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ASSESSMENT OF THE DEGREE OF QUALITY ATTRIBUTES OF THE CDU ELECTRONIC STUDENT INFORMATION SYSTEM (CESIS) AMONG THE CDU STUDENTS FOR SECOND SEMESTER A.Y. 2021-2022

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Abstract: This study evaluates the quality attributes of the CDU Electronic Student Information System (CESIS) among CDU students during the Second Semester of Academic Year 2021-2022. A 22-item questionnaire, modified from Mina et al. (2021), was used, covering domains such as Frequency, Reliability, Usability, Maintainability, Efficiency, and Portability (FRUMEP). Students enrolled at Cebu Doctors' University were selected through stratified random sampling to identify respondents from each academic unit. Among 976 responses, the majority of students rated CESIS highly in terms of Functionality (52.46%). Ratings for other attributes were moderate: Reliability in terms of Accessibility without Failure (50.31%) and Recovery after Failure (62.02%), Usability (49.39%), Efficiency (43.65%), and Maintainability (53.52%). Portability received a high rating (61.82%). Overall, CESIS demonstrated high quality in Functionality and Portability as an online enrollment system. However, moderate ratings in Reliability, Usability, Efficiency, and Maintainability indicate areas for improvement for students enrolled in the Second Semester of Academic Year 2021-2022.

Keywords: Online Enrolment System, CDU Electronic Student Information System, CESIS quality attributes

I. INTRODUCTION

Several Philippine schools and universities have resumed limited face-to-face classes after extensive COVID-19 lockdowns began in mid-March 2020. The pandemic led to significant changes in education, prompting most institutions to adopt distance learning and rely on online management systems for activities like admission, registration, enrollment, consultations, assessment, and payment.

Cebu Doctors' University (CDU) quickly adapted to the new normal, prioritizing health and safety by following government regulations and investing in online systems. Despite initial gains, students and parents faced confusion and anxiety at the start of the semester due to technical issues and miscommunication with the online enrollment process. These challenges highlight the need for continuous improvement in online systems to meet the expectations of digital-native students and ensure a smooth enrollment experience.

Most students enrolled at Cebu Doctors' University (CDU) this academic year are 21st century learners, considered digital natives due to their familiarity with high-tech gadgets and accessible internet.

Despite their comfort with technology, these students face challenges such as adapting to new online platforms, technical issues, and the need for more advanced and costly devices for demanding tasks. CDU's online management system, the CDU Electronic Student Information System (CESIS), was developed to address these needs and replace a previous system that struggled with data integration. Launched in January 2021 for the Second Semester of Academic Year 2020-2021, CESIS aims to enhance the online enrollment experience. Continuous improvement and adaptability of such systems are crucial for the sustainability of higher education institutions, as they transition from traditional face-to-face learning to home-based online learning environments.

According to Custodio and Castro (2016), computer digitalization is now considered as one of the leading inventions that an educational institution can have. The only way to adapt in this era is to embrace technology. As a result, it is believed that the online enrollment system is a clear improvement over the paper-based system (Thompson & Ahn, 2012). With online registration processing, even students based in other countries can inquire and enroll using the internet without the need to travel, as stated by Then (2006), which makes the institution more attractive (Mina et al., 2021).

The enrollment system must always maintain its efficiency and effectiveness for the students or enrollees. Thus, continuous assessment of the current enrollment system should be done to aid in improving its weak points and maintain its high performance (Panganiban, 2020). CESIS as a software needs to be continuously assessed by stakeholders or end users per se in its development as an effective online enrollment system.

II. METHODOLOGY

This descriptive cross-sectional survey included 976 students from Cebu Doctors' University (CDU) enrolled in the Second Semester of Academic Year 2021-2022. The university had 5,260 students enrolled in its various programs, including the Graduate School and the Senior High School. Using stratified random sampling and proportional allocation, students aged 16-67 were selected from each academic unit.

Exclusions were students under 16 or over 67, those involved in pilot testing, and research team members enrolled in CDU's graduate programs. The study used a modified questionnaire based on Mina et al. (2021) to evaluate the quality attributes of the CDU Electronic Student Information System (CESIS), with adjustments made according to the ISO 9126 quality model for software standards. This software accords with the international standard as an extension of previous work done by McCall (1977), Boehm (1978), FURPS, and others in defining a set of software quality characteristics. The questionnaire attributes 21 measurements into six areas, namely functionality, reliability, usability, efficiency, maintainability, and portability.

