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Research Article

End-User Computing Satisfaction (EUCS) Model: Implementation of Learning Management System (LMS) on Students Satisfaction at Universities

Andi Padalia[1], **Taufiq Natsir**[2]

[1]Department of Arts, Drama, Dance and Music Education, Universitas Negeri Makassar, Makassar, South Sulawesi, Indonesia.
[2]Department of Civil Engineering and Planning Education, Universitas Negeri Makassar, Makassar, South Sulawesi, Indonesia.

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Abstract: The purpose of this research is to find out the extent to which user satisfaction with the Learning Management System (LMS) service is so that it can provide better service and can satisfy/meet the needs of its users by measuring user satisfaction with information systems using the End-User Computing Satisfaction (EUCS) model approach. The researcher adopted the EUCS model developed by Doll and Torkzadeh regarding the satisfaction of end users of information systems. Related to the level of contentment experienced by end users of information systems, the researcher chose to implement the EUCS model that Doll and Torkzadeh had developed. The collected research samples came from a total of two hundred (200) students enrolled in the Arts, Drama, Dance, and Music Education Study Program in batches of 2021 and 2022. Confirmatory Factor Analysis (CFA), a subset of the Structural Equation Modeling (SEM) method, was used to analyze this research project's data. User satisfaction will also affect if the variable of ease of use in learning applications used by students is easy to access and can be accessed anywhere and anytime. This study found that students were highly satisfied with the Application of LMS in the learning process. It was also found that the five EUCS factors significantly increased satisfaction with learning technology.

Keywords: Blended Learning; Confirmatory Factor Analysis; Online Learning Systems; Open-Source Technology; Learning Media.

1. Introduction

The Coronavirus (COVID-19) outbreak has had a global adverse impact on all aspects of human life. The impact of the COVID-19 outbreak has slowed global economic growth and changes or restrictions on social interactions. From a health perspective, the Corona Virus has attacked millions of people from various parts of the world, who either get sick or die due to infection with this disease [1], [2]. When infected with this virus, symptoms are fever, cough, runny nose, bone pain, and breathing problems, which can lead to pneumonia [3].

The World Health Organization (WHO) has assessed and announced to the public that the COVID-19 outbreak is categorized as a global pandemic with a very worrying level of spread and severity [4]. The COVID-19 pandemic has harmed the economic, health, and social sectors and impacted education [5]. The Coronavirus pandemic has affected education systems worldwide, leading to the closure of schools, higher education, and colleges [6]. During this pandemic, educational institutions in various parts of the world are forced to find alternative solutions to carry out the educational process other than through face-to-face learning. Many countries have implemented a

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distance learning system to carry out teaching and learning activities.

The transformation of the learning system, based initially on face-to-face classes, has now changed to an online learning system or using the internet network (online learning) in all areas of education in Indonesia due to the Coronavirus pandemic. Online distance learning is a learning process between teachers and students that is not carried out physically or face to face in the same place and at the same time but through Information and Communication Technology (ICT) media and internet networks [7]. Online learning systems allow teachers and students separated by distance and time to carry out teaching and learning activities and communicate interactively in electronic media such as Zoom, Microsoft Teams, Moodle, Edmodo, YouTube, and other electronic media as learning media.

The Learning Management System (LMS) is an online-based academic information system developed in an educational institution to support learning activities. Ouadoud, Chkouri, & Nejjari [8] said that a Learning Management System or e-learning is a platform that provides a series of services to assist teachers or instructors in managing their learning materials. All the features provided in the LMS represent all services used to manage the learning process and interactions between teachers and students. LMS is often applied to educational institutions because of its ease and speed as a medium for delivering content, monitoring student academic participation, managing learning resources, and assessing student performance.

Chaubey and Bhattacharya stated that the implementation of LMS programs is generally in the form of the web server or cloud server-based website applications that are simple and easy to use via a browser [9]. LMS is usually developed using open-source technology or licensed [10]. LMS stores data and information related to users, lessons, and learning materials or content. All this information will be integrated and needed so that the LMS can run appropriately without any mismanagement of learning management. In using the LMS, each user, namely teachers and students, will be given their respective usernames and passwords to access the LMS [11]. The provision of a username and password aims to regulate which registered users can access the LMS according to their rights.

