End User Computing Satisfaction on Digital Trade Facilitation in the Philippines

Romer C. Castillo*[1], Heizel P. De Villa[2], Emmanuel C. Encinas[3], Jesserey Joyce D. Hernandez[4], Marvic M. Mandocdoc[5]
[1,2,3,4,5]Batangas State University, Batangas City, Philippines
e-mail: romer.castillo@g.batstate-u.edu.ph[1], heizeldevilla20@gmail.com[2], baby16.ee@gmail.com[3], jessereyjoyce@gmail.com[4], marvicmandocdoc@gmail.com[5]

Abstract

Digital trade facilitation is increasingly becoming essential in a modern customs environment. Many countries have started computerizing and automating their trade procedures, the success of which depends upon their government's information technology development. In usability perspective, the most appropriate success measure of an information system is the end-users' satisfaction. This study assessed the end-user computing satisfaction (EUCS) on digital trade facilitation in the Philippines, known as electronic to mobile (e2m) system. This also determined the profile of e2m clients and the differences on their satisfaction. This further established correlations among the dimensions of EUCS. The study is a descriptive-survey research, which used a valid and reliable EUCS questionnaire. The respondents consisted of 49 e2m clients who were selected conveniently. Statistical tests employed were Mann-Whitney U-Test, Kruskal-Wallis H-Test, and Spearman's Correlation. Results showed that majority of respondents are customs brokers, most are 4-6 years in profession, and with more than 10 transactions in a month. The end-users were generally satisfied on the total EUCS, as well as in content, accuracy, and timeliness, while they were very satisfied in format, and ease of use. Results also revealed significant differences in clients' satisfaction on the format when grouped to the profession, ease of use when grouped to years in the profession, and accuracy and total EUCS when grouped to the number of transactions in a month. All the five EUCS dimensions have significant positive moderate to strong correlations.

Keywords: e2m system, EUCS, information technology, Philippines' Customs, trade facilitation

Introduction

An essential component to unlock further gains from international trade is trade facilitation [1]. To streamline customs paperwork and improve transparency, most countries use online single window systems [2]. A single window, which is a one-stop facility for exchange of information between traders and government, reduces complexity, time, and costs involved in international trade [1]. Automation is part of a customs modernization program in order to be more transparent, predictable, and reliable and to be aligned to international standards [3]. Throughout the years, the function of customs have changed from mere gatekeeping and collection of trade taxes to facilitating the movement of goods, avoiding strict controls, and employing modern techniques of controls combined with facilitation [4].

Trade facilitation is a systematic rationalization of customs procedures and documents and includes all measures affecting the movement of goods between buyers and sellers in the entire international supply chain [1]. In a modernized customs, information technology is an essential part of trade facilitation to expedite the movement, clearance and release of goods [4]. Digital technology is seen as the better way to facilitate trade [5]. Digital trade facilitation is therefore defined as the application of information technology to automate and expedite international trade procedures, which is very important to sustain trade competitiveness and enable effective involvement in international e-commerce [6].

A modern customs automates the implementation of customs procedures, relies on e-payment, facilitates trusted partners through authorized economic operators schemes, and has readily accessible rules and regulations online [7]. The adoption of information technology in trade facilitation is a consequence of the Revised Kyoto Convention (RKC), seeing the need for customs modernization including the reduction of technical barriers to trade such as restrictive customs procedures [4]. Information technology can simplify and harmonize border and administrative procedures to facilitate trade [3].

Nevertheless, the success in automating trade procedures will depend on the information technology development of the government [1]. Asian economies implement electronic single windows

and digital trade facilitation [6]. In Southeast Asia, at the core of ASEAN Integration is the free flow of trade in goods [8]. In the Philippines, the Bureau of Customs (BOC) implement the Electronic to Mobile (e2m) System with advanced technology in both import and export processes that reduces face to face transactions and minimizes the need to go to the BOC for both import and export process [9]. This e2m system provides a dynamic and faster end-to-end cargo clearance process [3, 8].

The digital trade facilitation in the Philippines via e2m system is the subject of investigation in the present study. Researches in digital trade facilitation address some of the United Nation's Sustainable Development Goals (SDGs). In particular, research such as this may contribute to the attainment of SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), SDG 16 (Peace, Justice, and Strong Institution), and SDG 17 (Partnerships for the Goals). Among the targets for Goal 8 is the achievement of higher levels of economic productivity through technological upgrading and innovation; for Goal 9 is increase in access to information and communications technology; for goal 16 are reduction of corruption and bribery in all forms, and development of effective, accountable nd transparent institutions at all levels; and for Goal 17 are increase in exports of developing countries, and timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries [10].

Moreover, this study determines the end-user computing satisfaction (EUCS) of those using the e2m system. Measuring user satisfaction has a long history in the information system discipline [11]. Several studies have explored user satisfaction on information systems and examined the validity of measures used [12]. Among the many user satisfaction measures, the EUCS instrument [13] has been frequently used due to its relevancy and considered as the most widely used and important construct to measure the success of an information system on the usability perspective [14, 15]. The 12-item EUCS instrument consists of five subscales that represent the utility and user-friendliness of a software application [11].