The adapted framework, such as the Unified Theory of Acceptance and Use of Technology (UTAUT) model, is believed to be anchored to the most powerful technology acceptance theories that examined the ability of users to accept technology and their intention to adopt new technologies. Software quality attributes and their UTAUT's determinants can be classified into two major types according to their effect on technology adoption: objective and subjective. Any other determinant dependent on facts and not influenced by opinions, emotions, or personal feelings can be called objective. The objective effect on technology adoption leads one to accept or deny this technology. Therefore, the technology acceptance decision is an objective behavior. Efficiency and reliability, respectively, represent the objective effect of performance expectancy on behavioral intention and facilitating conditions on the usage behavior. On the other hand, a subjective attribute is anything that embodies

the sense of probabilities and influences opinions, emotions, or personal feelings. The subjective effect on technology adoption is related to the degree of user satisfaction with the technology. Usability and adaptability represent, respectively, the subjective effect on technology adoption for effort expectancy and social influence on behavioral intention to adopt any technology (Momani, 2020).

The researchers employed a survey questionnaire adapted from Mina et al. (2021) to evaluate the quality attributes of the CESIS online enrollment system. The questionnaire covered functionality, reliability, usability, efficiency, maintainability, and portability. Following some modifications, the questionnaire underwent validation by three experts, including a psychometrician, and subsequent pilot testing among selected CDU students to assess reliability. These steps ensured the questionnaire's accuracy and effectiveness before the actual data collection phase.

The questionnaire was composed of three sections. The first section, the Informed Consent Form, obtained explicit consent to participate from respondents. The second section collected demographic data including College/Department, year level, age range, internet speed, type of gadget, and user type. The third section assessed the quality attributes of the CDU Electronic Student Information System (CESIS). The 22-item questionnaire was composed of five questions on functionality, three on reliability, five on usability, three on efficiency, three on maintainability, and three on portability.

After review and approval by the CDU Institutional Ethics Review Committee, the researchers initiated the study by sending a transmittal letter to the Administration of Cebu Doctors' University seeking permission to conduct the research. Upon approval from the CDU Administration, transmittal letters were then sent to the Deans and the Senior High School Principal, requesting permission to use their students as research respondents. Additionally, a transmittal letter was forwarded to the University Registrar to request the total student population of CDU and the breakdown by College/Department. Subsequently, letters were sent to the Deans and the Senior High School Principal, seeking permission to recruit their secretaries as research data gatherers. The approved transmittal letter from the Administration was included with the request letter for the Deans and Principal.

A meeting took place to discuss the process of distributing and collecting questionnaires from participants. The participants were emailed the informed consent form along with a recorded video orientation. Subsequently, they were sent the Google form link for the research questionnaire. Parents of respondents who were minors (aged 17 years and below) were given the informed consent form via their children's email address. The entire data-gathering process lasted approximately two weeks. Strict confidentiality of all collected data was maintained.

After completing the data gathering process, responses were tabulated to aid analysis during data interpretation. The data were tallied, analyzed, and interpreted. Using the weighted mean, the typicality of responses per domain was determined. Scores were interpreted based on the mean of scores for each attribute, with 1.00 to 2.50 indicating a Low Degree of Quality, 2.50 to 3.25 a Moderate Degree of Quality, and 3.25 to 4.00 a High Degree of Quality. The weighted mean of each item in each attribute was interpreted as follows: Strongly Disagree (1.00 to 1.74), Disagree (1.75 to 2.49), Agree (2.50 to 3.24), and Strongly Agree (3.25 to 4.00). The modified research questionnaire demonstrated an acceptable Cronbach's α of 0.873, indicating item consistency and suitability for the chosen population.

III. RESULTS AND DISCUSSION

The Chi-square test of proportions was used for the cross-sectional analysis of the degree of quality attributes of CESIS

across the demographic characteristics. Descriptive statistics was utilized for frequency and percentage distribution.