The LMS application benefits educational institutions in managing and monitoring learning programs centrally and systematically. Learning material or content from various lessons will be stored centrally on a storage server and systematically managed by administrators. According to Sharma and Vatta [12], LMS can provide various features for teachers to deliver content through various formats. Content delivery formats supported by LMS are multimedia, video, and text. In terms of accessing learning materials, students will be more flexible in accessing materials anytime and anywhere. Learning materials can be updated by the teacher at any time so that learning information can be adapted to the needs of students at any time. In addition, resources in the form of learning materials can also be downloaded or reused, thereby saving more time, costs, and effort students must spend [32].

SYAM-OK (System and Application Management Open Knowledge) is a web-based learning management system developed using the Moodle platform by the Information Systems Office (KSI) of Universitas Negeri Makassar. Moodle is a Learning Management System (LMS) or Course Management System (CMS) used to build and design an online or e-learning-based learning site. SYAM-OK also acts as a Blended Learning method where lecturers and students can carry out learning interactions online when in class/face to face. By using SYAM-OK, students can download learning materials while in class or those previously explained by the lecturer in class. Lecturers can also provide learning material before class starts or other additional material easily for students. The learning process will be more effective because of the accessibility of learning materials and flexibility in how the learning process is carried out [13]. The initial Application of SYAM-OK was intended to be able to support the learning process given by lecturers to students more effectively and efficiently.

The use of SYAM-OK is now not only support. However, it plays a vital role in implementing academic activities in each faculty due to the COVID-19 outbreak. In the current pandemic situation, SYAM-OK, as a learning management system, the leading media for implementing online lectures or carrying out academic activities, must be able to facilitate and meet the expectations of its users. The Universitas Negeri Makassar needs to know how the level of satisfaction of end users of the College Site, especially during the current pandemic. Delone and McLean stated that the measure of user satisfaction has a high level of validity which can mean that it is difficult to reject or refute the success of a system that users think they like [14].

According to the statement of Urbach and Muller [15], measuring user satisfaction with an information system is very useful when the use of the information system is mandatory or mandatory, and the number of uses is not an appropriate indicator of the successful implementation of the system. Measurement of system end-user satisfaction can be used as a benchmark for the success rate of the implemented system. Research by Aggelidis and Chatzoglou states that end-user satisfaction is a tested or reliable determinant of the successful implementation

of an information system [16]. The greater the satisfaction end users feel, the more successful and effective the applied information system will be. The above statement is also supported by Kassim et al. [17] in a study that said that the user's assessment of the system to measure the end-user satisfaction with the system is a fundamental criterion of the successful implementation of information systems.

End-User Computing Satisfaction is a measurement model that assesses information system user satisfaction. End-User Computing Satisfaction, abbreviated as EUCS, is a measurement model used to measure the level of satisfaction of end users of an information system based on dimensions or satisfaction factors. The measurement model developed by Doll and Torkzadeh consists of 5 factors measuring end-user satisfaction with information systems: Accuracy, Content, Ease of Use, Format, and Timeliness.

This study will examine 5 (five) variable measures of user satisfaction from the EUCS model. The five variables will be used as research hypothesis factors to determine the relationship with SYAM-OK end-user satisfaction, namely active lecturers and students at Universitas Negeri Makassar. This research is expected to be the first step for Universitas Negeri Makassar to determine the extent of user satisfaction with the SYAM-OK service so that it can provide better service and satisfy/meet the needs of its users.

2. Material and Methods

2.1. Research Approach

Ex-post facto research is a study undertaken to evaluate events that have already occurred and then trace back to discover the causes that lead to these events. This type of research is the type that is used [18]. In the ex-post facto study, the evaluated variables did not get any treatment from the researchers. Quantitative methods were utilized in the carrying out of this study. Quantitative research is based on using numbers, beginning with collecting data and continuing through the analysis of the data and the presentation of the conclusions [19].

2.2. Population and Samples

The population in this study were students of the Arts, Drama, Dance, and Music Education Study Program at Makassar State University. The method of taking samples using the purposive sampling technique is determining the sample based on specific considerations, namely, the research objectives.

In Structural Equation Modeling (SEM) analysis, the sample size is between 100-200 [20]. Sample sizes between 100 and 200 are recommended for use with the Maximum Likelihood Estimation technique, with a minimum of 50 samples required for reliability [21]. Based on the objectives and analysis used in the research, the research samples taken were students of the Arts, Drama, Dance, and Music Education Study Program batches of 2021 and 2022, totaling 200 students using the SYAM-OK Application.

