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RESEARCH ARTICLE

Living Smart: Is Smart Home Devices Really Good?

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ABSTRACT

A smart home appliances is a household appliances that is outfitted with a communication network, high-tech equipment, appliances, and sensors that can be accessed, monitored, and controlled remotely, and provides services that are tailored to the requirements of the residents. The use of smart home appliances is becoming increasingly popular today due to consumers' busy lifestyles. Many people use smart home appliances to help them with household chores at home. However, many consumers have doubts about the "smartness" of smart home appliances. In reality, despite the touted features, some consumers face problems when using smart home appliances. Some appliances are not able to perform as it was claimed and have created dissatisfaction after using. Since the smart home appliances is a future trend, hence, marketers need to understand how can they satisfy consumers when they are developing smart home appliances. Therefore, this study aims to investigate customer satisfaction after using smart home appliances from the perspective of product quality. In this study, Garvin's eight dimensions of Product Quality which consist of factors such as Features, reliability, compliance, durability, and performance is adopted to see how they affect customer satisfaction. Using an online questionnaire, a total of 198 data were collected from users who use smart home appliances. The result of the study shows that product performance and conformance are the important factors influencing consumer satisfaction when using smart home appliances. This study provides the seller with an insight into the factors that influence consumer satisfaction and the result of the study can be used as a guide for marketers in the product development of smart home appliances.

INTRODUCTION

According to Yu and Sung (2023), the application sector of smart appliances has steadily expanded from the manufacturing sector to the smart appliance sector at home. This is a result of the widespread use of the Internet of Things (IoT) technology designed for the home. The home appliance industry is one of the first industries that is utilizing cutting-edge technology, such as the Internet of Things (IoT) and the cloud, ever since the Internet of Things began to attract prominence in the early 2010s (Aheleroff et al, 2020). The smart appliances are domestic gadgets that have the capability to connect to the internet and be operated from a distance using a smartphone or tablet (He, Martinez, Padhi, Zhang & Ur, 2019; Korneeva, Olinder & Strielkowski, 2021) . These devices frequently include advanced features such as voice command capability, energy monitoring, and automation features. The examples of smart home appliances such as : smart TVs, washing machines, refrigerators, and dishwashers are the popular smart home appliances purchased by the consumers today. The busy lifestyle in the marketplace today makes smart home appliances getting more important as they can help the users to save their time and effort in doing house chores.

According to Statista (2023), the value of the global market for smart home appliances will increase at a compound annual growth rate (CAGR) of 8.6% between 2022 and 2030. The Compound Annual Growth Rate (CAGR) is expected to be 14.20% from 2022 to 2027, leading to a projected market volume of $87.90 billion by 2027. It is anticipated that the market for smart appliances would generate revenue of $60.6 billion in the year 2024. Revenue is anticipated to have a compound annual growth rate (CAGR) of 11.04% between the years 2024 and 2028, which will result in a projected market volume of $92.2 billion by the year 2028.

Smart Home Appliances in Malaysia

Malaysia is now engaged in the development of its Internet of Things (IOT) infrastructure. Furthermore, it is noteworthy that the country is among the limited number of nations in Southeast Asia that possesses the necessary infrastructure for implementing Internet of Things applications.In addition, the statistics revealed that 96.8 percent of Malaysians have access to the internet, and that 98.7 percent of them do so using their mobile devices.

The Malaysian population is well prepared to use mobile technologies. Malaysia has been ranked number nine in terms of the average amount of time spent on mobile internet per day, which is three hours and fourteen minutes; number four in terms of mobile social media (74%); number seven in terms of mobile e-commerce (58%); number six (66%) in terms of mobile e-banking; and number three (48%) in terms of ride-hailing application programme. To put it another way, the acceptability of smart home applainces might not seem like a major issue (Rock, Tajudeen, & Chung, 2024).

According to National Internet of Things (IoT) Strategic Roadmap (2015), the market value of smart home appliances in Malaysia is expected to exceed 235 million dollars by 2025. By the year 2027, it is anticipated that there will be a total of at least 2.3 million households using the smart home appliances. In addition, the percentage of penetration of the smart home appliances in Malaysia will be reach 13.8% in 2022, and it is anticipated that this number will reach 26.0% by 2027. Based on the statistics above, we can see and know the smart home appliances are growing in the Malaysia Market.