The EUCS instrument was used to measure users' satisfaction on Malaysian government's electronic systems [16], to evaluate the Brazilian Financial Administration's integrated system [17], and to analyze the satisfaction on Indonesia's Customs & Excise Information System and Automation [18]. EUCS was also applied for web-based information system [19], website [20-22], disaster mitigation information system [23], security system [24], police information system [25], voter data information system [26], government financial system [27], computerized accounting system [28, 29], accounting information system [30, 31], office information system [12], hospital and health care information system [14, 32-37], education or academic information system [38-41], e-learning or learning management system [42-50], online library [51], university grading system [11], university tuition fee system [52], conference management system [53], enterprrise resource planning system [15, 54], mobile-based online shopping [55], mobile applications [56], e-commerce [57], business intelligence system [58], and logistics and courier service system [59].

Indeed, there is adequate literature dealing with the satisfaction of computing end-users [28]. However, only few research dealth with government information or computing systems [17]. Moreover, a clear research gap in the field of EUCS is the non-existence of a study dealing with digital trade facilitation. In addition, many of the recent studies dealth with the causal relations of computing systems' content, accuracy, format, timeliness, and ease of use to the users' satisfaction. The present study is different from the said recent studies since this reinstate the original EUCS framework [13] having content, accuracy, format, timeliness, and ease of use as components or dimensions of users' satisfaction. Further, the present study also includes tests of differences among the satisfaction of the different groups of users, which were not considered in the reviewed literature.

The present study assesses the level of end-user computing satisfaction on the digital trade facilitation of the Philippine Government, particularly the satisfaction of the clients or users of the Electronic to Mobile (e2m) System of the Bureau of Customs. More specifically, the following are the objectives of this study:

1. To characterize the end-users or clients of the e2m system as to their profession, years in profession, and number of transactions in a month;
2. To assess the level of satisfaction on e2m system as to its content, accuracy, format, timeliness, and ease of use, as well as the total EUCS;
3. To determine relationships among the five dimensions of EUCS; and
4. To determine differences on the satisfaction when users are grouped according to profession, years in profession, and number of transactions in a month.

The study is limited only to the users of digital trade facilitation in the Philippines since it is not appropriate to include trade facilitators from other countries because different countries have different

computing systems and generalization will be meaningless. The professions included in the study are only the customs brokers and the importers since they were the ones using the e2m system. Number of years in profession and number of monthly transactions are the other two grouping variables and assumed to manifest differences in satisfaction.

Methods

The stages of research for this study are provided in Figure 1 while the analysis process is shown in Figure 2. The research process started with problem identification upon casual talks to customs brokers as regards their experiences in using the e2m system. The next step is to conduct a thorough literature review and to formulate the research objectives, which were subjected to a number of revisions upon consultation with experts and peers and necessitated further reviews of literature. This was followed by choosing the appropriate research design, conducting the appropriate methods of gathering data, and the use of appropriate tools for data analysis. The last phase is the report writing, including the interpretation of the processed data that needed more literature review in order to enhance the discussion of results.

The analysis process started with the identification of variables to be used in the study, which were base on literature review and consultation with experts in the field. The main variables used in the study were the five dimensions of EUCS [13]. The next step is either adaption of items or indicators from a valid and reliable questionnaire or formulation of new items or indicators. The first option is adaption of the 12-item EUCS instrument [13], which was already proven to be valid and reliable [19, 20], and the second option is to construct a new instrument, if in case the adapted instrument is not appropriate for use in the current study and which will be decided after another reliability test. With this, data collection was the next step and afterwhich, a reliability test was conducted. The reliability test showed that the items per dimension were reliable and appropriate for use in the current study and hence, there was no need for the construction of a new instrument. This was followed by the computations of descriptive statistics, particularly frequencies, percents, means, and correlation coefficients. Parametric test assumptions or conditions were also considered before deciding whether to use parametric or nonparametric tests of differences. A condition for parametric test use, particularly the normality condition per group to be compared, was not statisfied. Therefore, it was deemed appropriate to use the nonparametrict tests such as Mann-Whitney U-test (instead of independent samples t-test) and Kruskal-Wallis H-test (instead of one-way analysis of variance).

Moreover, this study is a descriptive type of research employing a survey method. Respondents to this study are 49 clients or end-users of the digital trade facilitation via e2m system of the Philippines' Bureau of Customs (BOC). Before answering, they were informed about the research objectives and assured them that the information gathered through the survey will be confidential. All 49 responded questionnaires were retrieved immediately after accomplishing and were found to be usable for statistical analyses.

Convenience sampling was used to select two out of 17 BOC Collection Districts in the country due to mobility restrictions brought by the current pandemic. The two collection districts, located in separate ports that are considered as two of the biggest and busiest ports in the Philippines, were chosen because of their proximity and accessibility for the researchers' convenience. The selection of respondents transacting in either of the two collection districts was through the referral of some customs brokers. No specific sample size was computed, due to limited time and some travel restrictions, and the target is simply to have as many respondents (through referrals) as possible but should not be less than 30, which is the common rule of thumb for a sample size. These resulted to 49 respondents who are e2m system users or clients, willing to participate in the study, and readily available to answer the EUCS instrument.

