A review on the Smartwatches as IoT Edge Devices: Assessing the end-users continuous usage intention using structural equation modelling

Udit Chawla[1], Hena Iqbal[2], Harsh Vikram Singh[3], Varsha Mishra[4], Sarabjot Singh[5], Vishal Choudhary[6].

[1]University of Engineering and Management, Kolkata, India
[2]Ajman University, Ajman, UAE
[3]Techno India University, Kolkata, India
[4]Royal Holloway, University of London, London, United Kingdom
[5]Vellore Institute of Technology, Chennai, India
[6]The Heritage Academy, Kolkata, India
dr.uditchawla@gmail.com, dr.hena.iqbal@gmail.com, harsh16438@gmail.com, mishravarsha.vm@gmail.com, sarabjotsingh2624@gmail.com, chowdharyvishal0904@gmail.com

Abstract – The goal of this study is to identify people's intentions to use smartwatches and how their use of these devices is affected by the advantages and disadvantages of the IoT. For the research work, five cities were chosen, Delhi, Mumbai, Kolkata, and Chennai. These cities were chosen as a study focus primarily because these cities have seen the biggest increases in smartwatch usage in India. These cities have a significant contribution to the global smartwatch market. They provide a number of data points that are important for the research project, enabling it to provide satisfactory results. Structured questionnaires were used to collect data from the respondents. Convenience sampling method was used for the survey. The sample size for the data collection was 249, and it included men and women from a range of age groups, economic levels, and occupational backgrounds. From the findings, it has emerged that six factors influencing customer intention to use smartwatches are "Perceived usefulness", "Perceived ease of use", "Perceived connectivity", "Continuous usage intention", "Data risk", and "Performance risk". The technological characteristics of the Internet of Things, such as perceived connectivity, act as powerful stimulants for smartwatches, favorably affecting customers' perception and the behavioral effects of smartwatch use. The usefulness of smartwatches is unaffected by IoT concerns like data and performance, but the ease of use is negatively impacted by data risks. Furthermore, usefulness and ease of use have a positive influence on the intention to use.

Keywords – Internet of things (IoT); Smartwatch; Benefits; Risks

Introduction

Smartwatches are expanding into the area of the network edge, which will be important for future IoT systems [26]. The monitoring component of the IoT, including human activity, is best served by smartwatches. For example, the Apple Watch Series 8 has a number of built-in sensors, including an accelerometer, gyro, heart rate, barometer, always-on altimeter, compass, SpO2, VO2max, temperature (body), temperature sensing (0.01 accuracy), natural language commands, and dictation (talking mode). As being used for a variety of different purposes such as, tracking your fitness, managing your work, and booking appointments, smartwatches have become indispensable aspects of everyday life [27, 9, 10]. As a result, the development of smartwatches has sparked academic research on the variables affecting the use and acceptance of the device, with a focus on the function of the smartwatches' functional features [14, 18].

Today's modern smartwatch processors are very powerful and can easily execute deep-learning algorithms. For instance, using a special kind of machine called a Restricted Boltzmann Machine, researchers were able to show that it might be possible for someone to manually identify actions on a smartwatch [33]. Smartwatches have been growing in popularity lately, and they are often better than smartphones in terms of features and performance. For instance, action categorization was built and carried out on both smartphones and smartwatches systems by [12]. Their findings demonstrated that gesture action categorization on the smartwatch performed much better than on the smartphone, including an accurate gain of around twenty percent. This is primarily due to the fact that the inertial readings from smartwatches tend to be more precise compared to smartphones because the watch is much more closely related to the wearer and is physically attached to the hand [30].

As inter-processor efficiency has increased, smartwatches are using wireless networks such as 4G/LTE, which can potentially sustain maximum connection speeds of Fifty Mbits/second. However, because of their short battery lives, smartwatches still have difficulty comprehending and sending information from their sensing devices [11]. For instance, some smartwatch models don't have sensors that can take pictures or videos because it's hard to get accurate information in difficult conditions and it takes a lot of time to do morphological operations for visual information [42]. As smartwatches integrate into the IoT and begin transmitting copious quantities of real-time or nearly real-time information, these problems will grow more severe [17]. To overcome this issue, edge analytics have been suggested. The fundamental concept is to lessen the quantity of sensory information provided in order to minimize energy usage and, as a result, increase battery capacity. To decrease the amount of information delivered, techniques including quantization, screening, and modification can be utilized [10].

