USERS APPROACH ON PROVIDING FEEDBACK FOR SMART HOME DEVICES – PHASE II

Santhosh Pogaku

College of Education, Criminal Justice, and Human Service, University of Cincinnati, Cincinnati, Ohio

ABSTRACT

Smart Home technology has accomplished extraordinary success in making individuals' lives more straightforward and relaxing. Technology has recently brought about numerous savvy and refined frame works that advanced clever living innovation. In this paper, we will investigate the behavioral intention of user's approach to providing feedback for smart home devices. We will conduct an online survey for a sample of three to five students selected by simple random sampling to study the user's motto for giving feedback on smart home devices and their expectations. We have observed that most users are ready to actively share their input on smart home devices to improve the product's service and quality to fulfill the user's needs and make their lives easier.

1. INTRODUCTION

The current market of smart homes projects a global revenue of 85 Billion USD, and the usage is around 10% worldwide[1]. Smart home technology combines automation interface, monitors, and sensors [2]. Smart home devices will tend to increase humanity's way of life and many people's comfort. The looks are deceiving as smart homes aren't considering the user needs and necessities [3] as several critical challenges related to innovative home technology are yet to be addressed for smart home development [4]. Smart home technologies should be used more often than they should, even with specific settings. A clear view of the user's usage of the smart home devices still needs to be included. User feedback plays a vital role in getting the desired outcome and helps understand the user needs and what they want to use the smart home devices in the preferred way to fill the usage gap [4]. The essential features of smart home devices, such as UI, Networking, and Interface, push users to revisit or re-think the existing feedback approaches. For instance, from the feedback sender point of view, we have yet to determine to what extent the users using the smart home technology genuinely provide feedback to the devices during their daily routines regarding their personal space as it's a sensitive area. From the feedback receiver's point of view, we are still determining what information the receiver needs from the feedback provided to improve his products. This paper studies the user's behavioral intention of giving feedback on smart home devices.

Innovative home solutions are constantly interconnected, and the ecosystem has different types of devices, and a few of them are sensors where no human intervention is needed. Smart home products are different from regular products. These products are present in the living space of humankind. Yet, these devices even care for us, bringing a brand-new facet to such feedback. Hence, from the industry and researchers' perspective, it is evident that there is a need for research to build excellent feedback tools or models[5]. The long-term research goal would be to construct group-based feedback solutions for smart devices. At the beginning of the design, the software and the engineering requirements will define the user feedback [6]. The feedback design is significant and developed based on existing experiences and would be helpful for future

DOI: 10.5121/iju.2024.15101

software development [7]. Research has been conducted in the past, and the toll support user feedback has been used, but it has dedicated settings[8] [9]. Many studies have projected that the behavior of the input and software and preferences will vary accordingly, and it causes a mismatch.This research investigates the user approach to providing feedback for smart home devices. The research question is as follows: RQ: What is users' behavioral intention to give input on smart home devices and contribute to making the machines better and user-friendly?

2. METHODOLOGY

In this study, we used quantitative survey methodology by randomly selecting students to know how to provide feedback on smart home devices. Using a simple random sampling method, we have chosen a sample of the top 4 students representing 25% of the research participants in group 2.

A survey instrument was used in this quantitative research approach. A structured questionnaire with four measures, which is attached in "Appendix A," was designed utilizing the Behavior intention (BI) model [10] to measure the Behavioral Intention of Regarding users' approach to providing feedback for smart home devices, these measures were scored using a five-point scale where 1 = strongly disagree, and 5= strongly agree. The steps were modified to match the technology used in the study. The adapted instrument's construct validity, internal consistency, and reliability of the scales were evaluated, validated, and proven.

The survey instrument was designed on the Google Forms platform, the survey questions were placed in a sequence, and the linear scale from 1 to 5 was added as an answering option with a description of 1 = strongly disagree to 5 = strongly agree. The questionnaire instrument was sent to experts for a field study to confirm its content validity. Based on the suggestions given by the experts, a few changes have been made, such as adding a description in the title for better understanding.

We sent a formal email via UC Canvas to the sample containing the survey URL on 03/08/2023, mentioned that the survey form is anonymous and that no personal data will be gathered, and urged the users to fill in the survey with genuine feedback. The sample was given two email reminders on 03/09/2023 and 03/10/2023 to fill in the survey. The survey was closed on 03/10/2023, and the four responses were saved in Google Forms and later downloaded and used to conduct an in-depth analysis of the findings.