The first part of the survey questionnaire consists of items regarding the profile characteristics of e2m system clients such as profession, years in profession, and number of transactions in a month. The second part of the questionnaire is the EUCS instrument. The EUCS represents the users' affective attitude towards an information system [13] and was developed to see the economic and social benefits in information technology investments [60]. The instrument, which consists of 12 items under five dimensions, has undergone significant testing such as construct validity tests and confirmatory analyses [19, 20].

A four-point Likert scale from "almost never" to "almost always" was used in the questionnaire. To interpret the collective responses in terms of satisfaction, mean scores were computed. The guide for interpretation is presented in Table 1.

Table 1. Scoring and Interpretation

Response	Code	Mean	Interpretation
Almost Always	4	3.50-4.00	Very Satisfied
Often	3	2.50-3.49	Satisfied
Seldom	2	1.50-2.49	Dissatisfied
Almost Never	1	1.00-1.49	Very Dissatisfied
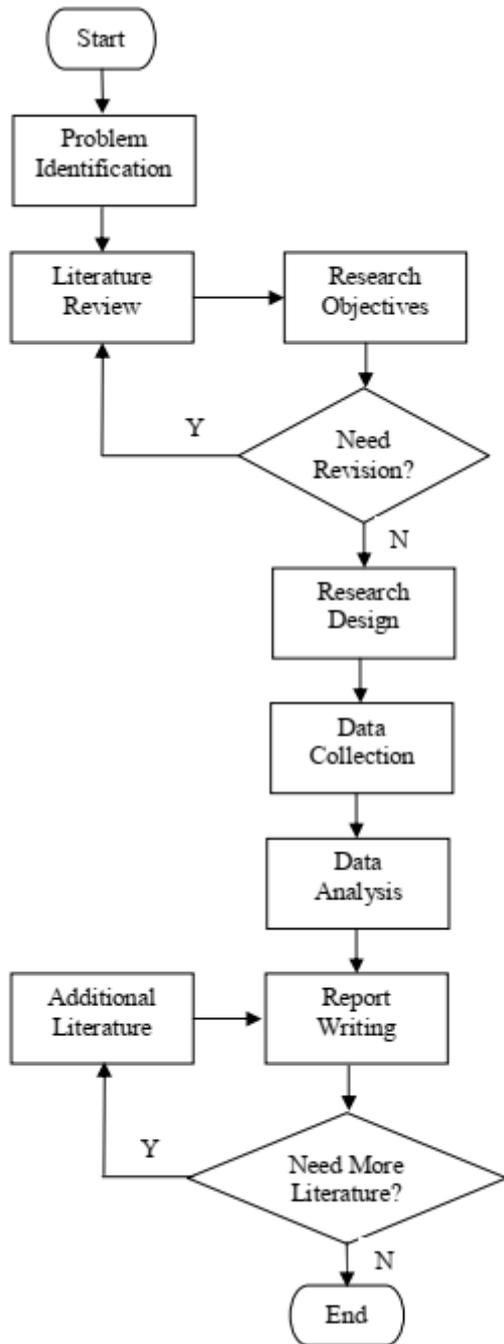
Figure 1. The Research Process
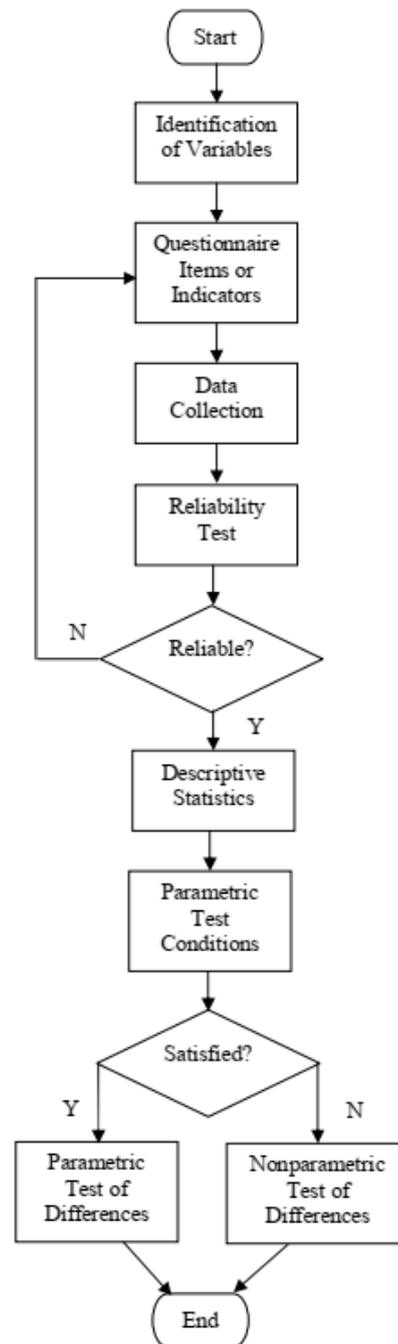
Figure 2. The Data Analysis Process

The data gathered were subjected to reliability tests for the five dimensions and the total EUCS. Results show that there are internal consistencies among the items in all dimensions and in the total EUCS with reliability coefficients or Cronbach's alphas ranging from .70 to .93. Shown in Table 2 are the

Cronbach's alphas of the present study and two previous studies, the original study in 1988 [13] and another study in 2009 [16], for purpose of comparison.