In this study, the essential characteristics of visual attraction are benefits, risks, and connectivity. Previous studies separately examined every one of these factors that affect potential users' acceptance of technologies [5, 6, 43, 1]. This study, however, looks at the benefits, risks, and connectivity of smartwatches in order to determine how they are visually attractive and how that affects their use and acceptance. Additionally, it examines how wristwatch owners mediate the influence of visual attractiveness on purchasing behavior and usage behavior considering that different people have different views and attitudes about technology [41, 35, 13]. This research addresses two significant research questions.

RQ1. What variables are co-related with the intention of using a smartwatch?

RQ2. What relationship exists between customer use behavior and the intention to use?

Theoretical Background

2.1 Perceived usefulness

Perceived usefulness is a measure of how much an individual knows that using certain technological tools will improve their productivity [7]. It is based on an individual's external intentions and expectations from a psychological standpoint [19]. The concept has a favorable link with acceptance intent, especially in a range of job scenarios [24, 37]. It is necessary to re-describe perceived usefulness because the current research places a strong emphasis on the terminal viewpoint when it comes to technological usage [28, 20]. In accordance with this research, the more useful a smartwatch is to its users, the more productive they will be [6]. Therefore, the more advantages customers receive, the happier they will be and the more likely it is that they will keep using smartwatches.

H1. Perceived usefulness is directly associated with the smartwatch continuous usage intention.

2.2 Perceived ease of use

The extent to which an individual experience that utilizing a certain technology might not require any effort is referred to as perceived ease of use [7]. In the moderate sector, the phrase "ease of use" may describe products whose self-service capabilities are widely used and whose simplicity of use by customers is seen as a key factor in their decision-making [29]. The acceptance of a new technology may be predicted using data on a person's perceived ease of use and their intended subsequent behavior. Technology is considered useful when it makes our lives easier. The idea of "ease of use" describes how easy technology is to use, without having to do any extra work [40]. Therefore, in the context of a smartwatch, perceived ease of use can be defined as the simplicity with which users pick up new interactive methods, such as natural language processing or gesture detection, and use them to interact with the device.

H2. Perceived ease of use is directly associated with the smartwatch continuous usage intention.

2.3 Perceived connectivity

A person's opinion of the effect of other people on their decision to accept new technologies is measured by societal influence, according to [41]. The Theory of Reasoned Action provides evidence of how people's opinion is influenced by arbitrary standards and sentiments. According to Rogers [31], the degree of acceptance and enthusiasm for new technologies is tied to their adoption rate. Perceived connectivity, which measures the number of individuals who use the same technologies, is a key factor that determines user acceptability, according to Luo, Gurung, and Shim [23]. The adoption of virtual technology is significantly influenced by perceived connectivity [36]. In fact, user acceptance of advanced technologies can be influenced by how widely it is used by others, particularly close family members or friends. According to Lu, Luo and Strong [22], a significant proportion of consumers are needed to develop potential relationships and recognition. Clearly, the perceived number of consumers, such as neighbors, relatives, or families, will influence how valuable a product is perceived to be in its use [37].

H3. Perceived connectivity is directly associated with the smartwatch continuous usage intention.

2.4 Performance risk

Performance risk entails the chance that goods will not function as planned. This significantly affects users' intentions to purchase specific items, such as smart wristbands. For instance, Hwang, Chung, and Sanders [16] discovered that customers' perceptions of the performance risks associated with smart apparel had a negative impact on their attitudes about it and, as a result, decreased their desire to purchase the item. A further study found that respondents' increased perceptions of performance risk resulted in a poorer sense of the value of fitness-tracking wearables and this may discourage people from purchasing smartwatches [21]. Smartwatches can continually track a person's everyday behavior and actions, which is one of its main tasks. As a result, whether such a smartwatch can reliably identify and quantify the objective variables is a crucial efficiency problem [32, 34].

H4. Performance risk is directly associated with the smartwatch continuous usage intention.

2.5 Data risk

Privacy risks are especially acute when smartwatch functions monitor personal data, emotions, and extremely personal actions [3]. Whether the user is aware of it or not, the smartwatch can gather and send private pieces of information to third parties. The privacy issue around the gathering, publication, and utilization of information produced by an individual's private smartwatch during their everyday activities could be especially relevant, as the watch is personalized, common, and near to the body. Privacy concerns are raised when it comes to the potential invasion of privacy in virtual communities and social media platforms. These concerns can be humiliating, and they can be exacerbated by private information technology (IT) gadgets that capture extremely private details [4]. Smartwatch reputations may be compromised when people worry that their personal details can be disclosed to or utilized inappropriately by other entities [25]

H5. Data risk is directly associated with the smartwatch continuous usage intention.