3. RESULTS

The data from the survey was collected by downloading an Excel sheet from the options given in Google Forms. This data consists of all the responses given by the sample. We have rechecked any incorrect information or data entered in the survey form to eliminate possible errors. There is less possibility of error as we have implemented a field test. We have renamed the samples from sample-1 to sample-5- 5 to perform the statistical analysis. A column has been generated for the behavioral intentional questionnaire, named the column header BI Questions, and followed horizontally from BQ1 to BQ5. The sum of all four values for a given sample becomes a quantitative number representing the entire behavioral intention of one piece. This has been performed for all five models; each sample will get one quantitative number. Table 1 illustrates the projection of the analysis made to the data, and Figure 1 shows the responses given by the samples in a graphical representation.

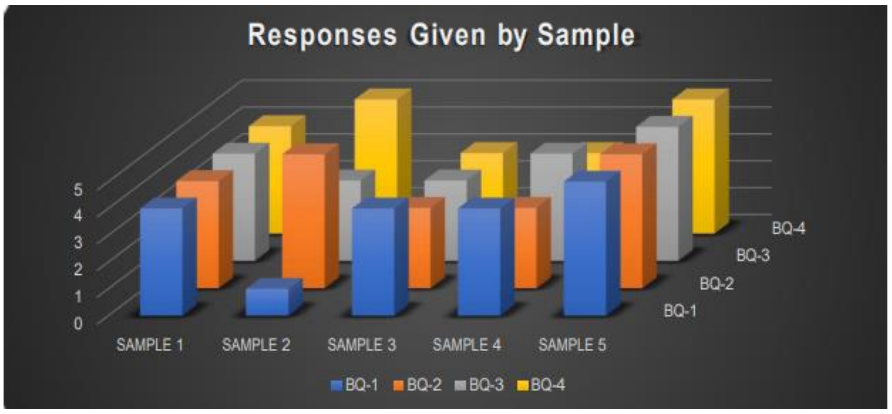

Figure 1: Responses Given by Sample

Table 1: Calculations made on the sample

BI Questions	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5
BQ-1	4	1	4	4	5
BQ-2	4	5	3	3	5
BQ-3	4	3	3	4	5
BQ-4	4	5	3	3	5
SUM	16	14	13	14	20

Table 2: Representation of the Questions

Question Tag	Questions
BQ-1	I Intend to provide feedback for the smart home devices continuously?
BQ-2	I will strongly recommend providing feedback that will help to improve the performance and service of the smart home devices.
BQ-3	I plan to continue providing feedback frequently on the smart home devices and contribute to making the device better
BQ-4	Assuming that I have very limited time, I intend to provide feedback frequently on the smart home devices

After summing each sample, we observed two quantitative numbers repeating in the sample data, and 14 can be considered the mode. This suggests that there is repetitive behavior in the sample. We calculated the mean by summing up all the sample values, which gave us the value of 77, and divided the value by the number of samples five, ending with the mean value of 15.4. The derived mean value is critical to calculating the standard deviation and the standard error. We have calculated the standard deviation by using the formula in the Excel sheet as =STDEV("sampling range") and provided the values as (16, 14, 13, 14, 20), and the standard deviation was derived as 2.792. The standard error has been calculated by using the formulae = STDEV(sampling range)/SQRT(COUNT(sampling range)), and the result obtained is 1.248. We also calculated the variance using the formulae =var("sampling range"), and we got the variance value for the sample as 7.8.

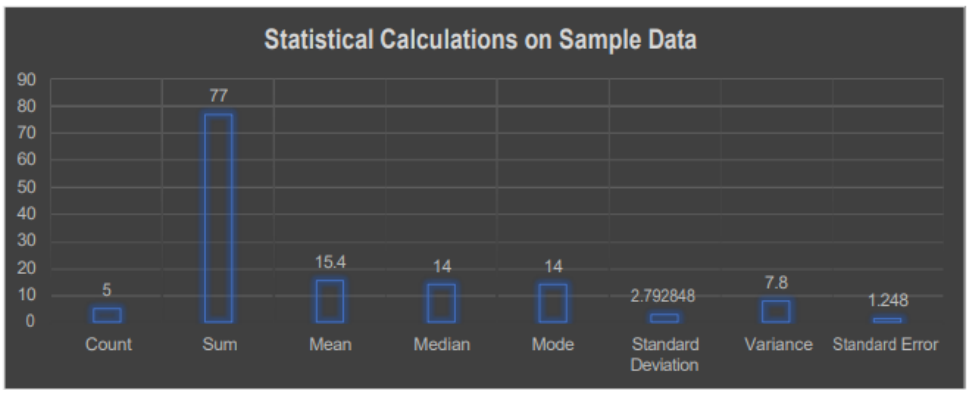

Figure 2 : Representation of statistical Calculations.

