio or video recordings will be optional for the participants to send to us through the Google forms platform (they will be able to submit files in the online report form if they want). Participants will be instructed to register photos, videos or screenshots of the devices and related apps whenever they find relevant in order to illustrate and enrich their diary reports. Participants will be explicitly instructed to focus on devices, apps and tasks they are performing and to avoid taking pictures of faces, addresses or other identifiable information. However, there is a risk of identifiable or private information appearing in these photos because participants will be the ones who will take the pictures and perform the recordings. We will review all submitted files in order to remove all identifiable or sensitive information before data analysis begins. Originals will be encrypted and kept separately from data in secure location together with code keys/participants identifiers.

Data will be stored on secure network server.

Data will be stored on stand-alone desktop computer (not connected to network/internet)

Data will be stored in the cloud (specify source providing service): <Type here>

Other (specify here): <Type here>

**Hardcopy Data, Recordings and Biospecimens (check all that apply):**

Coded data; code key is kept separate from data in secure location.

Data includes identifiable information. Provide rationale for maintaining identifiable info: <Type here>

Data will be stored in locked file cabinet or locked room at UCI/UCIMC.

Data will be stored locked lab/refrigerator/freezer at UCI/UCIMC.

Other (specify here): <Type here>

**Data on Portable Devices:**

5. Specify whether participant **identifiable data** will be stored on the device. If so, **explain why** it is necessary to store identifiers on the device.
6. Describe the **portable device(s) to be used** (e.g. audio/video recording device, tapes, cameras, mobile phones / iPhone, laptop, tablet, portable hard drive including USB flash drives).
7. Explain how long the identifiable data will be maintained on the portable device.

**Note:** Only the “minimum data necessary” should be stored on portable devices as these devices are particularly susceptible to loss or theft, thus creating a source for potential breach of confidentiality. If there is a necessity to use portable devices for initial collection of identifiable private information, the portable storage devices or the research files **MUST BE ENCRYPTED**, and identifiers transferred to a secure system as soon as possible.

Not applicable – No study data will be maintained on portable devices.

**OR**

Workshop photos will be taken with the research team mobile phones. Workshop audio and interviews will be recorded with a mobile phone or a portable audio recorder. The data will be transferred to a secure computer or server within 72 hours after the interview. This data does not include subject identifiable information.

**Data Retention:**

8. Explain **how long participant identifiers** will be **retained**. This includes the key code linking the data to the participants.

*Note: If more than one of the options below is applicable [e.g., the study involves children], records should be kept for the longer period.*

Not applicable. No identifiers are retained.

Destroy once its purposes has been served (e.g., for recruitment, after compensation granted)

Destroy once data collection/analysis is complete.

Destroy after publication/presentation.

Maintain for approximately <Type here> years (e.g., 3 months, etc.)

Maintain indefinitely. Other researchers may have access to de-identified data for future research.

Note: **Appendix M is required if identifiable data will be shared with non-UCI Researchers.**

Identifiable research records will be retained for seven years after all children enrolled in the study reach the age of majority [age 18 in California] as this study includes children.

Other: <Type here>

**Data Destruction of Recordings / Photographs:** If subject identifiable audio or video recordings or photographs will be collected, specify the timeframe for the transcription and describe retention / destruction plans.

Not applicable – No audio/video recordings or photographs will be collected.

Audio or video recordings transcribed and de-identified; specify time frame: **within three months after the interview**

Audio or video recordings maintained with identifiers; specify time frame: <Type here>

Audio or video recordings destroyed; specify time frame: **after publication/presentation**

Photographs maintained with identifiers; specify time frame: **within three months after collection**

Photographs destroyed; specify time frame: **after publication/presentation**

**Certificate of Confidentiality:**

Specify whether a [Certificate of Confidentiality \(COC\)](#) has been or will be requested from the National Institutes of Health (NIH). If yes, explain in what situations personally identifiable information protected by a COC will be disclosed by the UCI study team.