2.6 Continuous usage intention

Behavioral intention is defined as a person's consciously stated goal to engage in a particular activity [2, 39]. According to Dehghani and Tumer [8], consumers can choose and consume goods and services through a decision-making process known as consumer intent. It is described as “a user's desire to continually use the immediate good or service being used” to use a common example [15]. The immersive responses of wearable technologies can be regulated, modified, or rapidly changed according to the user's behavioral goals. It could also be used to improve the user's communicative talents [38].

3 Findings & Analysis

Demographic survey-Gender: Female- 40.7% and Male- 59.3%. Age: 18-25- 7.4, 26-30- 34.6, 31-35- 28.9, 36-40- 22.6, >40- 6.5. Educational Qualification-ICSE/CBSE- 8.1, High School- 20, Graduation- 47, PG- 24.2, Others- 0.7. Occupation: Service- 27, Business-22.9, Student-49.4, Others-0.7. Income- <25k- 1.7, 25k-50k- 38.2, 50k-75k- 30.5, 75k-1LAC- 18.2, >1LAC- 11.4.

EFA was performed for initial knowledge development of the construct.

CFA was also performed and we got the desired results.

From the Table 1 (Constructs with Variables), we can identify the variables of the respective Constructs. EFA is an Exploratory Factor Analysis and it's done to identify factors affecting Continuous Usage Intention. Confirmatory Factor Analysis (CFA) was performed after EFA.

Table 1 Constructs with Variables

Perceived usefulness
Perceived usefulness refers to how useful a person believes a technology or product to be.
Perceived usefulness can vary depending on the person's needs and preferences.
Perceived usefulness is a key factor that can influence a person's decision to adopt and continue using a smartwatch.
Perceived usefulness is important for the acceptance and continued use of technology.
Perceived usefulness is positively related to a consumer's intention to continue using a smartwatch.
If a consumer perceives a smartwatch as being helpful and useful, they are more likely to continue using it.
Smartwatches are becoming popular due to their many useful features like fitness tracking, etc.
A smartwatch can make your life easier by letting you stay connected without having to pull out your phone.
Perceived ease of use
Perceived ease of use refers to how easy or user-friendly a product is perceived to be by the users.
Smartwatches with well-perceived ease of use will be intuitive and simple for the user to operate.
User Interface (UI) design is important for making a user interface easy to use.
The physical design of the smartwatch affects the perceived ease of use.
Factors that can affect a user's perception of ease of use are the battery life, display size, features, and menu.
Consistent layout, readable text, and intuitive gesture commands can make a user interface more user-friendly.
Perceived connectivity
Smartwatches include additional sensors that can be used to track activity, detect falls, and measure altitude.
Smartwatches have various apps that can be downloaded and used to personalize and enhance the user's experience.
Smartwatches can be used as a tool for self-expression and personal style.
Smartwatches are a versatile technology that can do more than just receive notifications or track fitness.
Performance risks
The main performance risk associated with a smartwatch is its battery life.
The performance risk associated with smartwatches is the accuracy of their sensors and tracking features.
The performance risk of using a smartwatch is related to the cost of repairs or replacements.
The performance risk associated with smartwatches is related to the quality and reliability of the device.
Data risks
There is a risk that this personal data can be accessed or stolen by unauthorized parties.
Smartwatches often have GPS sensors, which can be used to track the wearer's location.
Many smartwatches include sensors that can track things like heart rate, sleep, and exercise.
Continuous usage intention
The important aspect for continuous usage is the compatibility and the ecosystem of the smartwatch.

Using structural equation modelling, the hypotheses H1, H2, H3, H4, and H5 are tested. As a result, a structural model using AMOS 22.0 was created (Figure 1), which shows the factors that affect the continuous usage intention of smartwatches.

According to the results, the model well fits the data (Chi-square value is 141.645, df = 54, p 0.001); CMIN/DF = 2.62; GFI = 0.94; AGFI = 0.92; NFI = 0.93; CFI = 0.97; and RMSEA = 0.045.