Table 1. Degree of Quality of Functionality Attribute of CESIS (n = 976)

Degree of Quality	f (%)
High	512 (52.46%)
Moderate	426 (43.65%)
Low	38 (3.89%)

Table 1 displays the frequency and percentage of CESIS's Functionality attribute's degree of quality based on the weighted mean reported by students. The data indicates that 512 (52.46%) students rated CESIS's Functionality attribute as high, while 426 (43.65%) rated it as moderate. Only 38 (3.89%) students rated it as low, suggesting that students perceived CESIS as a highly functional enrollment system. Functional suitability, as defined by Moumane et al. (2016) and quoted in Salleh et al. (2017), refers to how well a system performs its fundamental functions. The majority of students' ratings fall under the Strongly Agree category in Table 1.1, indicating their belief in CESIS's functionality, practicality, and safety in registering and enrolling students while ensuring security against unauthorized access.

According to Moumane et al. (2016, as cited in Salleh et al. 2017), the functionality quality characteristic emphasizes three aspects: functional completeness, functional correctness, and functional appropriateness. While most items in Table 1.1 have high weighted mean scores, items 3 and 5 may indicate areas for improvement, particularly in CESIS's interaction with other systems and its ability to surpass traditional enrollment methods.

Table 1.1. Weighted Mean of Functionality Attribute of CESIS (n = 976)

Functionality	*M*	Interpretation
1. CESIS suits its purpose to be an enrollment system.	3.41	Strongly Agree
2. CESIS can register students and enroll in the right subjects.	3.43	Strongly Agree
3. CESIS can interact with other systems (e.g. online payment)	3.16	Agree
4. CESIS does not permit unauthorized users.	3.55	Strongly Agree
5. CESIS is more convenient than the physical enrollment process.	3.11	Agree

Table 2 presents CESIS's degree of reliability, with 491 (50.31%) students rating it as having moderate reliability. There is only a slight difference between students who rated the attribute as high (24.90%) and those who rated it as low (24.79%).

Table 2. Degree of Quality of Reliability Attribute of CESIS in terms of Accessibility without Failure (n = 976)

Degree of Quality	f (%)
High	243 (24.90%)
Moderate	491 (50.31%)
Low	242 (24.79%)

The results, taken together, suggest that around 50% of the students perceived CESIS to be a moderately reliable and accessible enrollment system. A computing

system's dependability refers to its ability or property to be relied upon for the service it provides.

Table 2.1 Weighted Mean of Reliability Attribute of CESIS in terms of Accessibility without Failure (n = 976)

Reliability	*M*	Interpretation
CESIS is accessible anytime without experiencing failure.	2.97	Agree

Table 2.1 reveals the weighted mean of item number one, which states that "CESIS is accessible at any time without experiencing failure." The weighted mean for this item is 2.97, which is interpreted as Agree. The findings may indicate that the majority of students perceived that CESIS is accessible with little to no system failure.

Table 2.2 Degree of Quality Reliability of CESIS in terms of Recovery after Failure (n = 674)

Degree of Quality	f (%)
High	180 (26.71%)
Moderate	418 (62.02%)
Low	76 (11.27%)

Table 2.2 illustrates the frequency and percentage of CESIS's Reliability attribute's degree of quality, based on the weighted mean reported by 674 students who experienced system failure in the remaining two items of this attribute. These items specifically assess CESIS's ability to recover after a system failure. The majority of students (62%) rated CESIS's reliability as moderate, with 27% rating it as high and 11% as low. This suggests that students perceive CESIS's ability to recover from system failure as only moderately reliable.

According to Mohammadi et al. (2013), reliability refers to the ability to operate error-free under specific conditions for a defined period. While achieving perfect safety and reliability may seem elusive, as noted by Campos and Figuerido (2002, as cited in Whitworth and Zaic, 2003), system failure is considered inevitable by Gebauer and Schober (2006, as cited in Mina et al., 2021). Nonetheless, a good computing system should still execute its tasks as intended by users.

Table 2.3 Weighted Mean of Reliability Attribute of CESIS in terms of Recovery after Failure (n = 674)

If you have experienced system failure where a system notification appears on the screen (e.g. SQL error, system maintenance, etc.) or a system error notification was received from the EDP, please answer the next two statements. Otherwise, click N/A.		
Reliability	***M***	**Interpretation**
2. *CESIS can recover from the component or environmental failure (e.g. memory occupancy, disk usage) within 24 hours.*	3.07	Agree
3. *CESIS can be brought to full operation within 24 hours after the system goes down.*	3.03	

As shown in Table 2.3, only 674 (69.06%) of the 976 students had encountered system failure where a system message was displayed on the screen, or a system error communication was received from the EDP Office. The weighted means for the students on items 2 and 3 are 3.07 and 3.03, respectively. The findings suggest that most students agree that the CESIS system may function normally after a failure or system shutdown and recover within 24 hours.