*Note: If the COC has been secured, provide a copy of the COC Approval Letter with your IRB application or provide it to the IRB upon receipt.*

[ X ] Not applicable – No COC has been requested for this study.

**OR**

<Type here>

SUBJECT LINE:

RESEARCH STUDY PARTICIPANT NEEDED: INVESTIGATING INTERACTION WITH SMART HOME DEVICES

Dear UCI Student,

Lead Researcher Bruno Azevedo Chagas and researchers from the Informatics Department at the University of California, Irvine, under supervision of Professor David Redmiles are recruiting participants for a research study about how users interact with smart home technology in an everyday basis. This study may help us to better understand how existing smart home devices and related software can be improved in order to offer more comfort, convenience and pleasure to their users.

You are eligible to participate in this study if you are at least 18 years of age or older, are a student at UCI, has your own a mobile smartphone device and is interested in the Internet of Things or already has a smart home device (e.g. smart lights, Amazon Alexa, smart power plugs, etc.).

The study will take place part in the UCI Department of Informatics (Donald Bren Hall) in two different occasions and part will be completed online by filling a daily web report remotely for 4 weeks during the 2017 fall quarter. In total, the study should demand about 20 hours of your time: 4 hours attending to two meetings in the UCI Department of Informatics (a 3-hour initial workshop and a 1-hour final interview) and an estimated remote commitment of 15 hours for performing remote activities (20-30 minutes each day during 4 weeks).

As part of participating, you will be asked to attend to the initial workshop, log your activities remotely for 4 weeks, and come to a final interview after this period. At the initial workshop, you'll be given smart home devices and setup instructions to use them with your mobile phone. Throughout the study period, you are encouraged to use the devices however you like. Your task will be to report your impressions about interacting with these devices in an online form over the internet. It is expected that you submit about 3-5 reports each week in average. In addition, you'll be given a weekly task (4 tasks or one every 7 days) you must try to accomplish with the goal to stimulate your interaction with the devices. Further instructions will be provided to the participants in the initial workshop and throughout the study.

You will be paid for your participation in this research as follows: \$5 for participating in the initial workshop + \$5 per week on the proviso that you continue to actively participate on the study (up to \$20 for the 4 weeks of diary study) + \$5 for the final interview. Continued active participation means that you submit 3-5 diary reports in average each week you participate. Payment will be made in cash in the end of your participation up to the maximum of \$30. Furthermore, you will

be given the devices you used during the study as a compensation for your complete participation (up to \$200 value).

If you participate, there is no anticipated direct benefit. Your skills or performance will not be assessed and by no means identifiable data will be disclosed to professors or colleagues and will not interfere with your academic records.

If you are interested in participating in this study, please contact Bruno Azevedo Chagas at [bazeved1 \(at\) uci \(dot\) edu](mailto:bazeved1@uci.edu) or (\*\*\*) \*\*\*-\*\*\*\* informing your name, age, major and preferred contact.

Thank you very much for your time.

**RESEARCH STUDY:  
INVESTIGATING INTERACTION WITH SMART HOME DEVICES**

Lead Researcher: Bruno Azevedo Chagas, MSc

Bruno Azevedo Chagas and researchers from the Informatics Department at the University of California, Irvine under supervision of Professor David Redmiles are recruiting participants for a research study about how users interact with smart home technology in an everyday basis. This study may help us to better understand how existing smart home devices and related software can be improved in order to offer more comfort, convenience and pleasure to their users.

You are eligible to participate in this study if you are at least 18 years of age or older, are a student at UCI, has your own a mobile smartphone device and is interested in the Internet of Things or already has a smart home device (e.g. smart lights, Amazon Alexa, smart power plugs, etc.).