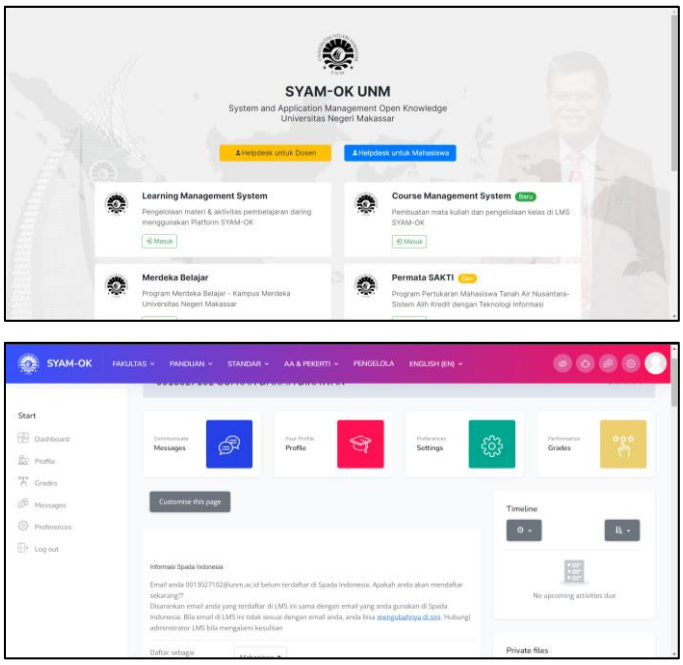

Figure 1. Interface Display of LMS SYAM-OK Universitas Negeri Makassar (UNM)

2.3. Research Model and Instrument

The researcher adopted the EUCS model developed by Doll and Torkzadeh regarding the satisfaction of end users of information systems. According to the results of an exploratory-confirmatory study that Doll and Torkzadeh [22] have conducted, it is explained that the end-user satisfaction factor of the system is influenced by 5 (five) factors or variables Content, Accuracy, Format, Ease of Use, and Timeliness.

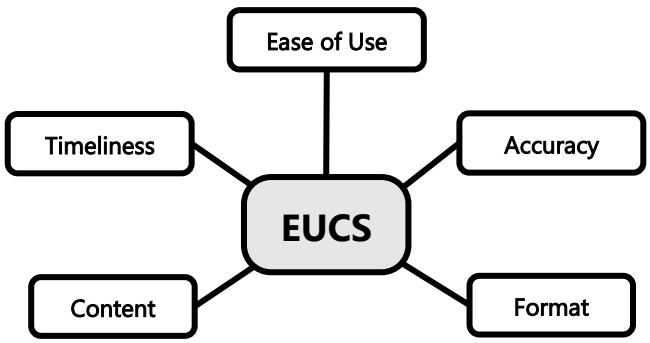

Figure 2. Research EUCS Model by Doll & Torkzadeh [22].

For measurement items/indicators used as manifest variables (observed variables), the researcher will use 12 measurement items from the EUCS model by Doll and

Torkzadeh. Their study also used a criterion question to determine end-user satisfaction: "Overall, how would you rate your satisfaction with the system?".

Table 1. Research Instrument

Constructs	Instrument (Questions)
Content	a. Is the information provided by the system correct and according to your needs?
	b. Does the information content provided meet your needs?
	c. Does the system provide exactly the reports you need?
	d. Does the system provide complete information?
Accuracy	a. Is the system accurate?
	b. Is the accuracy of the system satisfactory for you?
Format	a. Do you think the output has been presented in an appropriate and useful format?
	b. Is the information presented in a clear format?
Ease of Use	a. Is the system user-friendly?
	b. Is the system easy to use?
Timeliness	a. Is the system able to provide the information you need promptly?
	b. Does the system provide up-to-date information?

2.4. Data Collection

The data collection method in this study used a questionnaire using Google Forms as a tool for collecting primary data. The questionnaire is a technique for collecting data that permits the examination of the attitudes, beliefs, actions, and characteristics of numerous key individuals within the organization whom the new system or current systems may influence.