Research Problem

Despite the the usage of smart home appliances are growing in Global and Malaysia market, many are not satisfying with smart home appliances. Many complaints related to the quality of the products are lodge every year by the consumer.Products quality is to anything that may be sold to a market in order to satisfy a demand or a need of the consumers. There are quality standards for every product in order to fulfil the requirements of customers. Product quality is one of the aspects that can be measured and used to increase customer satisfaction. In order for items to be recognised and trusted by the larger community, quality is the most important factor. Products that are of high quality will be in high demand among customers (Cahaya, Siswanti, Putra, & Pattiwael, 2023). According to Kotler, and Armstrong (2010), the definition of product quality is the capability of an item to perform its capabilities. These capabilities include dependability, solidness, accuracy, simplicity of activity, and item fix, in addition to other key features. Also, product quality is one of the keys to achieve competitive advantage among business players that serve consumers. Consumers always want to acquire a quality product for the price they pay.

Quality issue is one of the problems of the smart home appliances (Luor, Lu, Yu, & Lu, 2015). Smart home gadgets that run wireless become less enticing, once the factor in the inevitable care of wireless equipment. On top of these, the batteries used in the smart home appliances such as cameras, smartwatches, and motion sensors run out of power faster than the normal batteries used in normal appliances. In addition, according to Gnotthivongsa and Alinsavath (2020), stated that the smart

home appliances is not able to perform as promised after few usage. On top of this, some users also complain about the privacy and security of the smart home appliances as most of the information of the smart home appliances are stored in the " cloud" , and "cloud " always are the target for the hackers (Carsten, Monika, and Jorg, 2018). Since most of the complaint of the start home appliances are on the products feature, hence it would be good to have a study to know how product quality is going to affect the customer satisfaction of smart home appliances.

According to Garvin's Eight Dimensions of Product Quality, product quality will affect customer satisfaction towards on a product and the customer will based on different functions or dimensions of a product to increase or decrease their satisfaction on a product. Hence the research would like to study how the products quality is going to influence the customers satisfaction by referring to the Gavin's eight dimensions model.

The general objective of this study is to see how the dimension in Garvin's model is going to affect the consumer satisfaction after using the smart home appliances.The research obejctive of the study includes:

Objective 1: To determine the relationship between features and customer satisfaction.

Objective 2: To determine the relationship between Reliability and customer satisfaction.

Objective 3: To determine the relationship between Conformance and customer satisfaction.

Objective 4: To determine the relationship between Durability and customer satisfaction.

Objective 5: To determine the relationship between Performance and customer satisfaction.

1.3 LITERATURE REVIEW

The session below will talked about customers satisfactions and Gavin's eight dimension of products quality.

1.3.1 Customer Satisfaction

Customer satisfaction, as described by Kotler and Armstrong (2010), is the measure of how satisfied individuals feel after assessing their experiences, including performance and outcomes, in comparison to their initial expectations. Customers will feel dissatisfied if the product fails to satisfy their expectations. Moreover, the consumer would feel contentment if the product fulfills their expectations. Moreover, if the performance exceeds their expectations, customers will experience a significant level of satisfaction (Gunawan, 2022).

Customer loyalty is a phenomenon that happens when satisfied consumers are interested in purchasing items from businesses whose performance is as expected. Customer satisfaction encompasses a number of different elements, including the intention to repurchase. These clients are difficult to convince by rivals. This is due to the fact that they are content with the performance of businesses that are able to match the expectations of their customers (Naini, Santoso, Andriani and Claudia, 2022; Olubiyi, 2024).

Lack of comprehension of client preferences by the service provider or industry may impede the achievement of consumer satisfaction with a product or service. Customer satisfaction levels for identical items or services can differ. Therefore, it is crucial for a company to continually provide top priority to the quality of the products and services offered to clients (Surahman et al., 2020). Also, according to Naini et al. (2022), the consistency to develop a product is one of a important factors the company should take note. The company must see and choose a quality level that will support product positioning. This quality level means the product's quality in carrying out its function so that

the resulting product can be of high quality and must be maintained by the company. The conformation of the product can have an impact on the level of customer satisfaction depending on the consistency of the product and its absence of damage.

1.3.2 Garvin's Eight Dimensions of Product Quality

Quality is a general definition of goods and services in advertising, developing, assembling, and maintaining that allows the goods and services utilised to satisfy the buyer's expectations. (Octavia, 2021; Prima, Rizal, Maksum, & Ashar, 2024). Garvin (1984) developed a system for evaluating product quality by classifying quality core components into eight categories. Garvin highlighted that quality encompasses various dimensions, each of which can be strategically leveraged to achieve a competitive edge over competitors (Hoe & Mansori, 2018).