The study will take place part in the UCI Department of Informatics (Donald Bren Hall) in two different occasions and part will be completed online by filling a daily web report remotely for 4 weeks during the 2017 fall quarter. In total, the study should demand about 20 hours of your time: 4 hours attending to two meetings in the UCI Department of Informatics (a 3-hour initial workshop and a 1-hour final interview) and an estimated remote commitment of 15 hours for performing remote activities (20-30 minutes each day during 4 weeks).

As part of participating, you will be asked to attend to the initial workshop, log your activities remotely for 4 weeks, and come to a final interview after this period. At the initial workshop, you'll be given smart home devices and setup instructions to use them with your mobile phone. Throughout the study period, you are encouraged to use the devices however you like. Your task will be to report your impressions about interacting with these devices in an online form over the internet. It is expected that you submit about 3-5 reports each week in average. In addition, you'll be given a weekly task (4 tasks or one every 7 days) you must try to accomplish with the goal to stimulate your interaction with the devices. Further instructions will be provided to the participants in the initial workshop and throughout the study.

You will be paid for your participation in this research as follows: \$5 for participating in the initial workshop + \$5 per week on the proviso that you

## RESEARCH PARTICIPANT NEEDED

continue to actively participate on the study (up to \$20 for the 4 weeks of diary study) + \$5 for the final interview. Continued active participation means that you submit 3-5 diary reports in average each week you participate. Payment will be made in cash in the end of your participation up to the maximum of \$30. Furthermore, you will be given the devices you used during the study as a compensation for your complete participation (up to \$200 value).

If you participate, there is no anticipated direct benefit. Your skills or performance will not be assessed and by no means identifiable data will be disclosed to professors or colleagues and will not interfere with your academic records.

If you are interested in participating in this study, please contact Bruno Azevedo Chagas at [bazeved1 \(at\) uci \(dot\) edu](mailto:bazeved1@uci.edu) or (\*\*\*) \*\*\*-\*\*\*\* informing you name, age, major and preferred contact. Or just scan the QR-code bellow from your mobile phone to send us an email:



September/October, 2017.

# **STUDY PARTICIPANT NEEDED: INVESTIGATING INTERACTION WITH SMART HOME DEVICES**

Fall 2017

Bruno Azevedo Chagas, MSc  
Professor David Redmiles



## Who:

- 18 years old and over
- Are a student at UCI
- Must have own mobile smartphone
- **Interested in the Internet of Things or already have a smart home device**
  - E.g. smart lights, Amazon Alexa, smart power plugs, etc.



## What:



- 4-week diary study about interaction with smart home devices:
  - 2 meetings:
    - Initial workshop (3 hours) - before
    - Final wrap-up interview (1 hour) - after
  - Diary online reporting: (4 weeks)
    - Daily filling an online form (3-5 reports / week in average)
    - 4 Weekly tasks (1 task per week)
    - Estimate 20-30 min / day
- Total commitment: 20 hours



## When and Where:

- 2017 Fall quarter
- Meetings will be held at the Donald Bren Hall
- Diary study will be answered remotely online (e.g. Google form)


## Financial Compensation:

- Up to \$30 in cash:
  - \$5 initial workshop
  - \$5 / week of continued active participation
  - \$5 final interview
  - Paid at the end of the study
- Keep devices at the end (up to \$200 value):
  - Upon completion, after final interview
- **NOTE: THIS IS NOT FOR EXTRA CREDIT!**

## Disclaimer:

- Your skills or performance will not be assessed and by no means identifiable data will be disclosed to professors or colleagues and will not interfere with your academic records.

## How:

- Apply to:
  - [bazeved1 \(at\) uci \(dot\) edu](mailto:bazeved1@uci.edu)
  - (\*\*\*) \*\*\* 
- Send your information:
  - Name
  - Age
  - Major
  - Preferred contact



**UNIVERSITY OF CALIFORNIA, IRVINE  
CONSENT TO ACT AS A HUMAN RESEARCH SUBJECT**

**RESEARCH STUDY:  
INVESTIGATING INTERACTION WITH SMART HOME DEVICES**

You are being asked to participate in a research study. Participation is completely voluntary. Please read the information below and ask questions about anything that you do not understand. A researcher listed below will be available to answer your questions.