Figure 2 shows that the mean is 15.4, and the mean is greater than the sum of the BQs of samples 2, 3, and 4 and less than the sum of the BQs of samples 1 and 5. This suggests that around 60% of the sample are inclined not to provide feedback for smart home devices, and 30% of the users are inclined to give feedback on the smart home devices to make them better. Figure 3 represents the standard deviation of the behavioral intentional model of the user's feedback approach on smart home devices. Three samples come under the 1st standard deviation, and only one comes under the 2nd standard deviation.

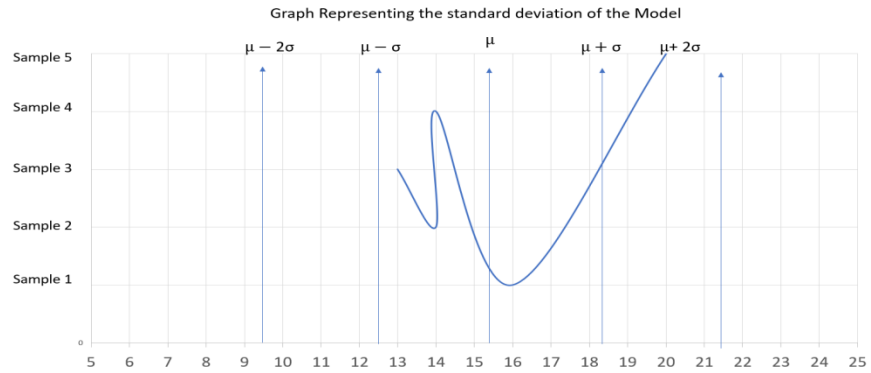

Figure 3: Representation of statistical Calculations.

4. DISCUSSION

This quantitative survey analysis shows how the users are interested in providing feedback on smart home devices and how the feedback can improve the machines. This study was conducted via surveys using an online platform to know the user feedback approach on smart home devices. The sample's quantitative answers helped us understand how eager the users are to provide feedback to improve the machines and performance. We talked with understudies to better understand the conduct, mentality, and requirements for criticism arrangement on brilliant home gadgets. We accept that the different points of interaction for controlling apparatuses and devices and the attributes of savvy home innovations like network, universality, and even intangibility will be tested while practically applying a criticism approach.

There is a particular limitation to the data, such as having access to limited people in the sample frame, which may not meet the external validity as we needed access to the larger sample and

were limited to a particular sample. The quantitative investigation methodology incorporates a study with close-completed questions. It prompts limited outcomes, as shown in the investigation recommendation. In this way, the results can only sometimes address the genuine occurring in a summarized structure. Moreover, the respondents have limited responses, considering the decision made by the investigator. Quantitative exploration requires significant measurable examination, which can be challenging for non-analysts. Non-mathematicians might observe measurable examination testing since it relies upon logical discipline. We have selected around the sample size of 75% of students in the group, directly impacting the transferability. The random selection of 12 students among 16 students shows the high dependability of the data we received from the students. The validity is established by taking the answers and providing graphs from the data presented in the results section. We have selected around the sample size of 25% of students in the group, directly impacting the transferability. The random selection of 5 students among 16 shows the high dependability of the data we received from the students. The validity is demonstrated by analyzing the responses and providing graphs from the data presented in the results section. In the previous paper, we conducted semi-structured interviews using qualitative measures to gauge the users' feedback on smart home devices and projected the results. As part of phase 2, we used survey methodology using quantitive criteria and performed analysis.

The results align with the findings [2] by C. Wilson and Tom Hargreaves, where the results of peer review research on smart home users and the exponential growth of the users. The author projected the functional view and instrumental view of the smart home devices. It also explained user-related challenges related to smart home challenges and lack of feedback, which matches how users are eager to provide input to improve smart home devices. After conducting a detailed survey, we took the quantitative data provided by the sample on a linear scale. We performed statistical analysis to check the behavioral intention of the sample ingiving feedback on smart home devices. Most sample answers were inclined to provide feedback, and around three samples' responses for two measures were neutral. After the statistical analysis, the study showed that the sample had a neutral behavioral intention to provide feedback on smart home devices.

