

Requirement Engineering SWE 6613

Team #1 - Smart Home Automation System Project Description

UniFi - "Unify your smart home, simplify your life."

Project Proposal:

The modern age of technology has ushered in a new era of smart devices at an unprecedented rate. From AI-powered home assistants, health-monitoring wearable devices, and Wi-Fi-enabled lightbulbs and outlets, we are inundated with more smart devices in our homes than ever before. Rising in tandem with this influx of new devices is an abundance of proprietary hardware and software developed by a myriad of manufacturers. This has ultimately left consumers overwhelmed and confused due to managing the countless number of mobile applications and user accounts for each of their unique smart devices. It is for this reason that we are proposing the development of an all-in-one smart home automation system solution. Our cross-platform software application will allow consumers to manage their smart home devices from one central location regardless of the manufacturer or the type of smart home device.

Required Functionalities:

- **Device Discovery:** When prompted by the user, the smart home automation integration system will perform a scan of the user's home network for smart devices. This will operate by querying a database which cross-references known manufacturers and their unique MAC address identifiers located on the smart device's Network Interface Controller (NIC). The user will then be given the option to select the discovered devices and add them to their account, where they can be managed.
- **Communication Integration:** The application will require a significant level of support for multiple communication protocols. Smart home devices operate on a broad range of

protocols including Wi-Fi, Bluetooth, and Zigbee, all of which would need to be supported by the application.

- **API Integration:** Smart home automation devices run on proprietary software created by the manufacturer. These software interfaces are necessary for basic device operation such as powering on or off, performing status checks, and adjusting values. The proposed application will feature a robust API integration strategy which standardizes communication between the application and the various smart devices.
- **Security & Privacy:** Handing over access to all smart devices within one's home requires a considerable amount of trust on the user's behalf. To meet these stringent demands, it is imperative that a strong security and privacy procedure is established featuring secure device pairing, end-to-end encryption, and secure access control and authentication.
- **Voice and AI Integration:** Since many smart devices operate with a unique "wake word" and pass information to the user using artificial intelligence audio output, the application must meet these requirements as well. The application will integrate with popular voice assistants such as Amazon Alex, Google Assistant, and Apple Siri to control these interfaces all within a centralized location.

Potential Stakeholders:

- End Users
- Cybersecurity Experts (security auditing)
- Legal Representatives / Regulatory Bodies (FCC, etc., certifications/approvals)
- Smart Device Manufacturers
- Application Development Team
- Communication Protocol Developers (for compliance certification)

Interviewers:

Round 1: Elliotte & Mekonnen

- End Users – HB (1)
- Cybersecurity Experts (security auditing) - JM (1)
- Legal Representatives / Regulatory Bodies (FCC, etc., certifications/approvals) - EB (1)

Round 2: Ester & Jeff

- Smart Device Manufacturers – EW (2)
- Application Development Team – MK (2)
- Communication Protocol Developers (for compliance certification) - HB (2)

GROUPS- RA- MK, EW

Enter your interview questions here:

(AI assisted)

End Users

- 1) What are the primary goals you want to achieve with the home automation system?
- 2) Which areas of your home do you want to automate (e.g., lighting, security, climate control, entertainment)?
- 3) Do you prefer voice control, mobile app control, or both?
- 4) Are there any accessibility requirements for users with disabilities?

Cybersecurity Experts

- 5) What security protocols should be implemented to protect the home automation system?
- 6) How should data be encrypted and stored?
- 7) What are the potential vulnerabilities, and how can they be mitigated?
- 8) What are the compliance requirements for data privacy and security?

Legal Representatives

- 9) What legal regulations must the home automation system comply with?
- 10) Are there any specific data privacy laws that need to be considered?
- 11) What are the liability concerns related to system failures or breaches?
- 12) How should user consent for data collection and usage be managed?

Smart Device Manufacturers - Elliott

- 13) What standards and protocols should the software adhere to for compatibility with various devices?
- 14) What are the latency and bandwidth requirements for compatibility?
- 15) How should the system handle network failures or disruptions?
- 16) What are the warranty and support terms for the software?

Application Development Team - Mekonnen

- 17) What are the key functionalities that the application should support?
- 18) How should the user interface be designed for ease of use?
- 19) What are the performance and scalability requirements?
- 20) How will the application integrate with other systems and devices?

Requirement Elicitation Interview

Cybersecurity Expert Question's

Mekonnen: Analyst

5.What security protocols should be implemented to protect the home automation system?

6.How should data be encrypted and stored?