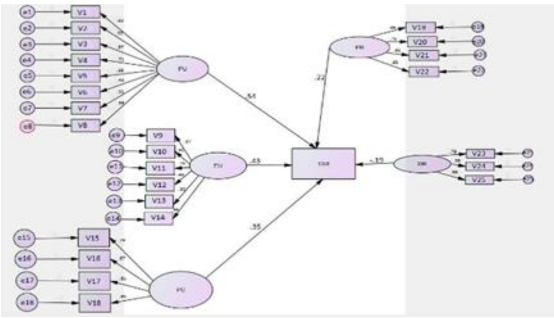

Figure 1. Structural Equation Modelling

The structural model suggests that Perceived usefulness (PU), Perceived ease of use (EU), Perceived connectivity (PC), and Performance risks (PR) have a positive influence on the Continuous Usage Intention of Smartwatches by Consumers. The construct Perceived usefulness (PU) is the most significant factor of Continuous Usage Intention as the regression weight is 0.54. The construct Perceived ease of use (EU) and Perceived connectivity (PC) are the second and third most significant factors of Continuous Usage Intention as their regression weights are 0.43 and 0.35. The construct Performance risks (PR)is the least significant factor of Continuous Usage Intention as its regression weight is 0.22. The Construct Data risk has a negative influence on Continuous Usage Intention as its regression weight is -0.19. Thus, it may be hypothesized that customers in general consider continuous usage intention with respect to the factors Perceived usefulness (PU), Perceived ease of use (EU), Perceived connectivity (PC), and Performance risks (PR). There is only a negative influence with the factor Data risks.

4 Managerial Implication and Conclusion

The phrase "perceived ease of use" relates to how someone feels about using a technical system. PEU has a favorable impact on people's attitudes toward adopting IoT. The more straightforward someone thinks using a smartwatch is, the more favorably that person will see the item and have an attitude toward using it. PEU hence has a favorable link with the continuous usage intention of smartwatches. The smartwatch is more beneficial to consumers as a result of their perception that it is simple to use. Thus, Perceived usefulness has a significant and positive relationship with smartwatch continuous usage intention. The perceived connectivity has a significant impact on how well-liked digital devices are. User acceptability may be influenced by how others, particularly close family or friends, utilize technology. The number of users—such as coworkers, friends, or family—will have an effect on how valuable technology is thought to be. Using a smartwatch and PC regularly are positively related. However, if people perceive fitness-tracking wearables to have a higher risk of malfunctioning, they are less likely to value them and buy smartwatches. Therefore, performance risk is crucial when choosing a wristwatch. As a result, PR and continuous usage intention of a smartwatch are positively correlated. The term "data risk" describes a person's worries about a potential invasion of privacy. Such losses of personal data can be more unpleasant with IT gadgets that capture private information. Smartwatch identity may be weakened when people worry that their personal information could be disclosed to or used inappropriately by other parties. So, privacy issues will make it harder for someone to identify with their wristwatch. As a result, data risk has a detrimental effect on the continuous usage intention of smartwatches. The purpose of this study is to evaluate the impact of smartwatch technology on both planned and actual use. Unlike previous studies focusing on consumer preferences, this research examined risks and benefits of smartwatches.

References

[1] Adapa, A., Nah, F. F. H., Hall, R. H., Siau, K., & Smith, S. N. "Factors influencing the adoption of smart wearable devices," Int. J. Hum. Comput. Interact., vol. 34, no. 5, pp. 399–409, 2018.

[2] Agudo-Peregrina, Á. F., Hernández-García, Á., & Pascual-Miguel, F. J. "Behavioral intention, use behavior and the acceptance of electronic learning systems: Differences between higher education and lifelong learning," Comput. Human Behav., vol. 34, pp. 301–314, 2014.

[3] Bellotti, V., & Sellen, A. "Design for privacy in ubiquitous computing environments," in Proceedings of the Third European Conference on Computer-Supported Cooperative Work 13–17 September 1993, Milan, Italy ECSCW '93, Dordrecht: Springer Netherlands, pp. 77–92, 1993.

[4] Choi, B. C., Jiang, Z., Xiao, B., & Kim, S. S. "Embarrassing exposures in online social networks: An integrated perspective of privacy invasion and relationship bonding," Inf. Syst. Res., vol. 26, no. 4, pp. 675–694, 2015.