Table 2. Reliability Coefficients

Scale	Number of Items	Cronbach's Alpha		
		1988 Study [13]	2009 Study [16]	Present Study
Content	4	.89	.91	.86
Accuracy	2	.91	.89	.90
Format	2	.78	.79	.70
Timeliness	2	.82	.83	.91
Ease of Use	2	.85	.88	.84
Total	**12**	**.92**	**.95**	**.93**

The following null hypotheses were formulated based on the objectives of the study and tested:
Ho_1: There is no significant relationship among the five dimensions of EUCS.
Ho_2: There is no significant difference on the satisfaction of users when grouped according to the profile variables.

Spearman's correlation was used for Ho_1. Mann-Whitney U-test was used for Ho_2, particularly in testing significant differences on users' satisfaction when grouped according to profession. Kruskal-Wallis H-test was also used for Ho_2 but particularly in testing significant differences on users' satisfaction when grouped according to number of years in profession, and according to number of transactions in a month. In addition, frequency and percentage were used to characterize the users. Moreover, mean was used to assess the level of users' satisfaction and to compare the mean assessments of the different groups of users.

Results and Discussion

Table 3 presents the profile characteristics of clients or users of the e2m system. As shown in the table, majority of the users are customs brokers and most are in their profession for 4 to 6 years. Further, most of the users have more than 10 transactions in the system per month.

In relation thereto, a previous study found the system to provide customs brokers and importers an easy and cheap filing of entries through the systems' electronic lodgment that allows registered users to use any computer with internet connection [3].

Table 3. Profile of e2m System End-Users or Clients

Profile Variable	Category	Frequency	Percent
Profession	Customs Broker	37	75.5
	Importer	12	24.5
Years in Profession	3 years or below	8	16.3
	4 – 6 years	17	34.7
	7 – 9 years	14	28.6
	10 years or above	10	20.4
Number of Transactions in a Month	5 transactions or below	10	20.4
	6 – 10 transactions	19	38.8
	11 transactions or above	20	40.8

Table 4 presents the users' satisfaction on e2m system for each EUCS indicator. As shown in the table, the users are satisfied on six indicators and very satisfied on the other six indicators. The three highest satisfaction are on the presentation of output in useful format, clarity of output information, and user-friendliness of the system while the two lowest satisfaction are on getting the needed information on time, and the provision of updated information. Findings implied that future plans to improve the system may focus more on frequent or automated updates to the system and speedy release of the usual or most needed information by the users.

In a similar study [16], users also rated the electronic government systems favorably. As regards indicators for timeliness having lesser satisfaction as compared to others, a previous study [3] found poor internet connection and server breakdown as major problems in using electronic lodgment of e2m system. A study [32] also found accuracy and timeliness to have the lowest average user satisfaction index. In one research [51], it was also recommended that the timeliness dimension needs to be improved. In another study [9], system users found that the client profile registration, acceptance of the manifest, export entry lodgment, releasing of cargo, import entry lodgment, cancellation of bonds, conduct of x-ray cargo, examination of x-ray cargo, and assessment of import fees and charges using the computerized import

and export transaction of the Bureau of Customs were effective, which in a way are similar to the results of this study as having users generally satisfied with the system.

Table 4. Users' Satisfaction on e2m System per EUCS Indicator

Indicator	Mean	Interpretation
Content		
1. Provision of sufficient information	3.53	Very Satisfied
2. Provision of necessary information	3.49	Satisfied
3. Provision of exactly needed reports	3.47	Satisfied
4. Meeting specific information needs	3.41	Satisfied
Accuracy		
1. Accurate system	3.51	Very Satisfied
2. Accurate information	3.43	Satisfied
Format		
1. Presentation of output in useful format	3.59	Very Satisfied
2. Clear output information	3.59	Very Satisfied
Timeliness		
1. Getting needed information on time	3.31	Satisfied
2. Provision of updated information	3.29	Satisfied
Ease of Use		
1. User friendly system	3.59	Very Satisfied
2. Easy to use system	3.55	Very Satisfied

Table 5 presents the users' satisfaction for each dimension of the EUCS, as well as the total satisfaction. Base on literature review, one of the frequency used tool to determine the satisfaction of computer system users is the EUCS. Previous literature also showed that the EUCS is a valid and reliable instrument and hence, the five dimensions of EUCS namely, content, accuracy, format, timeliness, and ease of use are adapted as test variables in this study. As shown in the table, the users are satisfied with regard to the total EUCS, as well as on content, accuracy and timeliness, and very satisfied on format, and ease of use. Findings implied that future systems upgrade has to prioritize improvement on timeliness, accuracy, and content.

Table 5. Users' Satisfaction on e2m System per EUCS Dimension

Dimension	Mean	Interpretation
Content	3.47	Satisfied
Accuracy	3.47	Satisfied
Format	3.59	Very Satisfied
Timeliness	3.30	Satisfied
Ease of Use	3.57	Very Satisfied
Total EUCS	*3.48*	*Satisfied*

The findings of the present study are similar to the findings of a previous study [29], where in overall, users are satisfied with the computerized accounting system and with the highest satisfaction on format and the lowest on timeliness. A study [30] also found the content, accuracy, and format of estate management system as satisfactory from the users' perspective while timeliness and ease of use need improvement. The study [30] recommended the development of user friendliness and system speed especially in peak computer closing hours to ensure user satisfaction.

