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Heuristic Usability Evaluation: A Case Study of Online Enrolment System of a State University

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***Keywords*— enrollment system, heuristic usability, interface, metaphors, models**

***Abstract*—** *The primary purpose of the study is to perform a thorough assessment of the user interface design of the Nueva Ecija University of Science and Technology's Online Enrollment System (NEUST-OES). From there, human-computer interaction concepts such as metaphors, models, appearances, and the overall interface structure and logic flow were evaluated using the Nielsen Ten Usability Heuristics as a model.*

The results of this study can be utilized for further system improvements, particularly on increasing user productivity and performance by structuring the elements based on design standards that follow cognitive psychology laws. The significant findings of this study were given to the developers of NEUST-OES so that they can use them as bases on improving the system user interface design. It is hoped that with these results, the system's user-friendliness and ease of use will be improved, hence, offering a smoother user interaction experience for both the students and the enrolling teachers.

I. INTRODUCTION

Rationale

The new normal has brought upon various changes in the way society does things. Due to the restrictions it imposes, online transactions have become the ideal option for consumers. Hence, organizations and businesses have been switching to online channels to accommodate their customer's needs. The conversion from face-to-face to online transactions also applies to the education sector. Schools have started to utilize online platforms to make their services available for their stakeholders.

To accommodate the changes and keep up with the new normal, the Nueva Ecija University of Science and Technology has come up with online solutions for its services, such as the Online Enrollment System. The system is designed to enable students from different campuses to enroll in the University in the comfort of their own homes.

The Nueva Ecija University of Science and Technology - Online Enrolment System (NEUST-OES) has been first implemented to handle online enrolment for the 1st Semester, S.Y. 2020-2021 and is continuously being utilized and improved. Thus, the researchers find it timely to conduct an interface design assessment through heuristic evaluation to further enhance the system.

The primary purpose of the study is to perform a thorough assessment of the user interface design of the Nueva Ecija University of Science and Technology's Online Enrollment System. From there, human-computer interaction concepts such as metaphors, models, appearances, and the overall interface structure and logic flow were evaluated using the Nielsen Ten Usability Heuristics as a model. [1]

The study results can be utilized for further system improvements, particularly in increasing user productivity and performance by structuring the elements based on design standards that follow cognitive psychology laws.

Incorporating the study results to develop an improved system user interface design can add to the system's user-friendliness and ease of use hence offering a smoother user interaction experience.

Related Literature

Human-computer interaction (HCI) plays an integral part in system design and development. Based on the various related studies mentioned above, the importance of human-computer interaction in maximizing usability, productivity, and user satisfaction can be established.

One aspect of HCI is applying metaphors, mental models, navigation, and appearance as essential design considerations as explored in the study conducted by Alexander and Ishak in 2018 [2]. They have proven that proper use and incorporation of such HCI components contribute to the increased user interactivity and engagement.

Another criterion, that the components mentioned above may impact, is the usability of the overall user interface design. In the context of HCI, Punchoojit and Hongwarittorrn (2017) have defined usability as contributory to productivity and performance [3].

Having established the usability definition, a proper tool to measure interface usability should also be considered. One of the most popular evaluation models is the Nielsen Ten Usability Heuristics which was developed in 1994. It may have been an old methodology, but it has been proven to be functional and effective in today's setting, as demonstrated in the study conducted by Kraweic and Dudycz in 2020. [4]

In relation to this, Iqbal (2020) has utilized the Nielsen Ten Usability Heuristics as the evaluation tool for the Uppsala University Student Portal. [5] Based on the results, the researchers were able to develop design guidelines to improve the user interface design. The findings reinforce the claims of the study made by Krawiec and Dudycz that even today, the Nielsen Heuristics can still be applied in usability evaluation.

Based on the analysis of the related studies above, it can be said that human-computer interaction (HCI) can indeed be a significant part of the whole design process. Properly chosen and applied metaphors, appearance, mental models, and other HCI components that make up the interface design can enhance the user experience by increasing productivity, engagement, and interactivity. Moreover, the validity of the Nielsen heuristics has also been verified. Therefore, the study of evaluating the Online Enrollment System using Nielsen Ten Usability Heuristics is feasible in terms of the proposed scope, the purpose, and the methodology.

Statement of the Problem

The study aims to assess the Nueva Ecija University of Science and Technology's Online Enrollment System's interface design and its impact on user interactivity. In relation to this, the researcher seeks to answer the following questions:

1. How can the user interface of the NEUST Online Enrollment System be assessed using Nielsen's Ten Usability Heuristics for interface design?
2. What are the possible impacts of the heuristic evaluation results to the overall system improvement?
3. How can the University utilize the results of the study for system enhancement?