Table 3. Degree of Quality of Usability Attribute of CESIS (n = 976)

Degree of Quality	f (%)
High	442 (45.29%)
Moderate	482 (49.38%)
Low	52 (5.33%)

Table 3 shows that only 442 students (45.29%) gave the usability of CESIS a high-quality rating, compared to nearly half (49.38%) who gave it a moderate rating. Usability is a quality attribute that can be evaluated based on user feedback. It speaks of how simple it is for a user to operate, prepare input for, and interpret service output. According to Mohammadi et al. (2013), usability includes satisfaction, learnability, effectiveness, and efficiency of usage. This may indicate that the majority of students are satisfied with CESIS, finding it simple to use, and efficient as an enrollment system.

Table 3.1 Weighted Mean of Usability Attribute of CESIS (n = 976)

Usability	*M*	Interpretation
1. CESIS is easy to understand.	3.30	Strongly Agree
2. CESIS is easy to learn (e.g. new user, old user).	3.29	Strongly Agree
3. CESIS can be opened in my preferred browser(s) (e.g. Microsoft Edge, Google Chrome, Mozilla Firefox, etc.)	3.56	Strongly Agree
4. CESIS supports different languages/dialects.	3.01	Agree
5. The CESIS user interface is well-organized and requires minimum effort from the users.	3.28	Strongly Agree

In Table 3.1, students strongly agreed with four out of the five statements regarding CESIS's comprehensibility, user-friendliness, compatibility with mainstream browsers, and well-organized interface. According to Whitworth and Zaic (2003), a computer system that is easy to use encourages users to utilize it fully. Dray (1995, as cited in Whitworth and Zaic, 2003) noted a significant increase in usability over the past decade, attributed to designers' efforts to minimize user effort by transitioning from command user interfaces (CUIs) to graphical user interfaces (GUIs).

Software that is easy to use tends to be less costly to learn, implement, use, and maintain, resulting in reduced expenses related to training, installation, user guides, and maintenance. Usability refers to the extent to which consumers engage with a website. The item "CESIS can support different languages or dialects" received the lowest weighted mean (3.01), indicating that students agree that CESIS should support languages other than English. It is advisable for the university to consider incorporating support for additional languages to further enhance CESIS's usability.

Table 4. Degree of Quality of Efficiency Attribute of CESIS (n = 976)

Degree of Quality	f (%)
High	364 (37.29%)
Moderate	426 (43.65%)
Low	186 (19.06%)

Table 4 indicates that 426 (43.65%) students rated CESIS as moderately efficient, while 364 (37.29%) rated it highly efficient. These results suggest that the majority of students perceive CESIS as an efficient enrollment system, with only 186 (19.06%) rating it as low in efficiency. This perception may stem from CESIS's nature as

a computerized enrollment system, which reduces human errors and processing time (Capanas et al., 2018), thus producing high-quality output.

However, the 186 students who rated the system as low in efficiency may have encountered occasional delays or lags, potentially due to traffic congestion or bottlenecks during peak enrollment periods. These minor disruptions could challenge the perception of CESIS as an efficient system, highlighting the impact of temporary fluctuations on the overall enrollment process (Sagarino et al., 2019).

Table 4.1 Weighted Mean Efficiency Attribute of CESIS (n = 976)

Efficiency	*M*	Interpretation
1. CESIS can respond immediately.	2.96	Agree
2. The device does not "hang" or "lag" when accessing different features of CESIS.	2.79	Agree
3. CESIS is less time-consuming than the physical enrollment process.	3.28	Strongly Agree

Table 4.1 presents a breakdown of each item under the CESIS efficiency attribute. The first two items, which focus on user access and system responsiveness, received weighted means interpreted as "Agree." This indicates that students agree that CESIS responds promptly to commands and operates without delays. However, for a few students who disagreed, this may align with the notion proposed by Whitworth and Zaic (2003) that computers may experience occasional malfunctions.

