Questionnaire on IoT systems evaluation from theuser perspective

Hello,

We are conducting a survey on the evaluation of the User Experience (UX) in the context of Internet of Things application (Internet of things - IoT). Our goal is to identify the main issues that need to be observed during the assessment in the view of the stakeholders of these systems.

The purpose of this questionnaire is to assist in the construction of a checklist to observe the user's behavior when interacting with applications in an IoT environment. This questionnaire is intended for researchers, developers, designers and evaluators who worked on the development and/or evaluation of applications in an IoT environment.
This questionnaire is organized into three sections: I - Demographic Data, II - Aspects related to IoT and III - Aspects related to the evaluation of user experience.

The questionnaire has a response time of eight minutes.
We guarantee the privacy and anonymity of the participants.

* Required

1. **1. Do you agree to participate in this survey?** *
   Mark only one oval.

   ◯ Yes, I agree to participate in this study and have worked with IoT applications.
   ◯ I do not agree to participate in this study or I do NOT work with IoT applications. *Stop filling out this form.*

Demographics

This section is composed of questions related to your demographic data.

2. **2. What is your gender?** *
   Mark only one oval.

   ◯ Female
   ◯ Male
   ◯ Prefer not to say

3. **3. How old are you?** *
   Mark only one oval.

   ◯ Less than 18
   ◯ 18 to 30 years old
   ◯ 31 to 40 years old
   ◯ 41 to 50 years old
   ◯ 51 to 60 years
   ◯ 61 to 65 years old
   ◯ over 65 years old

4. **4. What is your profession** *
   Check all that apply.

   - [ ] Developer
   - [ ] Designer
   - [ ] University Professor
   - [ ] Researcher
   - [ ] Graduate student
   - [ ] Specialist in IHC (Appraiser)
   - [ ] Other: _____

IoT Applications and Features

In this section, you will explore issues related to your experience in the development of applications and the treatment of two characteristics of Internet of Things.
The focus of the issues is on in the characteristics sensitivity to context and programmability.

- Context awareness is the ability of the system to understand contextual information and adapt proactively its functionality*.
- Programmability is related to the ability of "things" to assume a variety of behavior. At the simplest level, a programmable device is one that can assume an variety of behaviors in a user command without requiring physical changes**. E.g.: program to turn on the lights of a house from 18.00.

*CARVALHO, Rainara Maia et al. Quality characteristics and measures for human-computer interaction evaluation in ubiquitous systems. Software Quality Journal, v. 25, n. 3, p. 743-795, 2017.
**Minerva, R., Biru, A., & Rotondi, D. (2015). Towards a definition of the Internet of Things (IoT). IEEE Internet Initiative.

5. **5. With which paradigms you have already had experience?** *
   Consider yourself experienced if you have worked on the development or evaluation of at leasttwo applications of the paradigms listed below.
   Check all that apply.

   - [ ] Ubiquitous Computing
   - [ ] Mobile Computing
   - [ ] Wearable Computing
   - [ ] Internet of Things (IoT)
   - [ ] Wireless Networks and Sensors
   - [ ] Computer Networks
   - [ ] Embedded Systems
   - [ ] Other: _____

6. **6. How long have you been working with IoT applications?** *
   Mark only one oval.

   - ◯ Less than six months
   - ◯ Between six months and a year
   - ◯ Between one and two years
   - ◯ Between three and five years
   - ◯ More than five years

7. **7. How many applications in the Internet of Things environment have you participated in the development and/or evaluation?** *

   We ask that development and evaluation be considered separately in the response. For example: I developed and evaluated an IoT application, I consider the development of an applicationand an evaluation. If possible, state what type of appraisal was performed as for performance, usability, user or functional experience.

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8. **8. In which application domains do you have experience in developing/evaluating?**

   Check all that apply.

   - [ ] Education
   - [ ] Transport / Urban Mobility
   - [ ] Industry
   - [ ] Health
   - [ ] Agriculture
   - [ ] Intelligent Houses (Smarthomes)
   - [ ] Other: _____

9. **9. In your opinion, what are the most important types of contextual information when dealing with theIoT application development and evaluation?** *

   The examples of the types of context described below were taken from the work of Pereira et al. (2014.)*. *PERERA, Charith et al. Context aware computing for thei nternet of things: A survey. IEEE communications surveys & tutorials, v. 16, n. 1, p. 414-454, 2014.
   Check all that apply.