Garvin identifies eight dimensions that contribute to product quality from both products and consumer perspective. The following is an overview of these dimensions. Performance refers to the fundamental operational characteristics of a specific product. Features are additional components or characteristics that, when incorporated into a product, enhance its overall attractiveness to the intended audience. The reliability of a product can be examined by calculating the probability of it not experiencing any malfunctions within a specific time period when it is being used. The level of conformity of a product or service with a standard is determined by the extent to which it satisfies the specified requirements. The durability rating of a product indicates the estimated lifespan of its functionality. The serviceability of a product can be assessed based on the speed, simplicity, and cost of repairing it when it malfunctions. The term "aesthetics" encompasses the visual, tactile, and auditory aspects of the finished product. It is a matter of personal choice and an expression of individual tastes. Within this particular context, "perceived quality" denotes the quality that the client ascribes to the specific product or service under consideration. Nevertheless, it is crucial to acknowledge that perception does not always accurately represent reality (Hoe & Mansori, 2018).

Garvin emphasizes the importance of understanding these eight characteristics for strategic goals. An organization that chooses to compete based on quality might adopt several approaches to achieve this goal. It is not necessary for the organization to simultaneously pursue all eight dimensions. Instead, a segmentation strategy can be employed, where only a few specific dimensions are chosen to receive extra attention (Hoe & Mansori, 2018).

This study utilized just five of Garvin's eight dimensions of product quality, specifically features, reliability, conformance, durability, and performance. However, the study excluded serviceability, aesthetics, and perceived quality as the study primarily focuses is on investigating how the actual performance of smart home appliances affects customer satisfaction. These three excluded variables were pertain to consumer perception of the smart home appliances, which is not directly reflect on the product quality dimensions (Hoe & Mansori, 2018) . Below is are explanations of the five dimensions in Gavin's model:

1.3.2.1 Features

According to Hoe and Mansori (2018), features are defined as additional qualities or traits that enhance the appeal of a product to the consumer. According to Syahrial et al. (n.d.), the performance is primarily governed by the characteristics of the features, with careful consideration given to the secondary component of those features. According to Chan and Zaman (2018) and Ghosh and Roy (2020), features are an essential component that have a substantial impact on the overall quality of a product to a significant degree.

1.3.2.2 Reliability

Reliability refers to the probability of a product experiencing failure or damage within a specified time frame. Product reliability is inversely proportional to the likelihood of sustaining harm. In other

words, the more reliable a product is, the less likely it is to be damaged or harmed (Mahsyar & Surapati, 2020a).Reliability is crucial in an integrated smart home due to the presence of many appliances and gadgets that are interconnected and have different levels of tolerance for technological errors. The variation in tolerance levels presents significant difficulties, as different industries, such as boiler designers and household PC developers, may have divergent assumptions regarding the optimal crash tolerance to incorporate into their products. Similarly, even minor malfunctions in the computer's operation could lead to significant issues with the boiler's performance (Hasan et al., 2018).

1.3.2.3 Conformance

The degree to which a product satisfies the criteria established by a standard is referred to as its conformance, and it is also sometimes referred to as the product's level of conformity and compliance (Hilal & Top, 2019). Conformance is a promise that the seller makes to the customers, and the seller is obligated to follow this promise in order to guarantee that the items are able to fulfil their intended purpose (Maboudi, , Sheikh & Sana, 2024; Mahsyar & Surapati, 2020).

1.3.2.4 Durability

Durability refers to the capacity of a product to endure a certain level of usage before it requires replacement. Typical items can be used with a growing frequency, and even large amounts of electricity are unable to damage these products (Mahsyar & Surapati, 2020). Durability refers to the capacity of a product to be utilized over its entire lifespan until it either undergoes physical deterioration or necessitates replacement (Syahrial et al., n.d.). The duration for which a product or service can be utilized efficiently is a key factor in determining its longevity (Hassanein Abd-Elrahman, 2018).