On the other hand, students strongly agreed with item number three, stating that "CESIS is less time-consuming than the physical enrollment process." This suggests that students perceive CESIS as an efficient and hassle-free method of enrollment before the academic year begins (Bognot et al., 2021; Capanas et al., 2018), despite minor backlogs and delays that did not significantly impact the system's overall efficiency (Sagarino et al., 2019).

Table 5. Degree of Quality of Maintainability Attribute of CESIS (n = 697)

Degree of Quality	f (%)
High	229 (32.86%)
Moderate	373 (53.51%)
Low	95 (13.63%)

Only 697 (91.41%) of the 976 students indicated in Table 5 have encountered system maintenance while using the CESIS. These were those students who did not respond with "N/A" to any of the three related statements and only these responses were taken into account. In the same table, 229 students (32.86%) gave the CESIS attribute of maintainability a high rating, while 373 students (53.51%) gave it a moderate rating. Only 95 students, or 13.63%, gave it a low rating.

These findings suggest that the majority of students regarded CESIS to be maintainable whenever the enrollment system encounters problems, whether a sudden upgrade is required, or whenever it remains operational following system maintenance. As previously discussed in this study (Bognot et al., 2021; Sagarino et al., 2019; Capanas et al., 2018), the high trust in the maintainability of the enrollment system is rooted in its independence from physical intrusion caused by human-derived errors.

Table 5.1 Weighted Mean of Maintainability Attribute of CESIS (n = 697)

Maintainability	Weighted Mean	Interpretation
1. The Pinnacle can easily diagnose CESIS faults and inform upon inquiry and/or through announcements.	3.04	Agree
2. The Pinnacle can easily modify CESIS upon inquiry.	3.06	
3. CESIS continues to function after system maintenance has been made by the CDU registrar.	3.16	

Table 5.1 displays the weighted mean of students' responses regarding Maintainability items. It indicates that students believe and agree that the service provider, Pinnacle, can swiftly diagnose and notify them of CESIS errors. Additionally, they perceive the system as easy to modify in response to inquiries and capable of maintaining continuous performance after system maintenance. However, it is advisable for other key stakeholders in higher education institutions, such as IT professionals, software developers, and Registrar's Office staff, to evaluate the enrollment system's maintainability (Olipas, 2019). Maintainability across various models of systems should also be considered (Kapllani et al., 2020).

Table 6. Degree of Quality of Portability Attribute of CESIS (n = 922)

Degree of Quality	f (%)
High	570 (61.82%)
Moderate	296 (32.11%)
Low	56 (6.07%)

In Table 6, there are 922 (94.47%) of the 976 students who had CESIS access on various devices. These were those who did not respond with "N/A" to any of the three related statements. In this regard, only these students' responses to the three statements on the portability attribute of CESIS were taken into account. The Portability attribute of CESIS was rated as high by a significant portion of students (61.82%), while it was rated as moderate by 296 students (32.11%) and only 56 students (6.07%) gave it a low rating.

Table 6.1 Weighted Mean of Portability Attribute of CESIS (n = 922)

Portability	*M*	Interpretation
1. CESIS can be opened on different devices (e.g. laptop, desktop, tablet, smartphone.)	3.60	Strongly Agree
2. All CESIS features are present when opened with different devices.	3.45	Strongly Agree
3. No system faults were encountered when opening CESIS with different devices.	3.15	Agree

Based on the findings, students perceive CESIS as portable and accessible across different devices without any system flaws. Portability is a crucial aspect of information system performance (Whitworth et al., 2006). Flexible access to services resulting from technology adoption leads to user satisfaction (Fjermestad et al., 2011, as cited in Mina et al., 2021). A user-friendly interface system is essential for high levels of service-oriented satisfaction (Then, 2006).

Table 6.1 displays the weighted means of each item on the CESIS Portability attribute. Students strongly agree (weighted mean of 3.60) that CESIS and its features are accessible on various gadgets (Item 1). Similarly, they agree (weighted mean of 3.45) that there are no system flaws when

accessing CESIS on different devices (Item 2).

IV. CONCLUSION

CESIS, functioning as an online enrollment system, demonstrated notable functionality and portability attributes. Primarily, it showed moderate quality attributes in reliability, usability, efficiency, and maintainability, as perceived by the CDU students officially enrolled in the Second Semester of Academic Year 2021-2022.

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