**RESEARCH TEAM**

**Lead Researcher**

Bruno Azevedo Chagas, MSc, Junior Specialist  
Department of Informatics  
(\*\*) \*\*\_\* \*\*\*\_\*\* bazeved1 (at) uci (dot) edu

**Faculty Sponsor**

Professor David Redmiles, PhD  
Department of Informatics  
(\*\*) \*\*\_\* \*\*\*\_\*\* redmiles (at) ics (dot) uci (dot) edu

**Other Researchers**

Zhendong Wang, Master Student  
Department of Informatics  
(\*\*) \*\*\_\* \*\*\*\_\*\*  
[zhendow \(at\) uci \(dot\) edu](mailto:zhendow@uci.edu)

Tao Wang, PhD Candidate  
Department of Informatics  
(\*\*) \*\*\_\* \*\*\*\_\*\*  
[taow4 \(at\) uci \(dot\) edu](mailto:taow4@uci.edu)

Yorah Bosse, Visiting Researcher  
Department of Informatics  
(\*\*) \*\*\_\* \*\*\*\_\*\*  
[ybosse \(at\) uci \(dot\) edu](mailto:ybosse@uci.edu)

**STUDY LOCATION(S):** UC Irvine Department of Informatics, Donald Bren Hall and remotely (online form submission over the Internet)

**WHY IS THIS RESEARCH STUDY BEING DONE?**

The purpose of this research study is to investigate how users interact with smart home technology in an everyday basis over time. This study may help us to understand how existing smart home devices and related software can be improved in order to offer more comfort, convenience and pleasure to their users.

**HOW MANY PEOPLE WILL TAKE PART IN THIS STUDY?**

This study will enroll approximately 15 participants. The study procedures will be done in two locations according to the type of activity: two meetings in person that will be done at the UC Irvine Department of Informatics, Donald Bren Hall (an initial workshop and a final interview at the end) and an online diary report that should be submitted remotely over the Internet over the course of 4 weeks after the initial workshop.

## WHAT PROCEDURES ARE INVOLVED WITH THIS STUDY AND HOW LONG WILL THEY TAKE?

The study will span 4 weeks filling in an online diary report over the Internet and the research procedures involve also attending to two meetings (one before and one after the study) at the Department of Informatics, Donald Bren Hall:

1. Initial workshop (3 hours, at the UCI Department of Informatics, Donald Bren Hall): You will be invited to attend to an initial workshop (date to be defined to the best convenience of the participants) where you'll be given smart home devices to be used in the study. You should bring your mobile phone to this meeting and we will provide instructions about using the devices and installing the related software in your phone. Some activities (e.g. device and related apps installation, setup and tests) will be proposed in order to help you familiarize yourself with the technology and appropriate support will be provided if needed. You will answer a basic survey and we will provide detailed instructions for the diary study that will start on the following day (see next activity). If necessary, you will be able to ask us questions and clarify your doubts.
2. Diary report (4 weeks in length and an estimated commitment of 15 remote hours): In the following 4 weeks, you'll be asked to fill in an online report about your impressions about interacting with the smart home devices you were given and with the related software. It's expected that you submit 3-5 reports each week in average, but you can do more if you think there were more relevant experiences to report or are in doubt about the relevance of telling us something. "More" is better than "less." The online report will also allow you to optionally submit photographs, screenshots, audio or video recordings of the devices in order to illustrate and enrich your diary reports. They may help us understand the context and details of your experiences with the devices. While making these recordings you should focus on the devices and avoid taking pictures of faces, addresses or other identifiable information. Throughout this period, you are encouraged to use the devices however you like, but you'll be given a weekly task (4 tasks or one every 7 days) you must try to accomplish with the goal to stimulate your interaction with the devices. Tasks will comprise creating or enabling applets using the app "IFTTT" and the devices you got and should not take more than a few minutes to complete. We will provide the contact of the research team (email, phone, and instant messenger) that you can use in case you need technical assistance. Please, do not hesitate to ask for technical support with the devices. You are not being assessed in terms of your skills or performance with the devices and the most important thing to us is that you are able to use them in the way you like in order to submit rich diary reports. We estimate that remote activities should take a maximum of 20-30 minutes of your time in average each day during 4 weeks for a total of 15 hours at most. This time commitment should be enough for filling in the diary report in the expected rate, complete the study tasks and occasionally interacting with the research team for technical support.
3. A final interview (1 hour, at the UCI Department of Informatics, Donald Bren Hall): After the end of the diary study you'll be invited for a final interview within 5 days in a date and time to be scheduled according to your convenience.