1.3.2.5 Performance

According to Hoe and Mansori (2018), performance refers to aspects of a product that are basic to its core operations. The term "performance" is used to describe the core characteristics and measurable aspects of a product, as stated by Stir (2018). According to Ghosh and Roy's (2020) , there is a connection between performance and the essential characteristics of the product.Performance is the first dimension that Garvin considers when determining the quality of a product. Performance is the primary operating characteristi of a product, and it is also defined as the ability of a customer to operate and make use of the product without any problems based on the instructions that are given (Syahrial et al., 2018).

Based on the literature above, the following five hypotheses are formed to answer to the research objectives stated earlier:

H1: There is relationship between Features and customer satisfaction.

H2: There is relationship between Reliability and customer satisfaction.

H3: There is relationship between Conformance and customer satisfaction.

H4: There is relationship between Durability and customer satisfaction.

H5: There is relationship between Performance and customer satisfaction.

2. MATERIALS AND METHODS

The research methodology of the study are explained in the sections below:

2.1 Target Respondent

The study focuses on consumers aged 18 years old and above who have purchased and used smart home appliances in the past 6 months. This criteria was set to ensure the respondents can provides better opinion based on their experiences using smart home appliances.

2.2 Sample Size

Upon utilizing the G power software. The survey recommends using a sample size of 85. Nevertheless, the researcher will be sending questionnaires to at least 150 respondents to obtain responses that are both more precise and more consistent.

A research instrument, such as a questionnaire, is utilized to gather data from the intended participants. The questionnaire comprised two sessions: Session A and Session B. Session A mostly consists of demography questions, while session B is dedicated to questions pertaining to the factors. A five-point Likert scale, which ranges from "strongly disagree" to "strongly agree". The questionnaire in this study were adopted from the prior study conducted by Gu et al., (2019), Admasu (2021), Hoe & Mansori (2018) and Rakhmawati et al. (2020).

3.3 Data Collection

The data is collected using an online questionnaire. A Google form was created and the questionnaire was distributed randomly to respondents on social media. We asked a few screening questions in order to select appropriate respondents. In this study, the respondent must meet the conditions outlined below:

Malaysian individuals who fall within the age range of 18 and above.

Have prior experience of purchasing and using a home appliances in the past 6 months.

3. RESULTS AND DISCUSSION

All Total 198 usable data were collected in the study. There are 107 female respondents and 91 male respondents participated in the study. All the respondents had purchased smart home appliances before in the past 6 months. There are 156 participants purchased robot vacuum. The followed by 139 participants purchased security cameras, 107 participants purchased clothes washers and dryers, 38 participants purchased dishwashers oven and microwaves, 118 participants purchased televisions, and the last is 1 participant purchased air fryer, multi-function cooker.

3.1 Reliability Test

In accordance with Hulin,Netemeyer, and Cudeck (2001), the acceptable range for Cronbach's alpha values is between 0.6 and 0.8.

The value of Cronbach's Alpha for the customer satisfaction survey in this investigation is 0.849. In terms of features, the Cronbach's Alpha value is 0.769. In terms of reliability, the Cronbach's Alpha value is 0.713. In terms of conformity, the Cronbach's Alpha value is 0.629. In terms of durability, the Cronbach's Alpha value is 0.639. In terms of performance, the Cronbach's Alpha value is 0.856.

3.2 Multiple Linear Regression

Table 1: Multiple Linear Regression Analysis

	Unstandardized Coefficient		**Standardized Coefficients**		
Model	Beta	Std Error	Beta	t	Sig.
(Constant)	1.062	0.320		3.323	.001
Performance	.382	.060	.283	5.472	<0.001

Features	-.044	.051	-.040	-.587	.393
Reliability	.-044	.050	-.039	-.819	.414
Conformance	.052	.046	.614	11.837	<0.000
Durability	-.042	.043	-.042	-.972	.322
R square-0.668 ,F=77.42, Sig = 0.000 , DV= Customer Satisfaction					

Based on the Multiple Linear Regression Analysis Table 1 above, the relationship between the independent variables: performance, conformance, reliability, durability, and features and with the dependent variable, customers satisfaction were analysed and the result is satted in the table. The R Square = 0.668 which shows that there are indicates independent variable have an influence of 66.8% on the dependent variable which is customer satisfaction.with F value is 77.42 and the significant value (p-value) is at <0.001, which is less than 0.05. Therefore, this proven that the regression model is fit in this research with the data collected.

The significant value (p-value) of performance, conformance and Customer Satisfaction is <0.001, which is less than 0.05, this showed there is relationship between performance and Customer Satisfaction. Hence, H3 and H5 are supported.