However, another study [16] found timeliness, content, and accuracy as the important determinants of end-user satisfaction and the priorities of users while ease of use is not a priority. Moreover, a study [14] also found timeliness, accuracy, and format as factors having critical role in EUCS while ease of use has the least role.

Table 6 shows the correlations among the EUCS dimensions. As shown in the table, there is significant relationship between each two dimensions as indicated by p<.001. The Spearman rho coefficients ranging from .561 to .723 imply that the relationships are all positive and from moderate to strong. The strong correlations among these dimensions, especially those with rho coefficients of .60 or higher, indicate somewhat uncertain discriminant validity of these dimensions. A previous study [12] had similar findings of high correlations between content and the other four dimensions.

Table 6. Correlations among End-User Computing Satisfaction Dimensions

Dimension	Test Value	Accuracy	Format	Timeliness	Ease of Use
Content	rho	.631	.561	.709	.723
	p-value	.000	.000	.000	.000
Accuracy	rho		.569	.614	.606
	p-value		.000	.000	.000
Format	rho			.561	.697
	p-value			.000	.000
Timeliness	rho				.711
	p-value				.000

Table 7 presents the comparison of mean assessments of EUCS on e2m system of the different groups of users. Results imply that importers are more satisfied on e2m system than customs brokers except on format, where customs brokers have higher satisfaction, and on timeliness, where they have almost equal assessments. Moreover, it seems users who are 4-6 years in profession are more satisfied than the other three groups. Further, the mean assessments imply that those users with only 5 transactions or less have also lesser satisfaction than those with 6-10 transactions and those with more than 10 transactions. These findings may be used to further improve the system, particularly addressing the concerns of those least satisfied.

Table 7. Comparison of Means

Profile	Category	Content	Accuracy	Format	Timeliness	Ease of Use	Total
Profession	Customs Broker	3.45	3.43	3.66	3.30	3.53	3.47
	Importer	3.54	3.58	3.38	3.29	3.71	3.51
Years in Profession	3 or below	3.34	3.31	3.56	3.25	3.44	3.38
	4 – 6	3.66	3.59	3.65	3.59	3.79	3.66
	7 – 9	3.43	3.43	3.61	3.04	3.57	3.42
	10 or above	3.33	3.45	3.50	3.20	3.30	3.35
Monthly Transactions	5 or below	3.23	3.00	3.35	3.10	3.35	3.21
	6 – 10	3.63	3.63	3.71	3.45	3.76	3.64
	11 or above	3.45	3.55	3.60	3.25	3.50	3.47

Table 8 presents the differences on EUCS when grouped according to profile categories. These profile variables namely, profession, years in profession, and number of transactions in a month, which were used as grouping variables in the tests of differences, were determined upon consultation with experts in the field of customs and trade.

Results of Mann-Whitney U-test show that at significance level of .05, there is significant difference between the satisfaction of customs brokers and importers on e2m system format. Results of Kruskal-Wallis H-test show that at significance level of .05, there is significant difference on the satisfaction of users in terms of ease of use when grouped according to number of years in profession, and in terms of accuracy and in total EUCS when grouped according to number of transactions in a month. These confirm the earlier assumptions using mean comparisons that customs brokers are more satisfied on e2m system format than importers, those who are 4-6 years in profession are more satisfied on ease of use than those who are less than 4 years or more than 6 years, and those with only 5 or less transactions in a month are less satisfied on total EUCS and in terms of accuracy than those with 6-10 or more than 10 transactions.

Table 8. Differences on End-User Computing Satisfaction

Profile	Test Value	Content	Accuracy	Format	Timeliness	Ease of Use	Total
Profession	Mann-Whitney U	207.0	190.0	137.0	221.5	183.5	217.5
	p-value	.717	.416	.032	.990	.327	.916
Years in Profession	Chi-Square	5.725	2.125	.890	6.094	8.366	5.403
	p-value	.126	.547	.828	.107	.039	.145
Number of Transactions in a Month	Chi-Square	4.605	8.525	3.535	2.290	5.777	6.106
	p-value	.100	.014	.171	.318	.056	.047

Conclusions

The study primarily aimed to assess the level of end-user computing satisfaction (EUCS) on electronic to mobile (e2m) system, a digital trade facilitation in the Philippines. In particular, the study determined the characteristics of e2m system users as regards their profession, years in profession, and

number of transactions in a month; the total EUCS with the system and the EUCS dimensions namely content, accuracy, format, timeliness, and ease of use; the relationships among the EUCS dimensions; and the differences on satisfaction when the users are grouped according to profession, years in profession, and number of transactions in a month.