   - [ ] User
   - [ ] Computing (System)
   - [ ] Physical (Environment)
   - [ ] Historical
   - [ ] Social
   - [ ] Networking
   - [ ] Things
   - [ ] Sensor
   - [ ] Who (Identity)]
   - [ ] Where (Location)
   - [ ] When (Time)
   - [ ] What (Activity)
   - [ ] Why
   - [ ] Sensed
   - [ ] Profiled

10. **10. According to your experience, what difficulties have you had in developing a Application of the IoT environment with context-sensitivity?**

11. **11. According to your experience, what difficulties have you had in assessing sensitivity to the context of an application in the IoT environment?**

12. **12. The IoT applications you've been developing or evaluating have been concerned with the programmability of services or functionalities?** *
    Mark only one oval.
    - Yes
    - No
    - I don´t know

13. **13. How has programmability been addressed in IoT application development and evaluation?** *
    For example, what techniques, methods and technologies do you believe can be employed on the development or evaluation of these applications?

Information related to UX assessments

This section presents questions that address aspects that need to be captured in an evaluation of the user experience (UX) of an IoT system. These assessments seek to identify the problem areas mainly related to utility, satisfaction degree and earnings that users need to achieve in interacting with such systems.

The objective of this section is to identify important aspects for stakeholders of IoT systems byperform a UX evaluation.

14. **14. What aspects of users do you consider important to be captured during the evaluation of an IoT application's user experience?** *

Check all that apply.

- [ ] Humor
- [ ] Emotions
- [ ] Satisfaction
- [ ] User perception
- [ ] User requirements
- [ ] Trust
- [ ] Social factor
- [ ] Fun
- [ ] How significant the experience was
- [ ] Other: _____

15. **15. In your experience with IoT application evaluation, what information related to user behavior is most important to highlight user satisfaction when interacting with the system?** *

Check all that apply.

- [ ] Positive reactions during the evaluation (expressions that denote contentment and joy)
- [ ] User opinions about the experience while interacting with the IoT system
- [ ] Number of tasks that have been successfully completed
- [ ] Few negative comments during the evaluation
- [ ] Few negative or discontent reactions from the user during the evaluation (expressions of anxiety, sadness)
- [ ] User feedback on the experience after evaluation
- [ ] User attitudes after IoT system evaluation

16. **16. In your view, which of the check items listed below are most relevant to an observation checklist to evaluate the UX of an IoT system?** *

Check all that apply.

- [ ] User demonstrates signs of discomfort or annoyance with the IoT system (Signs of fatigue, insecurity during interaction)
- [ ] The user noticed operating problems related to thing thing interaction (For example: Problems of synchrony, responsiveness and connectivity of things).
- [ ] The user cannot program IoT system actions according to his or her preferences
- [ ] The user can understand all the things that make up the IoT system and handle them properly
- [ ] The IoT system perceives the context changes and correctly adjusts the user requirements
- [ ] The user realized the connectivity and synchronization issues on the IoT system, which cause delays in the services provided by the IoT system
- [ ] Context changes not perceived by the IoT system negatively affect the user experience when interacting with the IoT system
- [ ] The user shows signs of frustration during the interaction (e.g.: expressions of discontent or sadness).
- [ ] The IoT system provided a positive experience for users (Met their expectations and needs, worked correctly)
- [ ] The user has demonstrated signs of contentment with the IoT system (Expressions of satisfaction, joy and well-being. Make positive comments about the interaction with the system)
- [ ] The user does not understand which actions the IoT system performs in the environment
- [ ] The user made positive comparisons of the experience in relation to other systems he has already used
- [ ] The user makes positive comments about the interaction with the IoT system
- [ ] The main interaction mode (can be by instruction, conversation, manipulation or system is tailored to the user's needs (e.g.: The systems features a conversational interface that makes interaction more natural and was well received by the user)
- [ ] The user does not understand what types of restrictions or functionalities are not provided by the IoT system

17. **17. Based on your experience with the system IoT, which verification items would be relevant in an observation checklist to meet your needs to the evaluate the UX of an IoT system?** *

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