# User Experience Assessment of E-Learning System Using USE Questionaries

Vertic Eridani Budi Darmawan[1*], Wu Wei Shen[2], M Fathullah[3], Yuh Wen Chen [4], Cahya Nugraha[5], Fatiruna An Fasya Jalil[6]
[1,5,6] Department of Industrial Engineering, Universitas Negeri Malang, Jalan Semarang 5, Malang 65145, Indonesia; email: vertic.eridani.ft@um.ac.id, cahya.nugraha3333@gmail.com, jfatirunaanfasya@gmail.com
[2] Department of Information Management, Da Yeh University, No 168 University Rd. Dacun, Changhua 51591, Taiwan; email: wsw@mail.dyu.edu.tw
[3] Geopolymer & Green Technology, Centre of Excellence (CEGeoGTech), Faculty of Mechanical Engineering Technology Universiti Malaysia Perlis (UniMAP), Kampus Tetap Pauh Putra Arau, Perlis 026000, Malaysia; email:fathullah@unimap.edu.my
[4]Institute of Industrial Engineering and Management, Da Yeh University, No. 168 University Rd. Dacun, Changhua 51591, Taiwan; email: profchen@mail.dyu.edu.tw

* *Corresponding author*

**Abstract**
*The rapid growth of e-learning has gained significant popularity as customized mode of education. The opportunity to rebuild the e-learning as a challenge to assess the usability degree of e-learning are open. This study focuses on measuring the evaluation of usability of interactive-coding web-based learning module that has been developed. The study involved 59 students from Industrial Engineering Study Program who are actively used the e-learning for algorithm and programming course. The methodology used in this research is descriptive correlative method with a quantitative approach by collecting the usability measurement using the USE Questionnaire, which consist of for indicators, namely usefulness, ease of use, ease of learning, and satisfaction) represented by 30 questions with four possible Likert scale options. The research finding indicates that all the participants are satisfied with the four assessment variables and 56% are have positive comments and 44% has improvement comments. In the multiple linear regression analysis showed for F-Test that the independent variables (Usefulness, Ease of Use, and Ease of Learning) simultaneously have a significant effect on the dependent variable (Satisfaction) and for Partial t-test showed that there is a positive and significant relationship between Usefulness and Ease of Learning on satisfaction variables, meanwhile, there is no positive and significant relationship between Ease of Use on satisfaction variables.*
**Keyword**: E-learning, USE Questionnaire, Students' Perception, Usability

Kelompok BoK yang bersesuaian dengan artikel: *System Design & Engineering*

Saran format untuk mensitasi artikel ini:
Darmawan, V.E.B., Shen, W.W., Fathullah, M., Chen, Y.W., Nugraha, C., dan Jalil, F.A.F. (2023). User Experience Assessment of E-Learning System Using USE Questionaries. *Prosiding Seminar Nasional Teknik Industri* (SENASTI) 2023, 995-1004.

## 1. Introduction

The e-learning landscape has witnessed a remarkable surge in recent years. This increase has accelerated with the advent of the COVID-19 pandemic, forcing all work to become mobile. Since the occurrence of covid, most education uses e-learning (Shahzad et al., 2020) This also happens in the learning algorithm and programming section. The existence of online programming learning can create a new and widely accessible learning style. The current use of e-learning has the potential to shape effective and efficient education in the future. One of the online learning that can be used for programming is Interactive-Coding Web-Based Learning.

The Interactive-Coding Web-Based Learning Module has been used for students who are studying algorithms and programming. There are several module designs, one of which is the module developed in Darmawan's et al. (2022) research. The module is designed using the SDLC method which has a 3-tier architecture. It is also designed to be "interactive", by adding text, as well as learning videos in it. Videos and text can also be adjusted according to the existing educational curriculum.

The use of technology is often evaluated periodically, the evaluation process uses usability testing. Based on International Organization for Standardization (ISO) explained that usability testing is "The extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use Recent applications have demonstrated the growing importance of usability studies in improving user experience in various fields. In the field of mobile apps, usability studies have been carried out to optimize the user interface, streamline navigation, and improve the overall functionality of the app. In addition, e-commerce websites have used usability studies to identify weak points in the user journey, helping to improve conversion rates and customer satisfaction. client. In addition, educational platforms such as The Interactive-Coding Web-Based Learning Module have used usability studies to refine the user interface, simplify course navigation, and improve engagement, ensuring a seamless learning experience students. The USE questionnaire has been used by various studies to analyze the usability of products. One of them is the research conducted by Maramba et al. (2019). In their study, it is explained that USE was used to evaluate an e-Health application. USE was chosen to develop the e-Health application based on user satisfaction.