This study uses a questionnaire addressed to respondents. This type of questionnaire is a closed question that the respondent must answer. To get a score from each respondent's answer, the writer uses a 5-point Likert Scale, which gives value to the respondent's answer with the classification:

- Strongly agree (very high category) with a score of 5.
- Agree (high category) with a score of 4.
- Slightly agree (moderate category) a score of 3.
- Disagree (low category) a score of 2.
- Strongly disagree (very low category), a score of 1.

2.5. Data Analysis

Data processing and analysis includes editing and tabulation stages and data analysis stages. Editing and tabulating is the process of simplifying and organizing raw data into a form that is easy to read and understand. This process is carried out through editing and tabulation activities. The data analysis technique in this study used Second Order Confirmatory Factor Analysis (CFA) which is part of the Structural Equation Modeling (SEM) method using the IBM AMOS 23 Program as an analysis tool. After editing and tabulating the questionnaire data, the data is inputted into the IBM AMOS Program. The steps for analyzing data using Structural Equation Modeling (SEM) with the IBM AMOS 23 Program include drawing path diagrams, evaluating the measurement model (outer model), and evaluating the structural model (inner model).

3. Result and Discussion

3.1. Goodness of Fit (GOF)

The Goodness of Fit Test determines whether a sample data distribution follows a certain theoretical distribution. The Goodness of Fit Test will compare the two data distributions: the theoretical (expected frequency) and the actual (observation frequency). This test is almost the same as the binomial test; only if there are only two possible answers in the binomial, in the Goodness of Fit test, there are more than two possibilities [23]. The GOF test results can be seen as follows (Table 2).

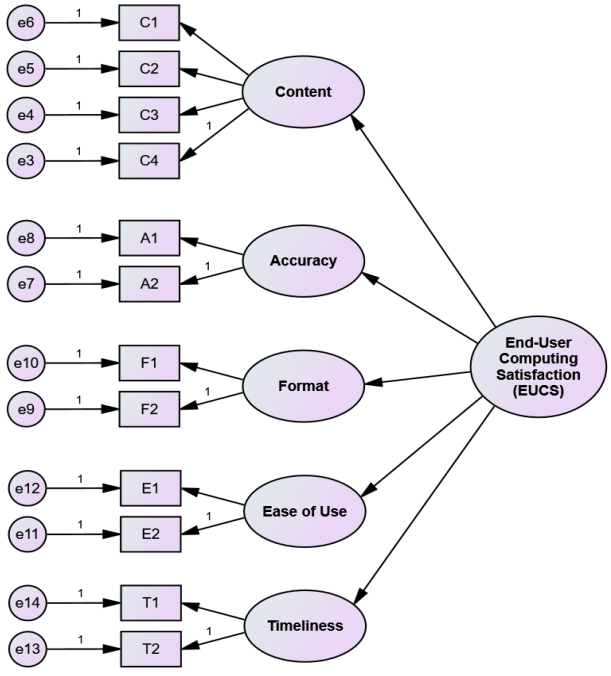

Figure 3. Research Model Output Program IBM AMOS

Table 2. Goodness of Fit (GOF) Test

Criteria	Value	Cut-Off	Sources
Chi-Square (X^2)	0.989	≥ 0.050	[24]–[26]
CMIN/DF	0.685	≤ 2.000	[27]–[29]

Criteria	Value	Cut-Off	Sources
GFI	0.965	≥ 0.900	[24], [29], [30]
RMSEA	0.000	≤ 0.080	[29], [31]–[35]
TLI	1.154	≥ 0.900	[29], [36], [37]
CFI	1.002	≥ 0.900	[35], [38], [39]
IFI	1.105	≥ 0.900	[40]

SEM tests a theory modeled on our sample data, so accuracy and caution are needed in determining the conclusions on the model obtained based on the criteria of GOF. Because the model meets more and more size criteria, the model is suitable for the data or sample we have. The GOF results show (Table 2) that the recommended measures are met, so it can be concluded that the model is fit (good).

3.2. Loading Factor, Composite Reliability, Average Variance Extracted, and Discriminant Validity.

The value of the loading factor describes the link between the study variables and their indicators. Therefore, the optimal indicator for a variable is the one with the highest loading value, as this value shows a stronger relationship between the indicator and the study variable. In the majority of citations, a factor weight of 0.50 or greater is deemed to have sufficient validity to explain latent constructs [41].