We recommend performing even more in-depth studies by exploring and conducting surveys on the larger sample on providing feedback and how effective the feedback is, which will help the sample and the receivers change the design, performance, service, and usability of the smart home devices.

5. CONCLUSION

In conclusion, our quantitative survey study reveals a high consumer interest in providing feedback on smart home devices and the potential impact of such feedback on device performance improvements. The research, conducted through an online survey, sought user feedback and engaged with a sample group of students. Findings indicate a general interest in users contributing their insights to make smart home appliances more efficient.

However, it is important to acknowledge study limitations, including limited access to a specific sample group, which may limit external validity. The quantitative approach of using closed-ended questions offers valuable insights value provided, but to put it simply, it has inherent limitations to dealing with complex user experiences. It can be taken in a limited way by non-accountants. Despite these limitations, the study establishes validity through rigorous data analysis, presenting images derived from the respondents' responses. Our results, consistent with previous research by Wilson and Hargreaves, reinforce the importance of providing usability information in the context of smart home appliances.

As we advance, we recommend more comprehensive studies with larger and more diverse samples to examine the use of data further and evaluate the effectiveness of such data in influencing the design and implementation of smart home devices on the design and implementation of women. A deeper understanding of user attitudes and behaviors will help refine smart home technology, ensuring it aligns more with user expectations and preferences.

REFERENCES

[1] Statista Homepage, https://www.statista.com/outlook/279/100/ smarthome/worldwide, last accessed 2020/

[2] C. Wilson, T. Hargreaves, and R. Hauxwell-Baldwin, "Benefits and risks of smart home technologies," Energy Policy, 103, 2017, pp. 72–83.

[3] A. G. Paetz, E. Dütschke, and W. Fichtner, "Smart homes as a means to sustainable energy consumption: A study of consumer perceptions," Journal of consumer policy, 35(1), 2012, pp. 23–41.

[4] C. Wilson, T. Hargreaves, and R. Hauxwell-Baldwin, "Smart homes and their users: a systematic analysis and key challenges," Personal and Ubiquitous Computing, 19(2), 2015, pp. 463–476.

[5] W. Trochim, J. Donnelly, & K. Arora (2015). Research Methods: The Essential KnowledgeBase, 2nd Edition. Wadsworth Publishing.

[6] I. Morales-Ramirez, A. Perini, and R. Guizzardi, "An ontology of online user feedback in software engineering," Applied Ontology, 10(3-4), 2015, pp. 297–330.

[7] M. Stade, F. Fotrousi, N. Seyff, and O. Albrecht, "Feedback gathering from an industrial point of view," Proceedings of the 25th International Requirements Engineering Conference (RE), 2017, pp. 71–79.

[8] M. Almaliki, C. Ncube, and R. Ali, "The design of adaptive acquisition of users feedback: an empirical study," Proceedings of the 8th International Conference on Research Challenges in Information Science (RCIS), 2014, pp. 1–12.

[9] M. Almaliki, C. Ncube, and R. Ali, "Adaptive software-based feedback acquisition: a persona-based design," Proceedings of the 9th International Conference on Research Challenges in Information Science (RCIS), 2015, pp. 100–111.

[10] Taufiq-Hail, G., Alanzi, A., Yusof, S. and Alruwaili, M., 2022. Software as a Service (SaaS) Cloud Computing: An Empirical Investigation on University Students' Perception. [online] Doi.org. Available at:<https://doi.org/10.28945/4740> [Accessed 11 March 2022]..

[11] T. Wehrmaker, S. Gärtner, and K. Schneider, "ConTexter feedback system," Proceedings of the 34th International Conference on Software Engineering (ICSE), 2012, pp. 1459–1460.

APPENDIX

Survey Questions

1. I Intend to provide feedback for the smart home devices continuously?
2. I will strongly recommend providing feedback that will help to improve the performance and service of the smart home devices.
3. I plan to continue providing feedback frequently on the smart home devices and contribute to making the device better
4. Assuming that I have very limited time, I intend to provide feedback frequently on the smart home devices