In total, the study should demand about 20 hours of your time.

You must meet the following requirements to be in the study:

1. Are at least 18 years old;
2. Are a student at UCI;
3. Have your own mobile smartphone (it will be used to install new apps and interact with the devices)
4. Is interested in the Internet of Things or already has a smart home device (e.g. smart lights, Amazon Alexa, smart power plugs, etc.).



## WHAT ARE THE POSSIBLE DISCOMFORTS OR RISKS RELATED TO THE STUDY?

There are no known harms or discomforts associated with this study beyond those encountered in normal daily life. The possible risks and/or discomforts associated with the procedures described in this study include:

1. Internet security risks introduced by the devices in your home network. Although devices are commercially available and password protected, all internet connected devices are exposed to networks attacks. These risks are not greater than those you already have if you already use smart connected devices in your home internet or if you buy one for yourself;
2. You may feel fatigued or too busy to do a task or a diary entry some days. In that case, it is totally fine to skip one or another day and re-start reporting when you feel more inclined. You can also withdraw from the study anytime without the need to explain why.
3. Photos/screenshots/audio/video recordings you choose to submit in your diary reports are optional but most welcomed to enrich your reports. When recording this information, you should focus on the devices, apps and tasks and avoid taking pictures of faces, addresses or other identifiable or sensitive information. Files submitted will be reviewed; identifiable and sensitive information will be removed before data analysis to protect your privacy. While the research team will make every effort to keep your personal information confidential, it is possible that an unauthorized person might see it. We cannot guarantee total privacy.

## ARE THERE BENEFITS TO TAKING PART IN THE STUDY?

### ***Participant Benefits***

You will not directly benefit from participation in this study in any anticipated way, but we hope you enjoy experiencing with these devices in your daily life.

### ***Benefits to Others or Society***

This study may help us to understand how to improve interaction with this kind of technology.

## WILL I BE PAID FOR TAKING PART IN THIS STUDY?

### ***Compensation***

You will receive \$5 for participating in the initial workshop, plus \$5 per week on the proviso that you continue to actively participate in the study (up to \$20 for the 4 weeks), plus \$5 for the final interview. Continued active participation means that you submit 3-5 diary reports on average each week you participate. Your payment will be made in cash in the end of your participation up to the maximum of \$30. Furthermore, you will be given the devices you used during the study as a compensation for your complete participation (that is, initial workshop, continued active participation over the 4 weeks of diary study and the final interview). If you decide to withdraw from the study or are withdrawn by the research team before the final interview, you will receive compensation proportional to your participation. You will be paid according to the activities you have participated in according to the amounts described above. Partial participation compensation will be paid in cash at the end of your participation upon the return of the devices to the research team.

### ***Reimbursement***

You will not be reimbursed for any out of pocket expenses, such as parking or transportation fees.

## WHAT HAPPENS IF I WANT TO STOP TAKING PART IN THIS STUDY?

You are free to withdraw from this study at any time. **If you decide to withdraw from this study you should notify the research team immediately.** The research team may also end your participation in this study if you do not follow instructions, miss scheduled visits, or if your safety and welfare are at risk.