Raykov [48] developed the composite reliability coefficient using confirmatory factor analysis in a structural equation model approach. In contrast to the alpha coefficient, which emphasizes item homogeneity, the composite reliability coefficient emphasizes identifying common factors (common factors) built from a set of items. The minimum Construct Reliability value of acceptable latent variable forming dimensions is ≥ 0.50 [20].

Average Variance Extracted (AVE) describes the average variance or discriminant extracted for each indicator to determine each item's ability to exchange measurements with the others. A convergence with an AVE equal to or greater than 0.50 is considered high quality. According to Fornell and Larker, a latent concept has sufficient discriminant validity if its AVE value exceeds its squared correlation with other latent constructs [42]. Thus, it can be said that the indicators correctly represent the latent constructs developed.

Table 3. Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE)

Constructs	Code	Loading Factor	Composite Reliability (CR)	Average Variance Extracted (AVE)
Content	C1	0.758	0.751	0.900
	C2	0.712		
	C3	0.752		
	C4	0.781		
Accuracy	A1	0.815	0.786	0.852
	A2	0.756		
Format	F1	0.742	0.835	0.890
	F2	0.858		
Ease of Use	E1	0.825	0.771	0.843
	E2	0.764		
Timeliness	T1	0.834	0.795	0.860
	T2	0.755		

Table 3 shows that the values for Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) have met the minimum recommended values. From these results, further analysis can be continued.

Table 4. Standardized Regression Weights

			C.R.	Prob.	Estimate
Content	<--	EUCS	5.041	0.000	0.785
Accuracy	<--	EUCS	5.115	0.000	0.651
Format	<--	EUCS	5.062	0.000	0.555
Ease of Use	<--	EUCS	1.371	0.152	0.595
Timeliness	<--	EUCS	8.522	0.000	0.768

3.3. The Effect of EUCS on Content

From the research results (Table 4), it was found that there was a positive and significant relationship between EUCS and content ($p<0.01$). The compatibility between the content in the information system and the output produced is important to users. The Content dimension measures user satisfaction based on system content. The content of a system typically consists of functions or modules that can be utilized by system users, as well as information generated by the system. Additionally, the content dimension evaluates whether the system generates data based on user requirements. User

satisfaction increases as modules and information systems become more comprehensive.

Grigoroudis stated that content is the first aspect that users see. The content in question is a response related to whether the website can meet the requests of the website users. The most important thing is the accuracy and credibility of the information conveyed on the website (e-learning) content [43]. A website's content shows the quality, completeness, degree to which it generalizes or specializes, and dependability of the material published on the website. The responsiveness of a website to the needs of its users and the reliability of the information shown on the site are both aspects of content related to the website as a whole [44], [45].

3.4. The Effect of EUCS on Accuracy

From the research results (Table 4), it was found that there was a positive and significant relationship between EUCS and accuracy ($p<0.01$). Accuracy means that the information generated or needed must be free from errors and not be biased or mislead users. The more accurate the information provided or needed, the more useful it will be for all information users, especially decision-makers.

The accuracy metric evaluates how satisfied users are with the information delivered by the system after it has received and processed user input. The accuracy of a system is evaluated by monitoring the number of mistakes it makes while processing user input and the number of mistakes it makes while processing data. Indicators that influence user satisfaction are accuracy, content, format, and timeliness variables. Furthermore, it is known that user satisfaction will have an effect if the variable accuracy has the appearance of the e-learning website that is correct and accurate, and every e-Learning website link that is clicked always displays the appropriate web page.

3.5. The Effect of EUCS on Format

From the results of the study (Table 4), it was found that there was a positive and significant relationship between EUCS and format ($p<0.01$). The format dimension measures system user satisfaction based on the appearance and beauty of the system interface. The system's formation will make it easy for the user to use it so that it can indirectly affect the user's level of effectiveness.

There is a significant and positive relationship between format variables and user satisfaction variables because the forms of e-learning are not too complicated. This means that all lecturers can use the facilities or menus in e-learning. This is apart from the benefits of e-learning for lecturers. However, in general, the easier the composition or form of a system, the higher the user's understanding of using the system. This also applies to e-learning systems; the ease of form or format in e-learning makes it easy for lecturers to try to use it. E-Learning user satisfaction will also have an effect if the format variables of e-Learning are considered, such as the display design having attractive colors, the information being displayed in a good format, and the display design of the e-Learning site having an easy-to-understand structure.