The result showed the p-value for Reliability, feature and durability are 0.414, 0.393 and 0.332, which is greater than 0.05. Hence, there is no relationship between Reliability, features and durability on Customer Satisfaction, hence, H1, H2 and H4 are not supported.

Based on the beta value (b), conformance is the most influential factor in affecting Customer Satisfaction when using smart home appliances, with the value of 0.614.

3.3 DISCUSSION OF THE STUDY

There is evidence suggests a relationship between the performance and conformance of smart home appliances and customer satisfaction. Customer expectations significantly impact product quality and ultimately influence the satisfaction of customers. .According to Weenas (2013),product quality can affect customer satisfaction based on product consistency free from damage. Kotler and Armstrong (2020) define satisfaction as the consumer's response to the effectiveness of a product or service, encompassing its ability to fulfil needs, meet expectations, and fulfil additional desires. Three indicators, namely the fulfilling of necessities, the fulfilment of expectations, and the fulfillment of aspirations, can be utilised to ascertain whether a consumer is satisfied (Lina, 2022).

There is no evidence to indicate any relationship between the durability and durability of smart home appliances and customer satisfaction. The possibility of getting this result maybe is because consumers nowadays never expect a products can be durable, and now they understand lifespan of the products differently compared to last time. Study mention that consumers nowadays want a products to last for just as long as they want them to last, but not necessarily any longer than that (Cox, Griffith, Giorgi, & King, 2013). Hence durability is no longer an important factors influencing the consumers satisfaction. Similar to proiducts features, tehre is a possibility that consumer use halo effect in selecting the products, as they emphasis only one the performance dimension of the products, but not on features. Hence, the consumer felt satisfy as long as the products can fulfilled its functional benefits.

4. CONCLUSION

This session includes the managerial implications, recommendation for the future study and the conclusion of the research.

4.1 Managerial Implications

On the foundation of the findings of this study, it is possible for the government to make a significant decision on the importation of smart home appliances or to grant permission for the development of new products related to smart home appliances by taking into consideration the questions or problems that concern quality and safety that smart home appliances would bring about. In addition, the government has the capacity to design and enforce policies about quality standards, legal laws, or regulations in order to guarantee that the smart home appliances meet the requirements for safety, dependability, and high-quality requirement. Through the findings of the study, the government can also assist consumers in better understanding the performance and conformance of smart home appliances and selecting smart home appliances that are suitable for them. This can be accomplished by providing the information that the study reveals, such as the factors that have an effect on the level of customer satisfaction in smart home appliances.

When it comes to businesses, they have the ability to gain a better understanding of the factors that will influence the level of customer satisfaction with their smart home appliances product. Furthermore, they have the ability to enhance the smart home appliances product based on the results of customer satisfaction, with the goal of developing a product that is better or more in line with what the customer seeks. Additionally, they are able to gain a deeper understanding of the market for smart home appliances by tracking the level of satisfaction experienced by customers. This will be an advantage for them when it comes to the development of new smart home appliances or when operating in a competitive environment. This is because they will be able to produce results that not only satisfy the needs and desires of customers, but also satisfy the requirements and desires of the market. When it comes to smart home equipment, therefore, businesses are able to determine the level of satisfaction experienced according to the findings of the study, to achieve higher levels of customer satisfaction, it is necessary to improve the performance of the products as well as their conformance. These two aspects can be improved by ensuring that the appliance functions are secure and that they are able to meet the expectations of consumers on the manner in which smart home appliances should demonstrate their capabilities.

4.2 Recommendation for Future Study

The recommendation for future Study is conduct research on the other three factors in Garvins model in affecting the consumer satisfaction, there are serviceability, aesthetics, and perceived quality. These three factors are confusing on how consumer see the quality of the products from the extrinsic cue.

Research on markets and across the products categories is the second recommendation. It involves carrying out cross-market research to contrast and comprehend how product quality affects consumer satisfaction in various industry. By examining this, it would give the business people in insights on how consumer see products quality when they are buying different types of products.