In this paper, the Interactive-Coding Web-Based Learning Module developed by Darmawan's et al. (2022) research will be carried out usability testing using the USE questionnaire. The selection of the USE (Usefulness, Satisfaction, and Ease of use) questionnaire as the framework for assessing the Interactive-Coding Web-Based Learning Module's usability is grounded in its established effectiveness and widespread use. The USE questionnaire provides a structured approach to gauge users' perceptions and experiences, encompassing key factors such as usefulness, satisfaction, and ease of use (Shanklin et al., 2022). The research problem at hand revolves around understanding how effectively the module caters to the needs of Industrial Engineering students and whether it achieves its intended objectives. By employing the USE questionnaire, the study seeks to uncover valuable insights into user perspectives, allowing for informed improvements to optimize the module's usability and overall impact on learning outcomes.

## 2. Method

The USE Questionnaire was used to measure the usability of the e-learning system in this research. USE questionnaire contains four aspects of usability: Usefulness, Ease of use, Learning Ease, and Satisfaction. Usefulness, Ease of Use, and Ease of Learning are independent variables, whereas Satisfaction is the dependent variable [1]. Fig. 1 depicts a conceptual model of the relationship between the variables.

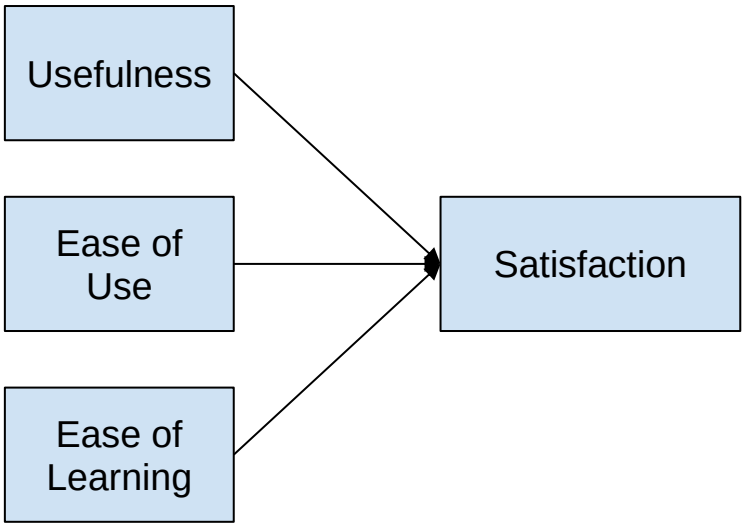


**Figure 1**. The conceptual model of four aspects USE questionnaire

USE questionnaire is a 30-item questionnaire represented in four aspects. All of the questions were constructed in a positive wording format. This instrument uses a 4-point Likert scale, with 1 representing "strongly disagree" and 2 representing "disagree," 3 representing "agree," and 4 representing "strongly agree." The questionnaire's structure is shown in Table 1. Within the questionnaire, participants can also leave comments in the blank space at the end of the questionnaire. The blank space was provided to submit participants' opinions after experiencing the learning process using the assessment of the e-learning system.

**Table 1**. Outline of the USE questionnaire

| Variables | Items Number | Total Items |
|---|---|---|
| Usefulness | 1, 2, 3, 4, 5, 6, 7, 8 | 8 |
| Ease of Use | 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 | 11 |
| Ease of Learning | 20, 21, 22, 23 | 4 |
| Satisfaction | 24, 25, 26, 27, 28, 29, 30 | 7 |
| Open-Ended Feedback | - | - |

To find out the user experience in using the e-learning system, it takes several participants to collect the actual data. The research involved 59 participants from Industrial Engineering students at the State University of Malang who use the E-Learning system as a tool for learning algorithm subjects in 2021. Among the participants, 54.24% were male (32 students), while 45.76% were female (27 students).

The first stage of the research was to gather the participants. Participants in this research were students, and the questionnaire was distributed online. The total number of participants who participated in this survey was 59 participants. The second stage was compiling usability test scripts based on USE questionnaire. Following that, usability testing was carried out, as well as data analysis based on the results of the questionnaire. Give explanation about the research procedure

## 3. Results and Discussion

### 3.1 Validity Test

A questionnaire can be considered valid if it meets the validity test and performs its intended measurement function. To examine the validity of measurement tests, the Pearson Correlation test can be utilized with IBM SPSS software. The questionnaire questions can be valid if Pearson's value is greater than the r table value on Pearson's test correlation. In contrast, if Pearson's value is less than the r table, the question fails the validity test.