3.6. The Effect of EUCS on Ease of Use

From the results of the study (Table 4), it was found that there was no positive and significant relationship between EUCS and ease of use ($p>0.01$). The Ease-of-Use metric assesses how contented users are with the system in terms of how simple it is to perform common tasks within the system, such as entering data, processing data, and locating relevant information. According to Karsh and Holden, one factor influencing an information system is how easy it is to use the system itself through convenience. Each user has their own experience, and if he likes the system, it is impossible for him or not to recommend it to others [46].

There is no significant effect between the Ease variable and the user satisfaction variable related to the ease obtained from e-learning. In contrast to the ease-of-use variable, which is related to the technical operation or use of e-learning, the Ease variable is a variable that describes the ease of access, ease of communicating with students, and also ease of relationship with space and time of delivery of lecture material. With the existence of e-learning, these conveniences are still difficult to feel. Under certain conditions, the relationship between lecturers and students through the e-learning system can be used as a substitute for face-to-face meetings, which will be difficult to establish directly. Communication limitations exist because they cannot directly meet face-to-face between lecturers and students. User satisfaction will also affect if the variable of ease of use in learning applications used by students is easy to access and can be accessed anywhere and anytime.

3.7. The Influence of EUCS on Timeliness

From the results of the study (Table 4), it was found that there was a positive and significant relationship between EUCS and timeliness ($p<0.01$). The Timeliness dimension measures user satisfaction based on the system's timeliness in displaying or providing the data and information needed by the user. Timely can be considered a real-time system, meaning all user input and requests are handled instantly, and the results are shown to the user without delay. The availability of interactive technology with discussions and guidance can be a tool for developing higher-order thinking skills [47]. This conforms closely to the format of e-learning, in which students have numerous

chances to delve deeper into the material via discussions and lecture guides.

Both students and teachers can benefit from e-learning. E-learning provides students with an alternative to traditional lecture-based education by facilitating learning outside the classroom, cultivating a culture of independent study, fostering a commitment to lifelong education, and fostering one-on-one student-teacher interaction. For professors, the advent of e-learning means new opportunities for efficient assessment, evaluation, and self-exploration in the classroom, all of which have a bearing on professors' professionalism and the quality of their students education [48].

According to DeLone and McLean, for a management information system to be successful and positively impact the organization, the information system must first have an individual impact by assessing user satisfaction [49]. According to Yusof et al. [50], the individual impact can be assessed by time efficiency, work effectiveness, decision quality, error reduction, and the impact of organizational and individual parts on real benefits. Based on the results, theory, and previous research, it can be concluded that the EUCS factors, which include components of content, format, accuracy, timeliness, and ease of use, have a real benefit to electronic system users.

4. Conclusion

The use of an information system that is repeated can be an indicator that the system has good benefits for its users. The higher the level of benefits received by the user, the higher the perceived satisfaction. This is inversely proportional to the level of use of user satisfaction. The high level of information system users cannot indicate that user satisfaction is also high, mainly because most users are required to use the information system. Users will continue to use the system regardless of whether they are satisfied or dissatisfied because they are necessary and needed.

Failure to implement an information system in a non-technical aspect is related to the perception of information system users. The use of an information system that is repeated can be an indicator that the system has good benefits for its users. The higher the level of benefits received by the user, the higher the perceived satisfaction. This is inversely proportional to the level of use of user satisfaction. The high level of information system users cannot indicate that user satisfaction is also high, especially because most users are required to use the information system. Users will continue to use the system regardless of whether they are satisfied or dissatisfied because they are required and needed.

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References

[1] N. Shrestha *et al.*, "The impact of COVID-19 on globalization," *One Heal.*, vol. 11, p. 100180, 2020.

[2] S. A. Tabish, "COVID-19 pandemic: Emerging perspectives and future trends," *J. Public health Res.*, vol. 9, no. 1, p. jphr-2020, 2020.

[3] A. Haleem, M. Javaid, and R. Vaishya, "Effects of COVID-19 pandemic in daily life," *Curr. Med. Res. Pract.*, vol. 10, no. 2, p. 78, 2020.

[4] World Health Organization, "WHO Director-General's opening remarks at the media briefing on COVID-19-11 March 2020." Geneva, Switzerland, 2020.