Results showed majority of respondents are customs brokers, most are 4-6 years in profession, and with more than 10 transactions in a month. The e2m system users were also found to be satisfied as regards total EUCS and in terms of content, accuracy, and timeliness; and very satisfied in terms of format, and ease of use. Moreover, all the five EUCS dimensions had significant positive moderate to strong correlation with each other. Results also revealed the significant differences on users' satisfaction on format when grouped according to profession, on ease of use when grouped according to number of years in profession, and on accuracy, and total EUCS when grouped according to number of transactions in a month.

This study has relatively achieved its purpose and is deemed relevant as it seems to be the first study on determining EUCS with an online or digital trade facilitation system. A limitation, however, is that this study employs only a few number of system users and no generalization of results can be made. Hence, further studies are deemed necessary. Future similar studies may consider greater number of end-users who are randomly selected and representing a wider geographic area. A mix of quantitative and qualitative analysis may likewise be considered by future researchers.

References

[1] Asian Development Bank (ADB) and United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), Designing and Implementing Trade Facilitation in Asia and the Pacific, Mandaluyong City, Philippines: Asian Development Bank, 2013.

[2] J. Peterson, "An overview of customs reforms to facilitate trade" Journal of International Commerce and Economics, Aug. 2017.

[3] L. C. De Dios, "The impact of information technology in trade facilitation on small and medium enterprises in the Philippines", ARTNeT Working Paper 74, Bangkok: Asia-Pacific Research and Training Network on Trade, 2009.

[4] F. A. Alburo, "The development impact of information technology in trade facilitation", ARTNeT Working Paper 78, Bangkok: Asia-Pacific Research and Training Network on Trade, 2010.

[5] N. W. Ismail, "Digital trade facilitation and bilateral trade in selected Asian countries", Studies in Economics and Finance, vol. 38, no. 2, pp. 257-271, 2021.

[6] Y. Duval, and K. Mengjing, "Digital trade facilitation: Paperless trade in regional trade agreements", ADBI Working Paper 747, Tokyo: Asian Development Bank Institute, 2017.

[7] P. Intal Jr., "AEC blueprint implementation performance and challenges: Trade facilitation", ERIA Discussion Paper 2015-41, Jakarta: ERIA, 2015.

[8] E. M. Medalla, "Managing the ASEAN economic integration process in the Philippines: An assessment of progress in trade liberalization and facilitation," PIDS Discussion Paper Series, no. 2012-41, Philippine Institute for Development Studies (PIDS), Makati City, 2012.

[9] A. M. Alcedo, and V. M. Cajala, "The present computerization program of the Bureau of Customs: Focus on import and export transactions", Paper presented at DLSU Research Congress 2015, De La Salle University, Mar. 2015.

[10] United Nations, Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development, 2020.

[11] W. Chin, and M. Lee, "A proposed model and measurement instrument for the formation of IS satisfaction: The case of end-user computing satisfaction", ICIS 2000 Proceedings, vol. 57, pp. 553-563, 2000.

[12] K. Lim, J. Lim, and J. H. Heinrichs, "Validating an end-user computing satisfaction instrument: Confirmatory factor analysis approach using international data", Journal of International Technology and Information Management, vol. 17, no. 2, pp. 153-166, 2008.

[13] W. J. Doll, and G. Torkzadeh, "The measurement of end-user computing satisfaction", MIS Quarterly, vol. 12, no. 2, pp. 259-274, 1988.

[14] V. P. Aggelidis, and P. D. Chatzoglou, "Hospital information systems: Measuring end user computing satisfaction (EUCS)", Journal of Biomedical Informatics, vol. 45, pp. 566-579, 2012.

[15] S. Mekadmi, and R. Louati, "An evaluation model of user satisfaction with enterprise resource planning systems", The Electronic Journal of Information Systems Evaluation, vol. 21, no. 2, pp. 143-157, 2018.

[16] N. Mohamed, H. Hussin, and R. Hussein, "Measuring users' satisfaction with Malaysia's electronic government systems", Electronic Journal of e-Government, vol. 7, no. 3, pp. 283-294, 2009.

[17] J.-A. S. Suzart, "End-user satisfaction with the Integrated System of the Federal Government Financial Administration (SIAFI): A case study", Journal of Information Systems and Technology Management, vol. 10, no. 1, pp. 145-160, 2013.

[18] M. Awaludin, and N. E. Yolanda, "Analysis of CEISA services user satisfaction using the EUCS method in the Directorate General of Customs and Excise", Proceeding SENATIK, vol. 4, pp. 421-433, 2018.

[19] L. Xiao, and S. Dasgupta, "Measurement of user satisfaction with web-based information systems", Proceedings of the Eight Americas Conference on Information Systems, pp. 1149-1155, 2002.

[20] S. F. Abdinnour-Helm, B. S. Chaparro, and S. M. Farmer, "Using the end-user computing satisfaction (EUCS) instrument to measure satisfaction with a web site", Decision Sciences, vol. 36, no. 2, pp. 341-364, 2005.

[21] T. Husain, and A. Budiyantara, "End-User Computing Satisfaction (EUCS) and WebQual 4.0 Analysis on User Satisfaction", Jatisi: Jurnal Teknik Informatika dan Sistem Informasi, vol. 4, no. 2, pp. 164-176, 2018.

[22] N. Puspitasari, R. Lestari, M. Taruk and E. Maria, "Website testing analysis using PIECES and EUCS Method," 2019 International Conference on Electrical, Electronics and Information Engineering (ICEEIE), pp. 298-302, 2019.