**Figure 2.** Validity test for each question

As shown in Fig. 2, every question in this questionnaire has a Pearson's correlation value more than the r table value. It can be concluded that the questioner question is valid to use.

### 3.2 Reliability Test

Reliability tests are used to see if the values in a questionnaire are consistent. This research uses Cronbach's alpha from each variable to compare it with acceptable value. In this research, the acceptable value of Cronbach's alpha is 0.7. Table 2 shows that Cronbach's alpha values for the four variables (Usefulness, Ease of use, Ease of learning, and satisfaction) are above 0.7. It can be concluded that Cronbach's alpha values for all variables meet acceptable criteria in reliability testing (Sharma, B. 2015).

**Table 2.** Cronbach's alpha values

| Variables | Cronbach's Alpha | Total Items |
|---|---|---|
| Usefulness | 0,961 | 8 |
| Ease of Use | 0,961 | 11 |
| Ease of Learning | 0,960 | 4 |
| Satisfaction | 0,961 | 7 |

### 3.3 Usability Measurement Score

Hasan & Abuelrub (2013) mentioned that the information gathered from the questionnaires was utilized to look for evidence of system usability issues and characterize the system's positive elements. This research employs a five-point Likert scale with the terms "accept" and "reject" as criteria. Accept is defined as a score of 3 to 4, while reject is defined as a score of 1 to 2. The reject criteria were interpreted as indicating a usability problem from the user's point of view. According to Marreez et al. (2013), as cited in Hariyanto et al. (2020), the Likert score was converted to "binomial data" by determining whether to accept or reject criteria based on the participants' agree or disagree responses. As shown in Fig. 2, the overall question from the first to the last question showed that the green color representing the "accept" criteria had a group's total raw number of participants' responses differs significantly from the "reject" group's total raw number of student participants responses. As a result, it can be stated that the participants are satisfied with the four assessment variables (Usefulness, Ease of use, Ease of learning, and satisfaction).