If you withdraw or are removed from the study, the researcher will ask you to attend to a final meeting to return the devices given to you in the initial workshop.

If you elect to withdraw or are withdrawn from this research study, the researchers will discuss with you what they intend to do with your study data. Researchers may choose to analyze the study data already collected or they may choose to exclude your data from the analysis of study data and destroy it, as per your request.

## HOW WILL MY PERSONAL INFORMATION BE KEPT?

### ***Subject Identifiable Data***

All identifiable information collected about you will be removed and replaced with a code. A list linking the code and your identifiable information will be kept separate from the research data. This procedure is necessary to support data analysis because subject identification can help us understand your data and we might occasionally need to clarify some answer with you. Only authorized individuals will have access to it. In addition, the photos/screenshots/audio/video recordings that you choose to submit in your diary reports may contain identifiable information and will be reviewed; identifiable and sensitive information will be removed before data analysis to protect your privacy. Only authorized individuals will have access to the originals.

### ***Data Storage***

Research data will be maintained in a secure location at UCI. Only authorized individuals will have access to it.

Research data will be stored electronically on a laptop computer in an encrypted file and is password protected.

The photos and audio recordings of the workshop and your interview will also be stored in a secure location; then anonymized, transcribed and erased at the end of the study.

The photos/screenshots/audio/video recordings you submit with your diary reports will also be stored in a secure location; then reviewed and anonymized before analysis and erased at the end of the study.

### ***Data Retention***

The researchers intend to keep the research data until the research is published and/or presented.

## WHO WILL HAVE ACCESS TO MY STUDY DATA?

The research team, authorized UCI personnel, the study sponsor, and regulatory entities such as the Office of Human Research Protections (OHRP), may have access to your study records to protect your safety and welfare.

Any information derived from this research project that personally identifies you will not be voluntarily released or disclosed by these entities without your separate consent, except as specifically required by law. Study records provided to authorized, non-UCI entities will not contain identifiable information about you; nor will any publications and/or presentations without your separate consent.

While the research team will make every effort to keep your personal information confidential, it is possible that an unauthorized person might see it. We cannot guarantee total privacy.

**ARE THERE OTHER ISSUES TO CONSIDER IN DECIDING WHETHER TO PARTICIPATE IN THIS STUDY?**

No one on the study team has a disclosable financial interest related to this research project.

**WHO CAN ANSWER MY QUESTIONS ABOUT THE STUDY?**

If you have any comments, concerns, or questions regarding the conduct of this research, please contact the research team listed at the top of this form.

Please contact UCI's Office of Research by phone, (949) 824-6662, by e-mail at [IRB@research.uci.edu](mailto:IRB@research.uci.edu) or at 141 Innovation Drive, Suite 250, Irvine, CA 92697, if you are unable to reach the researchers listed at the top of the form and have general questions; have concerns or complaints about the research; have questions about your rights as a research subject; or have general comments or suggestions.

**What is an IRB?** An Institutional Review Board (IRB) is a committee made up of scientists and non-scientists. The IRB's role is to protect the rights and welfare of human subjects involved in research. The IRB also assures that the research complies with applicable regulations, laws, and institutional policies.

## HOW DO I AGREE TO PARTICIPATE IN THIS STUDY?

You should not sign this consent form until all of your questions about this study have been answered by a member of the research team listed at the top of this form. You will be given a copy of this signed and dated consent form to keep. **Participation in this study is voluntary.** You may refuse to answer any question or discontinue your involvement at any time without penalty or loss of benefits to which you might otherwise be entitled. Your decision will not affect your future relationship with UCI or your quality of care at the UCI Medical Center.

Yes, I agree to allow the research team to audio record my voice in interviews and the workshop.  
 No, I do not agree to allow the research team to audio record my voice in interviews and the workshop.

Yes, I agree to allow the research team to collect my data electronically via online form.  
 No, I do not agree to allow the research team to collect my data electronically via online form.