4.3 CONCLUSION

Garvin's 8 Dimensions of Product Quality is a study that examines the aspects that influence the level of satisfaction that consumers have when using smart home appliances. Features, reliability, conformance, durability, and performance were some of the aspects that were taken into consideration. Those individuals in Malaysia who are 18 years old who have purchased and utilized smart home products within the previous six months are the target respondents for this study. The questionnaire survey is utilised, and it is disseminated among respondents using the Google Form. During the data collection process, 198 data that might be used were gathered. According to the findings of the research, conformity and performance are two significant aspects that have a significant impact on the level of satisfaction that can be experienced by customers who use smart home products. The findings of the study indicate that in order to fulfil the needs of Malaysian

consumers, the seller of smart home appliances ought to place an emphasis on the functionality of the items. This is because the majority of consumers focus primarily on the ways in which smart home appliances may assist them in resolving their issues, but they are not paying priority to any other aspects. Nevertheless, marketers are required to conduct ongoing research in order to adjust their strategy in order to correspond with the shifting patterns of consumer behaviour. The findings of the studies also provide a guide for business people and government officials, advising them on how they may use the findings of the study to improve their tactics in order to provide better benefits to their customers.

AUTHORS' CONTRIBUTION

Lim Ying San contributed to the conceptualization of the research, overseeing the data collection process and revise the manuscript prior to the submission.

Ng Tuan Hock contributed to refined research methodology and analyse the data. He participated in the critical review of the manuscript to ensure the overall coherence of the article.

Teh Hoe Pin contributed to the conceptualisation of the research, literature review and also study hypotheses of the manuscript. He also wrote the first draft of the manuscript.

REFERENCES

Admasu, T. (2021). The effect of actual product quality on purchase intention–the case of selected leather handbag manufactureres in addis ababa (Doctoral dissertation, ST. MARY'S UNIVERSITY).

Aheleroff, S., Xu, X., Lu, Y., Aristizabal, M., Velásquez, J. P., Joa, B., & Valencia, Y. (2020). IoT-enabled smart appliances under industry 4.0: A case study. Advanced engineering informatics, 43, 101043.

Cahaya, Y. F., Siswanti, I., Putra, Y. M., & Pattiwael, A. C. (2023). Contributions to Customer Satisfaction from Product Quality, Promotion and Price. Journal of Economics, Finance and Management Studies, 6(6), 2434-2440.

Carsten, S., Monika, J. and Jorg, N. (2018), "Smart services", Procedia - Social and Behavioral Sciences,Vol. 238 No. 1, pp. 192-198.

Chan, S. W., & Zaman, I. (2018). Comparative study of product quality perception between Malaysian and Non-Malaysian electrical appliance among tertiary students Factors Influencing on Higher Education: A Case of Public Sector Universities in Islamabad View project Sustainable Procurement View project. http://excelingtech.co.uk/

Cox, J., Griffith, S., Giorgi, S., & King, G. (2013). Consumer understanding of product lifetimes. Resources, Conservation and Recycling, 79, 21-29.

Garvin, D. A., & Quality, W. D. P. (1984). Really mean. Sloan management review, 25, 25-43.

Ghosh, S., & Roy, M. K. (2020). Identifying brand equity dimensions and measuring its relationship with product quality dimensions: A study on juice brands in india. In International Journal of Management & Entrepreneurship Research (Vol. 2, Issue 7). www.fepbl.com/index.php/ijmer

Gnotthivongsa, N., & Alinsavath, K. N. (2020). Real-time corresponding and safety system to monitor home appliances based on the internet of things technology. International Journal of Modern Education and Computer Science, 12(2), 1.

Gu, W., Bao, P., Hao, W., & Kim, J. (2019). Empirical examination of intention to continue to use smart home services. Sustainability (Switzerland), 11(19).

Gunawan, I. (2022). CUSTOMER LOYALTY: The Effect Customer Satisfaction. In Experiential Marketing and Product Quality. KINERJA: Jurnal Manajemen Organisasi dan Industri (Vol. 1, Issue 1).

Hasan, M., Biswas, P., Bilash, M. T. I., & Dipto, M. A. Z. (2018). Smart home systems: Overview and comparative analysis. Proceedings - 2018 4th IEEE International Conference on Research in Computational Intelligence and Communication Networks, ICRCICN 2018, 264–268. https://doi.org/10.1109/ICRCICN.2018.8718722

Hassanein Abd-Elrahman, A.-E. (2018). A Review of Telecommunications Service Quality Dimensions Article Information. In A Review of Telecommunications Service Quality Dimensions. Sch J Appl Sci Res (Vol. 1, Issue 1). www.innovationinfo.org

Hulin, C., Netemeyer, R., and Cudeck, R. (2001). Can a Reliability Coefficient Be Too High? Journal of Consumer Psychology, Vol. 10, Nr. 1,55-58.