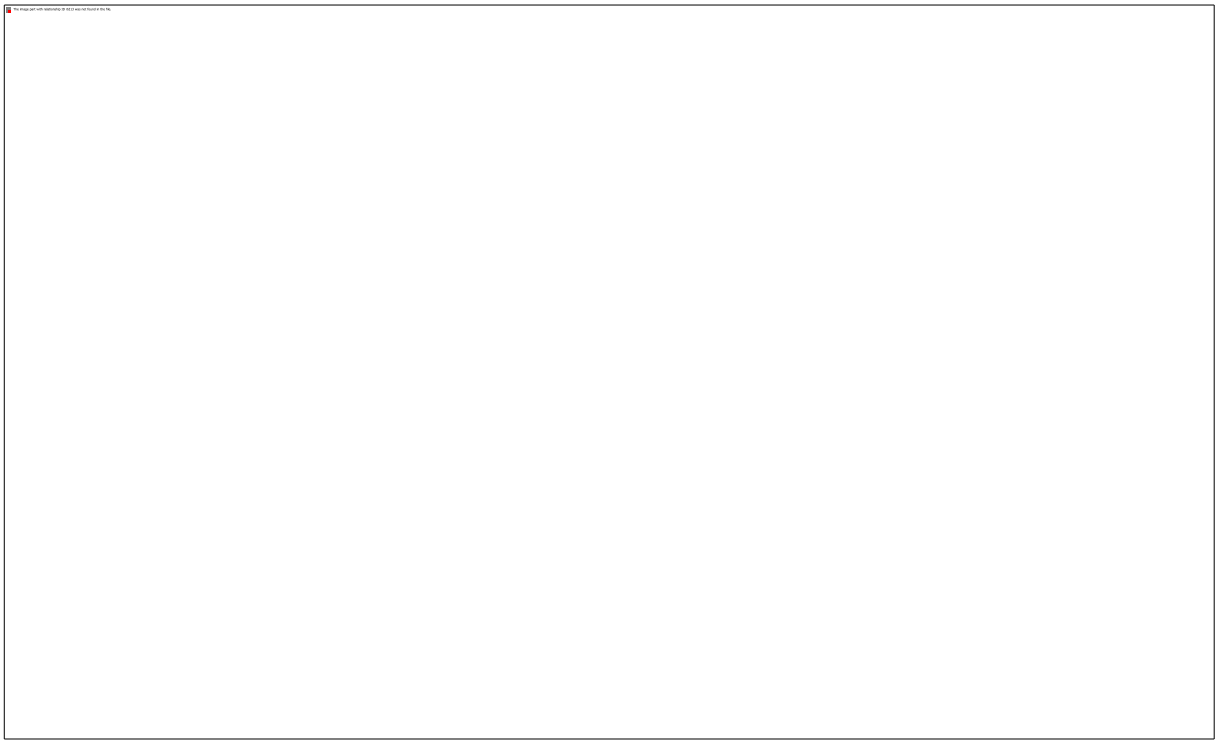

**Figure 3.** The Converted Binomial Data of all 30 USE questionnaire questions

### 3.4 Open-Ended Feedback

This questionnaire collects not only quantitative data but also qualitative. Qualitative data were obtained from the participant's responses that filled the blank space questions. As shown

in Table 3, every participant has a different opinion. Two participants did not give any feedback from the 59 participants that participated in this questionnaire. However, some participants give more than one feedback. There is a total of 62 positive comments with 56 negative comments. The most frequent positive and negative feedback can be seen below:

**Table 3.** Summarize of open-ended feedback

| Category | Feedback | Total Feedback |
|---|---|---|
| Negative Feedback | There is no user guide | 17 |
| | There is no column for discussion with others | 18 |
| Positive Feedback | It can be used and accessed anywhere | 24 |
| | Easy and simple to use | 20 |

### 3.5 Multiple linear regression prerequisites

Al-Ani & Al-Obaidi (2019) stated that regression analysis is one of the most widely used statistical approaches for developing empirical equations. A generalized variant of the simple linear regression model is the multiple linear regression model. In accordance with Hair et al. (2009), as referenced in Hariyanto et al. (2020), multiple linear regression was used to investigate the link between two or more independent variables and one dependent variable. Several basic assumptions about the variables should be evaluated before performing multiple linear regression analysis. There should be no multicollinearity, heteroscedasticity, or autocorrelation among the variables applied in this research.

#### A. Multivariate Normality Test

The first assumption is the variables in a multiple linear regression analysis should be normally distributed. According to Hariyanto et al. (2020), the residual data plot can be used to test this assumption by looking at the data points' track. If the data points follow a straight line, the residual is in a normal distribution, and there is no substantial variation from the standard plot, and vice versa.

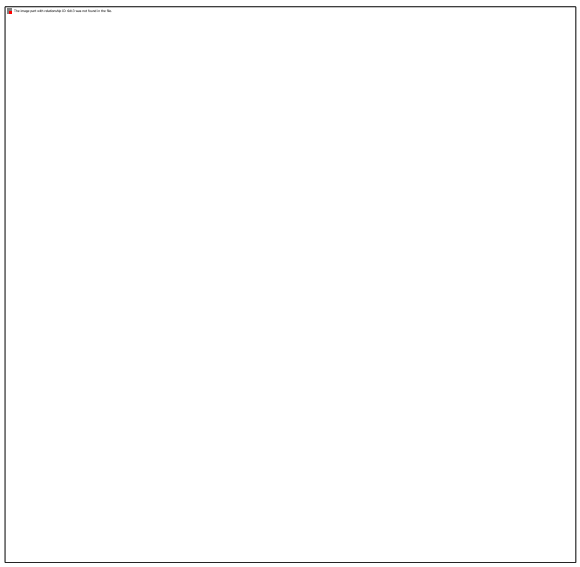

**Figure 4.** Normality test data plot

The data plot of this research shows the data points follow a straight line. It means there is no substantial deviation from the usual plot, as shown in Fig. 3. Thus, it denotes that the residual follows a normal distribution.

**B. Multicollinearity test**

The second assumption is that the data is not allowed to have multicollinearity because it will cause a problem in analyzing the data. The way to test this assumption is to observe the value of VIF (Variance Inflation Factor) and Tolerance using IBM SPSS software. If a Tolerance value is close to one, there will be less multicollinearity. On the other hand, if the value of VIF is more than 10, it is indicated the presence of multicollinearity (Shernavirtana, N. 2019). As shown in Table 4, all independent variables have a value of VIF less than 10 and a value of Tolerance more than 0.1. It can be concluded that all independent variables are free from multicollinearity.