Yes, I agree to allow the research team to use pictures, audio and videos that I submit on the proviso that any identifiable information about myself will not be published or presented without my separate consent.

No, I do not agree to allow the research team to use pictures and videos that I submit on the proviso that any identifiable information about myself will not be published or presented without my separate consent.

Your signature below indicates you have read the information in this consent form and have had a chance to ask any questions you have about this study.

***I agree to participate in the study.***

\_\_\_\_\_  
**Subject Signature**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Printed Name of Subject**

\_\_\_\_\_  
**Researcher Signature**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Printed Name of Researcher**

**RESEARCH STUDY:  
INVESTIGATING INTERACTION WITH SMART HOME DEVICES**

**TERMS OF COMMITMENT**

As a participant in the research study entitled “INVESTIGATING INTERACTION WITH SMART HOME DEVICES” you are being given a set of devices provided to you by the research team that will be under your responsibility and used by you throughout the study. You are free and encouraged to use the devices however you like and you will be able to keep the devices with you after the study finishes if you do not withdraw your participation only. That is, the devices will be given to you as part of your compensation for your complete participation in the study after the final interview. However, you agree that you will return the devices in case you withdraw from the study any time before the study ends.

Please, check each device that you have received:

- Amazon Echo Dot
- LIFX Wi-Fi Smart color LED
- WeMo Insight smart plug
- Flic button
- D-Link DCH-S150 smart motion sensor

Your signature below indicates you have read and agreed to the above terms.

***I agree to return the devices given to me in case I do not complete the study.***

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**Subject Signature**

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**Date**

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**Printed Name of Subject**

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**Researcher Signature**

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**Date**

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**Printed Name of Researcher**

# Diary Report Instructions

The online form is designed to work in most devices and web browsers and you can submit from any device you want (e.g. your computer or mobile phone). Choose a convenient time that you are likely to be home, not busy and able to think about your responses. In some cases, it might help if you are able to see and interact with the devices to refresh your memory while filling the report. This can help you recall the details about the situation you are reporting, your feelings and thoughts about it.

You start by informing your participant code \_\_\_\_\_, which will be used as your unique identifier for this research purposes. Please, do not share your code with other participants.

The main section of the diary report is the one about your recent experiences with the devices and we are providing further explanations to this section here in order to clarify possible anticipated doubts. The other parts are more “self-explanatory.”

The form allows you to edit your past answers after submission if needed. You can also enter a “snippet” which is a quick record you can use to log a situation temporarily for you to elaborate on it later. Use it to your best convenience and time management.

## Section 1 - Your recent interactions

### General instructions:

In this section, you are going to be asked 4 questions regarding your experience with the devices since your last report. All questions are required. If you don't have an answer to a question on a particular day, just say "Nothing" or "N/A." As a general rule, you can be brief about repetitive situations (*that is*, something that you have already reported before) and elaborate more on new situations and experiences you are reporting for the first time. Whenever applicable, try to address the following topics in your answer to each question:

- **What:** What happened?
- **When:** Day and approximate time
- **Where:** Where was the device(s)? Where were you? (If possible, be precise e.g. at home, in my room, etc. Remember we don't know where you placed the devices, so this is the place you will tell us about it. Also, if you were interacting remotely, please let us know about where you were at the time, if possible.)
- **Who:** Was there another person involved? In person or remotely? Can you describe his/her role?
- **Why:** Why did you think that happened? How would you explain that to another person if you had to?
- **How:** How did you feel about it? Would you say this situation was positive or negative? Why?

Research study  
“INVESTIGATING INTERACTION WITH SMART HOME DEVICES”

**Section 1 - Your recent interactions**

**Questions:**

**A) Did you interact with any of the devices since your last report? Which ones? What did you do?\***

Tell us about all interactions you made since your last report. You can describe what you did or tried to do, being brief on what you have already told us before and elaborating more on new situations.