[5] S. J. Ball, *The education debate*. Policy Press, 2021.

[6] N. Mustafa, "Impact of the 2019–20 coronavirus pandemic on education," *Int. J. Heal. Prefer. Res.*, vol. 4, no. 1, pp. 25–30, 2020.

[7] A. W. T. Bates and A. Sangra, *Managing technology in higher education: Strategies for transforming teaching and learning*. John Wiley & Sons, 2011.

[8] M. Ouadoud, A. Nejjari, M. Y. Chkouri, and K. E. El Kadiri, "Educational modeling of a learning management system," in *2017 international conference on electrical and information technologies (ICEIT)*, 2017, pp. 1–6.

[9] B. Bhattacharya and A. Chaubey, "Learning Management System in Higher Education," *IJSTE Int. J. Sci. Technol. Enginering*, vol. 2, no. 3, pp. 29–51, 2019.

[10] C. C. Aydin and G. Tirkes, "Open source learning management systems in e-learning and Moodle," in *IEEE EDUCON 2010 Conference*, 2010, pp. 593–600.

[11] S. Rapuano and F. Zoino, "A learning management system including laboratory experiments on measurement instrumentation," *IEEE Trans. Instrum. Meas.*, vol. 55, no. 5, pp. 1757–1766, 2006.

[12] A. Sharma and S. Vatta, "Role of learning management systems in education," *Int. J. Adv. Res. Comput. Sci. Softw. Eng.*, vol. 3, no. 6, pp. 997–1002, 2013.

[13] C. Müller, M. Stahl, M. Alder, and M. Müller, "Learning effectiveness and students' perceptions in a flexible learning course," *Eur. J. Open, Distance E-Learning*, vol. 21, no. 2, pp. 44–52, 2018.

[14] W. H. DeLone and E. R. McLean, "Information systems success: The quest for the dependent variable," *Inf. Syst. Res.*, vol. 3, no. 1, pp. 60–95, 1992.

[15] N. Urbach and B. Müller, "The updated DeLone and McLean model of information systems success," in *Information systems theory*, Springer, 2012, pp. 1–18.

[16] V. P. Aggelidis and P. D. Chatzoglou, "Hospital information systems: Measuring end user computing satisfaction (EUCS)," *J. Biomed. Inform.*, vol. 45, no. 3, pp. 566–579, 2012.

[17] E. S. Kassim, S. F. A. K. Jailani, H. Hairuddin, and N. H. Zamzuri, "Information system acceptance and user satisfaction: The mediating role of trust," *Procedia-Social Behav. Sci.*, vol. 57, pp. 412–418, 2012.

[18] W. Goddard and S. Melville, *Research methodology: An introduction*. Juta and Company Ltd, 2004.

[19] F. N. Kerlinger and H. B. Lee, *Foundations of Behavioral Research*, 4th ed. New York: Holt, Rinehart and Winston, 2000.

[20] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 7th ed. Harlow, England: Pearson New International Edition, 2014.

[21] T. A. Whittaker and R. E. Schumacker, *A Beginner's Guide to Structural Equation Modeling*. Routledge, 2022.

[22] W. J. Doll and G. Torkzadeh, "The measurement of end-user computing satisfaction," *MIS Q.*, pp. 259–274, 1988.

[23] R. D'Agostino, *Goodness-of-fit-techniques*. Routledge, 2017.

[24] K. G. Jöreskog and D. Sörbom, *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Scientific Software International, 1993.

[25] G. D. Garson, *Partial Least Squares: Regression & structural equation modeling*. Asheboro, USA: Statistical Publishing Associates, 2016.

[26] J. J. Hox and T. M. Bechger, "An introduction to structural equation modeling," 2007.

[27] B. Wheaton, B. Muthen, D. F. Alwin, and G. F. Summers, "Assessing reliability and stability in panel models," *Sociol. Methodol.*, vol. 8, pp. 84–136, 1977.

[28] E. G. Carmines, "Analyzing models with unobserved variables," *Soc. Meas. Curr. issues*, vol. 80, 1981.

[29] R. E. Schumacher and R. G. Lomax, *A Beginner's Guide to Structural Equation Modeling: Third Edition*, 3rd ed. Mahwah, NJ: Lawrence Erlbaum Associates, 2010.