**Table 4.** Value of variance inflation factor and tolerance for each variable

| Variables | Tolerance Values | VIF Values |
|---|---|---|
| Usefulness | 0.279 | 3.578 |
| Ease of Use | 0.177 | 5.642 |
| Ease of Learning | 0.382 | 2.619 |

**C. Heteroscedasticity test**

Heteroscedasticity is the final assumption of multiple linear regression. The heteroscedasticity test determines whether there is an inequality of variance between the residuals of one observation and the residuals of another observation based on the regression model (Cen, 2022). One way to determine whether or not heteroscedasticity exists is the glejser test. Cen (2022) stated that if the independent variable is statistically significant in influencing the dependent variable, then heteroscedasticity exists. On the other hand, there is no evidence of heteroscedasticity if the independent variable has no statistical significance in influencing the dependent variable. The results of the Heteroscedasticity test using IBM SPSS statistics software are shown in the following Table 5, with a significance level of 5%.

**Table 5.** Heteroscedasticity test result

| Model | Sig. | VIF |
|---|---|---|
| (constant) | 0.309 | |
| Usefulness | 0.977 | 3.578 |
| Ease of Use | 0.475 | 5.642 |
| Ease of Learning | 0.277 | 2.619 |

Because each variable's significance value is more than 0.05, it may be stated that there is no evidence of heteroscedasticity.

### 3.6 Multiple linear regression analysis

#### A. F-Test

The F-test is used to simultaneously determine the effect of all the independent variables on the dependent variable (Nani, et al., 2021). Acceptance criteria will be used to confirm the existence of a significant effect. The acceptance criteria for the f test are as follows: if the value of significance value is less than 0.05 ($\alpha$: 5%), it can be concluded that the independent variables simultaneously have a significant effect on the dependent variable, whereas if the significance value is more than 0.05 ($\alpha$: 5%), then the independents variable simultaneously does not affect the dependent variable (Lestari. S. 2019).

**Table 6.** F test result

| Model | Sum of Squares | F | Sig. |
|---|---|---|---|
| Regression | 9.758 | 45.486 | 0.000 |
| Residual | 3.933 | | |
| Total | 13.691 | | |

As shown in Tab. 6, using IBM SPSS software, the significance value is 0.00. It is less than 0.05. therefore, it can be concluded the independent variables (Usefulness, Ease of Use, and Ease of Learning) simultaneously has a significant effect on the dependent variable (Satisfaction).

#### B. Partial t-test

This testing is performed to see if the independent variable (Usefulness, Ease of Use, and Ease of Learning) has a partial and significant effect on the dependent variable (Satisfaction). The following is the partial regression coefficient test outcome on SPSS output Coefficient, as shown in Fig. 5.

**Table 7**. Partial t-test result

| Model | t | Sig |
|---|---|---|
| (Constant) | 0.027 | 0.979 |
| Usefulness | 3.417 | 0.001 |
| Ease of Use | -0.788 | 0.434 |
| Ease of Learning | 5.131 | 0.000 |

Lubis (2020) mentions four stages to performing a partial test (t-test). The first stage is determining the hypothesis. The hypothesis for this research is as follows, Ho: There is no positive and significant relationship between Usefulness (X1) on the satisfaction variables (Y), Ha: There is a positive and significant relationship between Usefulness (X1) on the satisfaction variables (Y), Ho: There is no positive and significant relationship between Ease of Use (X1) on the satisfaction variables (Y), Ha : There is a positive and significant relationship between Ease of Use (X1) on the satisfaction variables (Y), Ho : There is no positive and significant relationship between Ease of learning (X1) on the satisfaction variable (Y), Ha : There is a positive and significant relationship between Ease of Learning (X1) on the satisfaction variables (Y).

The second stage is determining value t. As shown in Fig. 5, the value of t on each independent variable is 3.417 for Usefulness, -0.788 for Ease of Use, and 5.131 for Ease of learning. Furthermore, to indicate whether a significant effect exists, criteria testing can be used as follows, if the significance value is less than 0.05, then there is a significant effect. On the other hand, if the significance value is more than 0.05, there is no positive and significant relationship between the variables.

The last stage is the conclusion. As shown in table 7, Usefulness and Ease of Learning have a significance value of less than 0.05, and Ease of use has a significance value of more than 0.05. This states a positive and significant relationship between Usefulness and Ease of Learning on satisfaction variables. Meanwhile, there is no positive and significant relationship between Ease of Use on satisfaction variables.