[5] Choi, J., & Kim, S. "Is the smartwatch an IT product or a fashion product? A study on factors affecting the intention to use smartwatches," Comput. Human Behav., vol. 63, pp. 777–786, 2016.

[6] Chuah, S. H. W., Rauschnabel, P. A., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. "Wearable technologies: The role of usefulness and visibility in smartwatch adoption," Comput. Human Behav., vol. 65, pp. 276–284, 2016.

[7] Davis, F. D. "Perceived usefulness, perceived ease

of use, and user acceptance of information technology," MIS Q, vol. 13, no. 3, p. 319, 1989.

[8] Dehghani, M., & Tumer, M. "A research on effectiveness of Facebook advertising on enhancing purchase intention of consumers," Comput. Human Behav., vol. 49, pp. 597–600, 2015.

[9] Dehghani, M., & Dangelico, R. M. "Smart wearable technologies: state of the art and evolution over time through patent analysis and clustering," Int. J. Prod. Dev., vol. 22, no. 4, p. 293, 2018.

[10] Gaura, E. I., Brusey, J., Allen, M., Wilkins, R., Goldsmith, D., & Rednic, R. "Edge mining the internet of things," IEEE Sens. J., vol. 13, no. 10, pp. 3816–3825, 2013.

[11] Conti, F., Palossi, D., Andri, R., Magno, M., & Benini, L. "Accelerated visual context classification on a low-power smartwatch," IEEE Trans. Hum. Mach. Syst., vol. 47, no. 1, pp. 1–12, 2016.

[12] Weiss, G. M., Timko, J. L., Gallagher, C. M., Yoneda, K., & Schreiber, A. J. "Smartwatch-based activity recognition: A machine learning approach," in 2016 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), pp. 426–429, 2016.

[13] Ha, T., Beijnon, B., Kim, S., Lee, S., & Kim, J. H. "Examining user perceptions of smartwatch through dynamic topic modeling," Telemat. Inform., vol. 34, no. 7, pp. 1262–1273, 2017.

[14] J.-Hong, J. C., Lin, P. H., & Hsieh, P. C. "The effect of consumer innovativeness on perceived value and continuance intention to use smartwatch," Comput. Human Behav., vol. 67, pp. 264–272, 2017.

[15] Hong, J., Lee, O. K., & Suh, W. "A study of the continuous usage intention of social software in the context of instant messaging," Online Inf. Rev., vol. 37, no. 5, pp. 692–710, 2013.

[16] Hwang, C., Chung, T. L., & Sanders, E. A. "Attitudes and purchase intentions for smart clothing: Examining U.S. consumers' functional, expressive, and aesthetic needs for solar-powered clothing," Cloth. Text. Res. J., vol. 34, no. 3, pp. 207–222, 2016.

[17] Kumar, K., Liu, J., Lu, Y. H., & Bhargava, B. "A survey of computation offloading for mobile systems," Mob. Netw. Appl., vol. 18, no. 1, pp. 129–140, 2013.

[18] Kalantari, M., & Rauschnabel, P. "Exploring the early adopters of augmented reality smart glasses: The case of Microsoft HoloLens," in Augmented Reality and Virtual Reality, Cham: Springer International Publishing, pp. 229–245, 2018.

[19] Kim, H. W., Chan, H. C., & Gupta, S. "Value-based Adoption of Mobile Internet: An empirical investigation," Decis. Support Syst., vol. 43, no. 1, pp. 111–126, 2007.

[20] Kulviwat, S., Bruner II, G. C., Kumar, A., Nasco, S. A., & Clark, T. "Toward a unified theory of consumer acceptance technology," Psychol. Mark., vol. 24, no. 12, pp. 1059–1084, 2007.

[21] Li, J., Ma, Q., Chan, A. H., & Man, S. S. "Health monitoring through wearable technologies for older adults: Smart wearables acceptance model," Appl. Ergon., vol. 75, pp. 162–169, 2019.

[22] Lou, H., Luo, W., & Strong, D. "Perceived critical mass effect on groupware acceptance," Eur. J. Inf. Syst., vol. 9, no. 2, pp. 91–103, 2000.

[23] Luo, X., Gurung, A., & Shim, J. P. "Understanding the determinants of user acceptance of enterprise instant messaging: An empirical study," J. Organ. Comput., vol. 20, no. 2, pp. 155–181, 2010.

[24] Marangunić, N., & Granić, A. "Technology acceptance model: a literature review from 1986 to 2013," Univers. Access Inf. Soc., vol. 14, no. 1, pp. 81–95, 2015.