Elliotte: Analyst

7.What are the potential vulnerabilities, and how can they be mitigated?

8.What are the compliance requirements for data privacy and security?

Interview Reflection's

Ester Baah:

What are the experienced benefits of the interview in which you acted as an analyst?

As an analyst, I was able to ask questions that will help me understand what the most key features of the home automation system were going to be for this project, its benefits from a day-to-day user's perspective. This made it easier to understand its real-world application and how to develop it properly.

One additional benefit as saw as an analyst was understanding how the user interface and overall user experience affects the systems usage, and it is a critical area for the app development team to focus on.

As a customer, I was able to explain how important users' needs such as data privacy and collection are, as part of their pain points. In this area, I was also able explain the importance of data liability concerns for the home automation system including data breaches and sensitive information and how data can be recovered.

I had first acted as a customer; this helped me more concrete on understanding of user needs and challenges before delving into the technical details of the system. It also helped me focus my analysis on areas that were most relevant to users and ensure that the system was designed to meet their specific requirements. However, if I had first acted as an analyst, I may have had a more comprehensive understanding of the system's capabilities and limitations before experiencing it as a user. This could have helped me to identify potential areas for improvement and ensure that the system was designed to be both functional and user-friendly.

I could have conducted multiply series of interviews with both analysts and customers to get a more comprehensive understanding of the system from multiple perspectives. Additionally, I could have conducted user testing to observe how users interacted with the system and identify any usability issues.

Jeff McGurk:

- o I suffer from “stage fright” in situations that are left open-ended or unstructured. The irony is I can be up on an actual stage and perform in front of hundreds of people without a problem, so long as I have a script. The interviews gave me a chance to practice these semi-structured interactions and I think the more I practice the better I will become. It was helpful that we had the questions decided ahead of time because I had to focus less on coming up with things on the fly and more on the listening and trying to make the transitions sound genuine. I don’t think I nailed it, but it was good practice.
- What are the experienced benefits of the interview in which you acted as a customer?
 - o I think these benefits happened before the actual interview, during the planning phase. I wrote out all of my answers, word-for word, even including some pauses or fillers for authenticity. So whereas you might go into an actual interview somewhat blind, only knowing the general topic but not the specific questions, you have to come up with an answer on the spot. I had the chance to really think about a home automation system, what the security implications might be, and really take my time and analyze the topic properly.
- In which order you conducted the interviews (e.g., you were first the customer)? In your opinion, did the order affect positively or negatively your performance as an analyst?

- o I was first a stakeholder and then we switched, and I played an interviewer. I'm not sure that this order effected my performance at all, having seen how the other interviewers did it before it was my turn. As I said we had all our questions laid out beforehand and I wrote out all my full answers. I'll address my thoughts on this in the next question.
- Would you have preferred to conduct the interview differently?
 - o There are 2 aspects I think maybe I would change for next time. First, I played the cybersecurity expert. I thought this made the most sense since I've been doing cybersecurity for over 20 years. But it limited my chance to stretch myself and look at the problem from another perspective. I would have like to play another role and think about how they would answer. Secondly, for all of the preplanning. It definitely made our interviews very efficient and we were able to get them completed in 1 take, but I fear that it made them sound a little rehearsed. I'm curious how it would go to not have the stakeholders know the questions ahead of time and try a more authentic interview.

Elliott Wideman:

1. What are the experienced benefits of the interview in which you acted as an analyst?

In my role as an analyst, I found that each stakeholder focused on different aspects of the project, with some providing more technical insights than others. This made me realize the importance of understanding that each stakeholder has a unique perspective and set of concerns. Conducting the interview helped me see how critical it is to adapt our questions to capture the diverse viewpoints of stakeholders.

One of the biggest benefits I experienced was that the interview setup—having five people in the chat room together—created an environment where everyone could hear the responses. This not only facilitated direct communication but also allowed stakeholders to learn from each other. For example, one stakeholder might not have been aware of certain system capabilities until they heard another explain it. This collective learning was an unexpected benefit of the interview process.

Overall, this experience taught me the value of well-coordinated interviews. When managed properly, these interviews became a powerful tool for gathering diverse insights in one session, which was particularly beneficial for my first elicitation interview.

2. What are the experienced benefits of the interview in which you acted as a customer?

As a stakeholder in the interview, I realized that I needed to have a deep understanding of my part of the system to effectively communicate what I wanted to achieve. This required not only

being familiar with our requirements but also understanding the technical aspects of the system, which I found challenging to explain at times. Being in this position gave me a new appreciation for how complex it can be to articulate specific needs, especially when dealing with technical components like Zigbee and Wi-Fi 6.