**B) Did you notice any automatic behavior since your last report? Tell us about it.\***

For example, if you deliberately interacted with some device, you are probably telling us about it in the previous question. However, if you notice some automatic behavior that was not immediately started by you, tell us about it here. We are calling "automatic behavior" as opposed to any "immediate interaction" you made, even if it is a behavior due to a configuration (e.g. an IFTTT applet) that you have made before.

**C) Did you make any change in the devices since your last report? What did you change? Why?\***

For instance, if you have moved a device to another place, changed a setting/configuration in the device or IFTTT, or if you noticed you started to behave/interact differently with a device please tell us here. And don't forget to explain to us WHY you made it!

**D) Was there any situation that you considered particularly surprising or unexpected since your last report? Please, tell us about it.\***

It can be any positive or negative situation that you went through that somehow called your attention to the devices or made you feel in a particular way about them.

**Upload a file to enrich or illustrate your previous answers (optional).**

On the end of this section, you will be able to upload file(s) to enrich your report. You can submit photos/screenshots/audio/video recordings that you think can illustrate the situations you described on any of your answers in this section. For example, you may upload a picture (e.g. a photo of the device and its surroundings, a screenshot, etc.) or a video to illustrate a particular situation and help us understand what happened and things like the context, the device location, status, behavior, etc.

# Diary report - "Investigating Interaction with Smart Home Devices"

Instructions: <https://goo.gl/1qANvv>

\* Required

1. Your participant code: \*

Inform your private identification code you received from the research team. Please, do not share your code or show it to other people, especially to the other participants.

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2. Is this a snippet or a diary report? \*

Mark only one oval.

Snippet *Skip to question 3*

Diary report *Skip to question 4*

Snippet (temporary)

Instructions: <https://goo.gl/1qANvv>

3. Record here a short snippet of information about something that has occurred freshly so that you can elaborate on it later. \*

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Section 1 - Your recent interactions

Instructions: <https://goo.gl/1qANvv>



4. A) Did you interact with any of the devices since your last report? Which ones? What did you do? \*

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5. B) Did you notice any automatic behavior since your last report? Tell us about it. \*

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6. C) Did you make any change in the devices since your last report? What did you change? Why? \*

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7. D) Was there any situation that you considered particularly surprising or unexpected since your last report? Please, tell us about it. \*

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8. Upload one or more files to enrich or illustrate your previous answers.

Files submitted:

Section 2 - How would you rate your satisfaction with the devices?

In the following questions, please rate your experience from 1 to 5, where 1 means that you are very unsatisfied and 5 means that you are very satisfied; 3 is neutral; and 0 means you are not using it.

9. A) Amazon Echo Dot \*

Mark only one oval.

	0	1	2	3	4	5	
0=Not using it / 1=Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

10. B) LIFX Smart Light Bulb \*

Mark only one oval.

	0	1	2	3	4	5	
0=Not using it / 1=Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

11. C) WeMo Insight Smart Plug \*

Mark only one oval.

	0	1	2	3	4	5	
0=Not using it / 1=Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

12. D) Flic button \*

*Mark only one oval.*

	0	1	2	3	4	5	
0=Not using it / 1=Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

13. E) D-Link Smart Motion Sensor \*

*Mark only one oval.*

	0	1	2	3	4	5	
0=Not using it / 1=Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

14. F) IFTTT \*

*Mark only one oval.*

	0	1	2	3	4	5	
0=Not using it / 1=Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

15. G) Your overall satisfaction using these devices and apps \*

*Mark only one oval.*

	1	2	3	4	5	
Very unsatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied

16. Have your level of satisfaction changed since your last report? \*

Mark only one oval.

- Yes    *Skip to question 17*
- No    *Skip to question 18*
- I don't know    *Skip to question 18*

*Skip to question 18*

Why have your satisfaction changed?

17. Please, explain. \*

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Section 3 - Final comments

18. Is there anything else you'd like to tell us about? Or any questions you'd like us to answer?

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