[25] Montgomery, K. C., Chester, J., & Kopp, K. Health Wearable Devices in the Big Data Era: Ensuring Privacy, Security, and Consumer Protection. Democraticmedia.org. [Online]. Available: https://www.democraticmedia.org/CDD-Wearable-Devices-Big-Data-Report. [Accessed: 26-Jun-2023].

[26] P. Lamkin, "Smartwatch popularity booms with fitness trackers on the slide," Forbes, 22-Feb-2018. [Online]. Available: https://www.forbes.com/sites/paullamkin/2018/02/22/smartwatch-popularity-booms-with-fitness-trackers-on-the-slide/. [Accessed: 26-Jun-2023].

[27] Park, E., E. Park, K. J. Kim, K. J. Kim, S. J. Kwon, and S. J. Kwon. "Understanding the Emergence of Wearable Devices as Next-generation Tools for Health Communication." Information Technology & People 29 (4): 717–732, 2016.

[28] Park, Y., Chen, J.V.: Acceptance and adoption of the innovative use of smartphone. Ind. Manag. Data Syst. 107(9), 1349–1365 (2007)

[29] Pavlou, P. A., and M. Fygenson. "Understanding and Predicting Electronic Commerce Adoption: An Extension of the Theory of Planned Behavior." MIS Quarterly 30: 115–143, 2006.

[30] R. Rawassizadeh, B. A. Price, and M. Petre, "Wearables: has the age of smartwatches finally arrived?," Communications of the ACM, vol. 58, no. 1, pp. 45–47, Dec. 2014.

[31] Rogers, E. M. Diffusion of innovation (5th ed.). New York: Free press, 2003.

[32] Rupp, M. A., Michaelis, J. R., McConnell, D. S., & Smither, J. A. The role of individual differences on perceptions of wearable fitness device trust, usability, and motivational impact. Applied Ergonomics, 70, 77–87, (2018).

[33] S. Bhattacharya and N. D. Lane, "From smart to

deep: Robust activity recognition on smartwatches using deep learning," in 2016 IEEE International Conference on Pervasive Computing and Communication Workshops (PerCom Workshops), pp. 1–6, 2016.

[34] Shih, P. C., Han, K., Poole, E. S., Rosson, M. B., & Carroll, J. M. Use and adoption challenges of wearable activity trackers. Proceedings of the IConference 2015. Retrieved from http://hdl.handle.net/2142/ 73649, 2015.

[35] Sohail, M. S., and I. M. Al-Jabri. "Attitudes Towards Mobile Banking: Are There any Differences between Users and Non-Users?" Behaviour & Information Technology 33 (4): 335–344, 2014

[36] Strader, T. J., Ramaswami, S. N., & Houle, P. A. Perceived network externalities and communication technology acceptance. European Journal of Information Systems, 16(1), 54–65. doi:10.1057/palgrave. ejis.3000657, 2007.

[37] Tarhini, A., Arachchilage, N.A.G., Masa'deh, R., Abbasi, M.S.: A critical review of theories and models of technology adoption and acceptance in information system research. Int. J. Technol. Diffus. 6(4), 1–20 (2015)

[38] Turhan, G. "An Assessment Towards the Acceptance of Wearable Technology to Consumers in Turkey: The Application to Smart Bra and T-shirt Products." Journal of the Textile Institute 104 (4): 375–395, 2013.

[39] Venkatesh, V., J. Y. Thong, and X. Xu. "Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology," MIS Q, vol. 36, no. 1, p. 157, 2012.

[40] Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. "User acceptance of information technology: toward a unified view", MIS Quarterly, Vol. 27 No. 3, pp. 425-478, 2003.

[41] Verkasalo, H., C. López-Nicolás, F. J. Molina-Castillo, and H. Bouwman. "Analysis of Users and Non-users of Smartphone Applications." Telematics and Informatics 27 (3): 242–255, 2010.

[42] Y. Ai, M. Peng, and K. Zhang, "Edge computing technologies for Internet of Things: a primer," Digital Communications and Networks, vol. 4, no. 2, pp. 77–86, Apr. 2018.

[43] Yang, H., J. Yu, H. Zo, and M. Choi. "User Acceptance of Wearable Devices: An Extended Perspective of Perceived Value." Telematics and Informatics 33 (2): 256–269, 2016.