He, W., Martinez, J., Padhi, R., Zhang, L., & Ur, B. (2019, May). When smart devices are stupid: negative experiences using home smart devices. In 2019 IEEE Security and Privacy Workshops (SPW) (pp. 150-155). IEEE.

Hilal, D., & Top, C. (2019). Impact of product and service quality of gated communities on the repurchase intentions: case study in Kurdistan region of Iraq. International Journal of Economics, Commerce and Management, 7(6), 505-515.

Hoe, L. C., & Mansori, S. (2018). The Effects of Product Quality on Customer Satisfaction and Loyalty: Evidence from Malaysian Engineering Industry. International Journal of Industrial Marketing, 3(1), 20.

Kotler, P., & Armstrong, G. (2010). Principles of marketing. Pearson education.

Korneeva, E., Olinder, N., & Strielkowski, W. (2021). Consumer attitudes to the smart home technologies and the Internet of Things (IoT). Energies, 14(23), 7913.

Lina, R. (2022). Improving Product Quality and Satisfaction as Fundamental Strategies in Strengthening Customer Loyalty. In Jurnal Mahasiswa Ekonomi & Bisnis(Vol.2, Issue 1).

Luor, T. T., Lu, H. P., Yu, H., & Lu, Y. (2015). Exploring the critical quality attributes and models of smart homes. Maturitas, 82(4), 377-386.

Maboudi, F., Sheikh, R., & Sana, S. S. (2024). The selection of mobile phones based on the dimensions of qualities by word-of-mouth approach. International Journal of System Assurance Engineering and Management, 1-13.

Mahsyar, S., & Surapati, U. (2020a). Effect of service quality and product quality on customer satisfaction and loyalty. Business and Accounting Research (IJEBAR) Peer Reviewed-International Journal, 4.

Naini, N. F., Santoso, S., Andriani, T. S., & Claudia, U. G. (2022). The effect of product quality, service quality, customer satisfaction on customer loyalty. Journal of consumer sciences, 7(1), 34-50.

National Internet of Things (IoT) Strategic Roadmap: A Summary (2015). Mimos Berhad. Accessed on 27 April, 2024. from : https://www.mimos.my/iot/National_IoT_Strategic_Roadmap_Summary.pdf.

Oktavia, A. (2021). Analisis Pengendalian Kualitas Produk Menggunakan Pendekatan Statistical Quality Control (SQC) di PT. Samcon. Industri Inovatif : Jurnal Teknik Industri, 11(2), 106-113. https://doi.org/10.36040/industri.v11i2.3666

Olubiyi, T. O. (2024). Improving Customer Experience Through Differentiation Capability: The Rise of Competition Among Africa's Consumer Goods Companies. PaperASIA, 40(5b), 230-240.

Prima, F. K., Rizal, F., Maksum, H., & Ashar, F. (2024). The Impact of Quality Control Implementation on Productivity and Product Quality in Industry. PaperASIA, 40(4b), 52-58.

Rock, L. Y., Tajudeen, F. P., & Chung, Y. W. (2024). Usage and impact of the internet-of-things-based smart home technology: a quality-of-life perspective. Universal Access in the Information Society, 23(1), 345-364.

Surahman, I. G. N., Yasa, P. N. S., & Wahyuni, N. M. (2020). The Effect of Service Quality on Customer Loyalty Mediated by Customer Satisfaction in Tourism Villages in Badung Regency. Jurnal Ekonomi & Bisnis JAGADITHA, 7(1), 46–52.

Ştir, M. (2018). Product Quality Evaluation in Physical Stores versus Online Stores. Expert Journal of Marketing, 6(1), 7–13.

Statista (2023) . Smart Appliances - Worldwide. Assessed on 1 Aprilm 2024, from https://www.statista.com/outlook/cmo/smart-home/smart-appliances/worldwide#analyst-opinion

Syahrial, E., Suzuki, H., Schvaneveldt, S. J., & Masuda, M. (2018). Customer Perceptions of Mediating Role of Ownership Cost in Garvin's Dimensions of Quality.J Jpn Ind Manage Assoc, Vol 69, 95-112, 2E.

Yu, Y., & Sung, T. J. (2023). A value-based view of the smart PSS adoption: a study of smart kitchen appliances. Service Business, 17(2), 499-527.