Through this process, I learned more about these technologies, especially how **Zigbee** supports low-power smart devices and how **Wi-Fi 6** enhances performance for multiple devices.

Additionally, I gained insights into how **Atlanta** is positioning itself as a tech-forward city, particularly with the integration of smart home technologies. This context helped me better understand the broader implications of our project and how our system fits into the future of smart home automation.

Overall, being a customer in the interview helped me develop a stronger technical foundation and pushed me to clarify my understanding of the system, making me more confident in expressing the specific needs for the project.

3. In which order you conducted the interviews (e.g., you were first the customer)? In your opinion, did the order affect positively or negatively your performance as an analyst?

I started as an analyst and then transitioned to the role of the stakeholder. The order definitely made a difference in how I approached both roles. As an analyst, I focused on gathering information, but when I became the stakeholder, I realized there were several points that the other interviewees raised that I hadn't initially considered. Their insights gave me a new perspective on the system and made me think about it on a deeper level.

For example, certain technical details brought up by others helped me better understand how the system could be improved, especially regarding integration and performance. This allowed me to refine my understanding of the requirements and see the project from different angles.

Overall, I believe the order had a positive impact on my performance as an analyst. Acting as the analyst first gave me a foundation, and then acting as the stakeholder allowed me to reflect on what I had missed earlier and gain a more complete picture of the system. This combination ultimately strengthened my ability to analyze the system from both a technical and user perspective.

4. Would you have preferred to conduct the interview differently?

I actually liked the group interview approach because it allowed everyone to hear each other's perspectives, and I think it led to valuable insights. However, I would be interested in conducting **individual interviews** just to see how the results might differ. It's more about exploring how stakeholders might express their thoughts or bring up different ideas when they're interviewed one-on-one, without the influence of group dynamics.

While the group setting facilitated shared learning and collaboration, individual interviews might allow for more focused discussions and could reveal different aspects of the system that didn't come up in a group conversation. I think it would be interesting to compare both methods and see what additional insights we could gain.

Mekonnen Kindo:

What are the experienced benefits of the interview in which you acted as an analyst?

- As an analyst, the main advantage of conducting interviews was to get information from the stakeholders themselves as to what their expectations and needs are. It facilitated deeper understanding through follow-up questions, allowing for more comprehensive requirement gathering. In addition, it helped me expose potential needs that would not have been revealed

by other approaches such as surveys or questionnaires. This experience also helped to improve my communication and active listening which is important to overcome the gap between the stakeholders and developers so that the requirements provided are clear and executable.

What are the experienced benefits of the interview in which you acted as a customer?

- There were some major advantages I received as a customer in the interview. First, it gave me the opportunity to express my requirements and expectations precisely, so I was sure that the development team would comprehend the scope of the project from my side. This enabled me to communicate challenges and preferences directly, thus assisting in better integration of the Stakeholders and the Developers. It also helped in raising issues that would have otherwise been neglected and therefore developed a more comprehensive approach to the problem being solved. Also being in this role, as a customer, gave me insight from a different angle which would assist in efficient communication and coordination with respect to various phases of the project. In general, as the interview was done, it turned out to be an efficient tool for making sure that the corresponding expectations of the customer were met as well as improved the awareness of all the parties to each other.

In which order you conducted the interviews (e.g., you were first the customer)? In your opinion, did the order affect positively or negatively your performance as an analyst?

- Taking on the role of an analyst first had a beneficial effect on my performance. It allowed me to gather adequate technical information about the project before putting myself in the position of the client. This two-sided perspective allowed me to pose even more appropriate and precise questions during the customer interview, thus ensuring that critical requirements were not missed. In addition, it developed further the skill of dealing with the interface between what the stakeholders want and what can be technically worked out, thereby raising the level of quality in requirements analysis.

Would you have preferred to conduct the interview differently?

- No, I would not have wanted to carry out the interview in any other way. The process was organized in a systematic manner so that communication and obtaining project goals was easy. Being both the analyst and the customer helped gather useful information as well as clarifying any issues. This interview's way of doing achieved the desired outcomes.

Questionnaire link

Spartans link:

<https://forms.office.com/Pages/DesignPageV2.aspx?subpage=design&id=5W7yRTTxnkO8k-bH4z1hwkCKY2RLIONNueZu2d2vHu9UQ0U1WExWSjdRWTRWUU8xUDhIQjhJUDhDWi4u>