[23] K. D. Hartomo, and A. D. T. Hernanda, "Design and validity test of the disaster mitigation information system using EUCS method," 2nd International Conference on Innovative and Creative Information Technology (ICITech), pp. 184-189, 2021.

[24] S. J. Putra, R. Rosalina, A. Subiyakto, and M. N. Gunawan, "Extending the End-user Computing Satisfaction with security measures," 6th International Conference on Cyber and IT Service Management (CITSM), pp. 1-5, 2018.

[25] A. E. Hadisuwarno, and R. Bisma, "Analysis of user acceptance of e-Kinerja applications with the TRAM and EUCS methods at the police", Teknologi: Jurnal Ilmiah Sistem Informasi, vol. 10, no. 2, pp. 93-109, 2020.

[26] A. Dewima, Y. Amrozi, M. K. Milad, and A. Rohman, "User satisfaction measurement of voter data information system with EUCS model in Komisi Pemilihan Umum Surabaya", Proceeding 1st International Conference on Business & Social Sciences (ICOBUSS), pp. 64-75, 2020.

[27] R. Waluyo, "Analysis of the satisfaction of village financial system users using the EUCS method in Purbalingga", Jatisi: Jurnal Teknik Informatika dan Sistem Informasi, vol. 8, no. 3, pp. 1638-1650, 2021.

[28] A. Ilias, and M.-Z. A. Razak, "End-user computing satisfaction (EUCS) towards computerized accounting system (CAS) in public sector: A validation of instrument", Journal of Internet Banking and Commerce, vol. 16, no. 2, pp. 1-17, 2011.

[29] A. Ilias, M.-Z. A. Razak, R. A. Rahman, and M. R. Yasoa, "End-user computing satisfaction (EUCS) in Computerised Accounting System (CAS): Which the critical factors? A case in Malaysia", Computer and Information Science, vol. 2, no. 1, pp. 18-24, 2009.

[30] S.-C. C. Fong, and M.-W. H. Ho, "Accounting information systems end-user satisfaction: Evidence of Hong Kong Housing Authority", The International Technology Management Review, vol. 4, no. 1, pp. 27-41, 2014.

[31] M. R. Renaldy, "Evaluating the satisfaction of the user of the accounting information system application of PT. Unilever TBK with an EUCS evaluation model", Jurnal Ilmiah Mahasiswa, vol. 9, no. 2, pp. 1-17, 2021.

[32] A. Prasetyowati, and R. Kushartanti, "User satisfaction analysis of primary care information systems in Semarang City with EUCS model", Unnes Journal of Public Health, vol. 7, no. 2, pp. 120-125, 2018.

[33] S. Rouhani, S. Zamenian, and S. Rotbie, "A prototyping and evaluation of hospital dashboard through End-User Computing Satisfaction Model (EUCS)", Journal of Information Technology Management, vol. 10, no. 3, pp. 43-60, 2018.

[34] Z. A. Golo, S. Subinarto, and E. Garmelia, "Analysis of user satisfaction level of primary care information system using End User Computing Satisfaction (EUCS) method at Primary Care", Jurnal Rekam Medis dan Informasi Kesehatan, vol. 4, no. 1, pp. 52-56, 2021.

[35] T. P. Sari, and W. V. Trisna, "Evaluation of primary care application users in the first class clinic in Pekanbaru District on human, organization and technology factors using the EUCS method", Advances in Social Science, Education and Humanities Research, vol. 373, pp. 92-97, 2019.

[36] A. Cucus, and G. Halim "Testing user satisfaction using End-User Computing Satisfaction (EUCS) method in Hospital Management Information System (SIMRS) (Case Study at the Regional Public Hospital Dr. A. Dadi Tjokrodipo)", Journal of Information Engineering and Applications, vol. 9, no. 5, pp. 54-62, 2019.

[37] A. F. Hanesya, A. Caesarina N. Marchianti, and S. Bukhori, "Evaluation of the Hospital Information System (HIS) using EUCS and PIECES methods on the Medical Record Section of RSUD Dr. Haryoto Lumajang", International Journal of Computer, Network Security and Information System, vol. 3, no. 1, pp. 13-20, 2021.

[38] N. A. O. Saputri, and A. Alvin, "Measurement of user satisfaction level in the Bina Darma information systems study program portal using End User Computing Satisfaction method", Journal of Information Systems and Informatics, vol. 2, no. 1, pp. 154-162, 2020.

[39] M. B. Suryawan, and P. Prihandoko, "Evaluation of SIAKAD Politeknik Negeri Madiun using TAM and EUCS approach", Citec Journal, vol. 4, no. 3, pp. 233-244, 2017.

[40] P. Purwanto, and P. B. D. Hedin, "Measurement of user satisfaction for web-base academic information system using end-user computing satisfaction method", IOP Conference Series: Materials Science and Engineering, vol. 909, 2020.

[41] N. A. Hidayah, E. Fetrina, and A. Z. Taufan, "Model satisfaction users measurement of academic information system using End User Computing Satisfaction (EUCS) method", Applied Information Systems and Management, vol. 3, no. 2, pp. 119-123, 2020.