## 4. Conclusion

This research aims to analyze user satisfaction in using an interactive coding Web-Based Learning Module. There are 3 variables used to determine user satisfaction, namely Usefulness, Ease of Use, and Ease of Learning. Based on the results of the analysis and discussion in the previous section, it was found that the variables usefulness and ease of learning have a positive correlation with user satisfaction, on the other hand the variable ease of use has no correlation to user satisfaction. This shows that users are satisfied with the usability and ease of learning from this web-based learning. Meanwhile, users are still not satisfied with the ease of using this website.

This can be used as an evaluation in developing the Interactive-Coding Web-Based Learning Module, some input can be taken from the existing open feedback, where this web-based does not have a guide in its operation, so that users find it difficult to use it.

## Daftar Pustaka

Darmawan, V. E. B., Chen, Y. W., Fathullah, M., Larasati, A., Mu'id, A., & Julia, R. A. (2021). Design an interactive-coding web-based learning module for algorithm and programming course in industrial engineering students. In 2021 7th International Conference on Electrical, Electronics and Information Engineering (ICEEIE) (pp. 237-241). DOI: 10.1109/ICEEIE52663.2021.9616825.

Dotoli, M., Epicoco, N., Falagario, M., Costantino, N., & Turchiano, B. (2015). An integrated approach for warehouse analysis and optimization: A case study. Computers in Industry, 70(1), 56–69. https://doi.org/10.1016/j.compind.2014.12.004

Gaspersz, V. (2011). Lean Six Sigma for Manufacturing and Service Industries. Jakarta: PT Gramedia Pustaka Utama.

Gendreau, M., Laporte, G., & Séguin, R. (1996). Stochastic vehicle routing. European Journal of Operational Research, 88(1), 3–12. https://doi.org/10.1016/0377-2217(95)00050-X

Madadi, N., Roudsari, A. H., Wong, K. Y., & Galankashi, M. R. (2013). Modeling and simulation of a bank queuing system. In Computational Intelligence, Modelling and Simulation (CIMSim), 2013 Fifth International Conference on (pp. 209–215). DOI: 10.1109/CIMSim.2013.41.

Mamad, M., Mouyouh, N., & Aboulhaoua, J. (2017). Warehousing process improvement through implementation of Lean: A case study of optimizing and reorganizing two warehouses in Morocco. Revue Marocaine de Management et d'Économie, 2(2), 73–90.

Maramba, I., Chatterjee, A., & Newman, C. (2019). Methods of usability testing in the development of eHealth applications: A scoping review. International Journal of Medical Informatics, 126, 95-104. https://doi.org/10.1016/j.ijmedinf.2019.03.018.

Nakajima, S. (1988). TPM: Introduction to Total Productive Maintenance. Cambridge: Productivity Press.

Nani, D. A., Handayani, M. T. K., & Safitri, V. A. D. (2018). Fraud dalam proses akademik pada ISO 9241-11:2018(en). Ergonomics of human–system interaction—Part 11: Usability: Definitions and concepts.

Reichhart, A., & Holweg, M. (2007). Lean distribution: Concepts, contributions, conflicts. International Journal of Production Research, 45(16), 3699–3722. https://doi.org/10.1080/00207540701223576

Senderovich, A., Weidlich, M., Gal, A., & Mandelbaum, A. (2014). Queue mining – predicting delays in service processes. In International Conference on Advanced Information Systems Engineering (pp. 42–57). https://doi.org/10.1007/978-3-319-07881-6_4

Shahzad, A., Chin, H. K., Altaf, M., & Bajwa, F. A. (2020a). Malaysian SMEs performance and the use of e-commerce: A multi-group analysis of click-and-mortar and pureplay E-retailers. Pakistan Journal of Commerce and Social Sciences (PJCSS), 14(1), 1–33.

Shanklin, R., Kortum, P., & Oswald, F. L. (2022). USE-Lite: Psychometric item reduction of the USE (Usefulness, Satisfaction, and Ease of Use) Questionnaire. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 66(1), 1882–1886. https://doi.org/10.1177/1071181322661142

Supriyadi, S., Ramayanti, G., & Roberto, A. C. (2017). Analisis kualitas produk dengan pendekatan Six Sigma. In Prosiding SNTI dan SATELIT 2017 (pp. 7–13). DOI:10.17605/OSF.IO/UVPEZ

Van den Berg, J. P., & Zijm, W. H. M. (1999). Models for warehouse management: Classification and examples. International Journal of Production Economics, 59(1–3), 519–528. https://doi.org/10.1016/S0925-5273(98)00114-5