[30] J. S. Tanaka and G. J. Huba, "A general coefficient of determination for covariance structure models under arbitrary GLS estimation," *Br. J. Math. Stat. Psychol.*, vol. 42, no. 2, pp. 233–239, 1989.

[31] J. H. Steiger and J. C. Lind, "Statistically based tests for the number of common factors," 1980.

[32] M. W. Browne and R. Cudeck, "Alternative ways of assessing model fit," *Sage Focus Ed.*, vol. 154, p. 136, 1993.

[33] L. J. Williams and E. O'Boyle Jr, "The myth of global fit indices and alternatives for assessing latent variable relations," *Organ. Res. Methods*, vol. 14, no. 2, pp. 350–369, 2011.

[34] F. Chen, P. J. Curran, K. A. Bollen, J. Kirby, and P. Paxton, "An empirical evaluation of the use of fixed cutoff points in RMSEA test statistic in structural equation models," *Sociol. Methods Res.*, vol. 36, no. 4, pp. 462–494, 2008.

[35] L. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives," *Struct. Equ. Model. a Multidiscip. J.*, vol. 6, no. 1, pp. 1–55, 1999.

[36] L. R. Tucker and C. Lewis, "A reliability coefficient for maximum likelihood factor analysis," *Psychometrika*, vol. 38, no. 1, pp. 1–10, 1973.

[37] P. M. Bentler and L. T. Hu, "Evaluating model fit," in *Structural equation modeling: Concepts, issues, and applications*, Thousand Oaks, CA: SAGE Publications, 1995, pp. 76–99.

[38] P. M. Bentler, "SEM with simplicity and accuracy," *J. Consum. Psychol.*, vol. 20, no. 2, pp. 215–220, 2010, doi: 10.1016/j.jcps.2010.03.002.

[39] T. A. Brown, *Confirmatory Factor Analysis for Applied Research*, 2nd ed. New York: The Guilford Press, 2015.

[40] K. A. Bollen, "A new incremental fit index for general structural equation models," *Sociol. Methods Res.*, vol. 17, no. 3, pp. 303–316, 1989.

[41] S. Sharma, *Applied Multivariate Techniques*. New York, USA: John Wiley & Sons, Inc., 1996.

[42] C. Fornell and D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *J. Mark. Res.*, vol. 18, no. 1, pp. 39–50, 1981.

[43] E. Grigoroudis, C. Litos, V. A. Moustakis, Y. Politis, and L. Tsironis, "The assessment of user-perceived web quality: Application of a satisfaction benchmarking approach," *Eur. J. Oper. Res.*, vol. 187, no. 3, pp. 1346–1357, 2008.

[44] X. Zhu and S. Gauch, "Incorporating quality metrics in centralized/distributed information retrieval on the World Wide Web," in *Proceedings of the 23rd annual international ACM SIGIR conference on Research and development in information retrieval*, 2000, pp. 288–295.

[45] S. Beck, "The good, the bad and the ugly: or, why it'sa good idea to evaluate web sources," *Retrieved May*, vol. 14, p. 2003, 1997.

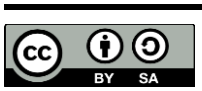
[46] R. J. Holden and B.-T. Karsh, "The technology acceptance model: its past and its future in health care," *J. Biomed. Inform.*, vol. 43, no. 1, pp. 159–172, 2010.

[47] D. R. Garrison, T. Anderson, and W. Archer, "Critical inquiry in a text-based environment: Computer conferencing in higher education," *internet High. Educ.*, vol. 2, no. 2–3, pp. 87–105, 1999.

[48] G. Singh, J. O'Donoghue, and H. Worton, "A study into the effects of elearning on higher education," *J. Univ. Teach. Learn. Pract.*, vol. 2, no. 1, pp. 16–27, 2005.

[49] W. H. Delone and E. R. McLean, "The DeLone and McLean model of information systems success: a ten-year update," *J. Manag. Inf. Syst.*, vol. 19, no. 4, pp. 9–30, 2003.

[50] M. M. Yusof, J. Kuljis, A. Papazafeiropoulou, and L. K. Stergioulas, "An evaluation framework for Health Information Systems: human, organization and technology-fit factors (HOT-fit)," *Int. J. Med. Inform.*, vol. 77, no. 6, pp. 386–398, 2008.



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