[42] D. Novita, and D. S. Ningsih, "Analysis of the effect of Vilep e-learning implementation at Poltekkes Kemenkes Palembang with the EUCS approach", Jatisi: Jurnal Teknik Informatika dan Sistem Informasi, vol. 7, no. 1, pp. 29-41, 2020.

[43] F. Wijaya, S. A. Solikhatin, and C. Tahyudin, "Analysis of end-user satisfaction of Zoom application for online lectures", 3rd East Indonesia Conference on Computer and Information Technology (EIConCIT), pp. 348-353, 2021.

[44] T. A. Prasetya, C. T. Harjanto, and A. Setiyawan, "Analysis of student satisfaction of e-learning using the end-user computing satisfaction method during the Covid-19 pandemic", Journal of Physics: Conference Series, vol. 1700, 2020.

[45] W. A. Putera, and I. M. Candiasa, "Analysis of e-learning user satisfaction ITB STIKOM Bali using End User Computing Satisfaction (EUCS) method", Journal of Physics: Conference Series, vol. 1810, 2020.

[46] S. R. Arifin, M. A. Zaidin, R. A. Pratomo, A. Amirah, D. S. Angreni, and D. R. Wulandari, "Students' satisfaction of learning management system: A study of Dipa Makassar University, Indonesia", 3rd International Conference on Cybernetics and Intelligent System (ICORIS), pp. 1-4, 2021.

[47] Y. Tjong, L. Sugandi, A. Nurshafita, Y. Magdalena, C. Evelyn, and N. S. Yosieto, "User satisfaction factors on learning management systems usage", International Conference on Information Management and Technology (ICIMTech), pp. 11-14, 2018.

[48] A. M. Cisca, S. W. Nasution, S. L. R. Nasution, and E. Girsang, "Analysis level of satisfaction student P3D for distance learned based End-User Computing Satisfaction (EUCS) method in the COVID-19 era", Budapest International Research and Critics Institute-Journal, vol. 4, no. 2, pp. 1738-1746, 2021.

[49] W. Wahyuni, and S. H. Pratiwi, "Students' satisfaction towards online learning during the COVID-19 pandemic through End-User Computing Satisfaction (EUCS)", Jurnal PAJAR (Pendidikan dan Pengajaran), vol. 5, no. 2, pp. 391-402, 2021.

[50] K. N. Rachmah, A. N. Haq, N. H. Assobarry, F. N. Sabila, and T. L. M. Suryanto, "Edmodo e-learning analysis using End-User Computing Satisfaction method (Case Study: Senior High School 1 Sampang)", International Journal of Computer, Network Security and Information System, vol. 3, no. 1, pp. 1-6, 2021.

[51] M. Azwar, I. Surandari, and H. I. Djohar, "Evaluating the library website of the Indonesian Ministry of Education and Culture through the End-User Computing Satisfaction (EUCS) model", Library Philosophy and Practice (e-journal), vol. 4166, 2020.

[52] N. A. Hidayah, E. Rustamaji, and P. Purusotama, "Determining user satisfaction factors on university tuition fee systems using End-User Computing Satisfaction (EUCS)", 6th International Conference on Cyber and IT Service Management (CITSM), pp. 1-5, 2018.

[53] R. Anggara, C. W. Budiyanto, and P. Hatta, "Comparison between TAM, EUCS, TTF analysis to evaluate user acceptance for conference management system", AIP Conference Proceedings, vol. 2194, pp. 1-6., 2019.

[54] W. Weli, "Re-examination and expanding the EUCS model on cloud-based ERP system", Journal of Information and Organizational Sciences, vol. 45, no. 1, pp. 115-135, 2021.

[55] I. Kurniasih, and D. Pibriana, "Effect of user satisfaction of mobile based online shopping applications using the EUCS method", Jatisi: Jurnal Teknik Informatika dan Sistem Informasi, vol. 8, no. 1, pp. 181-198, 2021.

[56] E. Prastyo, C. W. Budiyanto, and R. A. Yuana, "Measuring mobile applications user's satisfaction: A closer look into the appropriate information systems user's satisfaction", IOP Conference Series: Materials Science and Engineering, vol. 1098, 2021.

satisfaction to use of e-commerce as media marketing property in Yogyakarta and Central Java using EUCS method", Jurnal Penelitian Pers dan Komunikasi Pembangunan, vol. 21, no.2, pp. 101-108, 2017.

[58] C-K. Hou, "Examining users' intention to continue using business intelligence systems from the perspectives of end-user computing satisfaction and individual performance", International Journal of Business Continuity and Risk Management, vol. 8, no. 1, pp. 49-70, 2018.

[59] R. Munap, S. N. B. Ahmad, S. A. Hamid, M. F. Beg, and M. T. Beg, "The influence of End User Computing System (EUCS) on user satisfaction: The case of a logistic and courier service company", The International Journal of Social Sciences and Humanities Invention, vol. 5, no. 12, pp. 5103-5110, 2018.

[60] W. J. Doll, and G. Torkzadeh, "The measurement of end-user computing satisfaction: Theoretical and methodological issues", MIS Quarterly, vol. 15, no. 1, pp. 5-10, 1991.