II. METHODOLOGY

The research study intends to perform a heuristic evaluation on the NEUST Online Enrollment System using the Nielsen's Ten Usability Heuristics tool. As Nielsen (1994) defines it, a heuristic evaluation is used to find usability problems in a user interface design to provide better information for improvements [6]. Although a panel of experts usually does a heuristic evaluation, the researchers have surveyed the users to grasp better what the users think and experience while using the system.

The researchers employed convenience sampling technique. As defined by Saunders (2012), convenience sampling is a non-probability sampling method that considers a sample population that is convenient for the proponents to connect and reach out to [7]. In addition, Luciano (2020) stated that this type of sampling carefully considers the availability and willingness of the respondents to participate in the study [8]. An online questionnaire was distributed to four hundred twenty-eight (428) respondents comprised of students and enrolling teachers.

The population size has been validated using Slovin's formula, where the ideal sample size recommended was three hundred twenty-two (322).

The questionnaire was comprised of ten practical questions about their usability experience based on the Ten Usability Heuristics. The respondents were asked to rate each criterion based on the table shown below.

Table 1. Likert Scale for User Evaluation

Scale	Verbal Description
4	Strongly Agree
3	Agree
2	Slightly Agree
1	Disagree

For the interpretation and consolidation of the final results, the researchers used weighted mean to compute and generate a summary of all the responses from the respondents. The range and verbal description of the final results were described in the table below.

Table 2. Likert Scale for Final Results

Scale	Range	Verbal Description
4	3.26 – 4.00	Very Satisfactory
3	2.51 – 3.25	Satisfactory
2	1.76 – 2.50	Poor
1	1.00 – 1.75	Needs Improvement

III. FIGURES AND TABLES

Figure 1 shows the ratings given by the respondents as regards the visibility of the system status. There are 179 responses (41.8%) who strongly agreed. Then, 216 (50.5%) agreed, 28 (6.5%) find it slightly agreeable, while there are 5 respondents (2%) who disagreed about the system having its status information readily available.

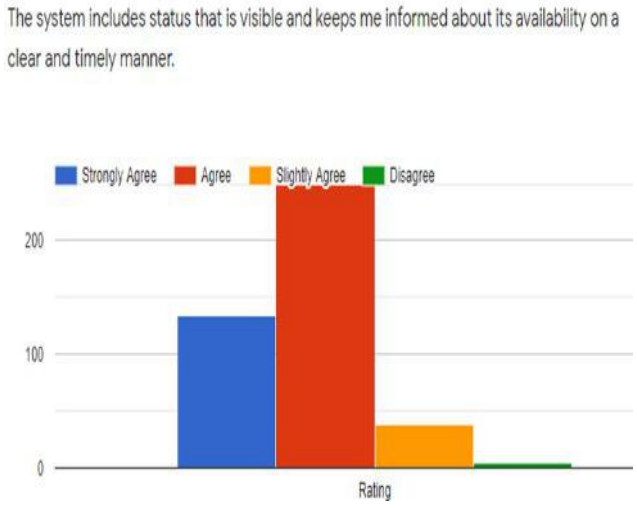

Fig.1: Visibility of System Status

Figure 2 shows the results about the user-friendliness of the system with regards to the choice of words and terminologies. There are 199 (46.5%) strongly agreed with the statement, 196 (45.8%) agreed, and 33 respondents (7.7%) slightly agreed, and no one disagreed.

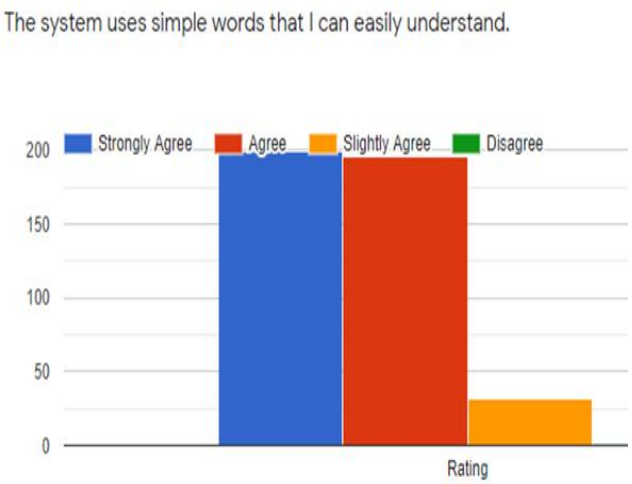

Fig.2: Match between system and the real world

Figure 3 shows the response summary about user control and freedom. There are 152 (35.5%) Strongly Agree responses, 224 (52.3%) agreed, 49 (11.5%) slightly agreed, and 3 (0.7%) disagreed.

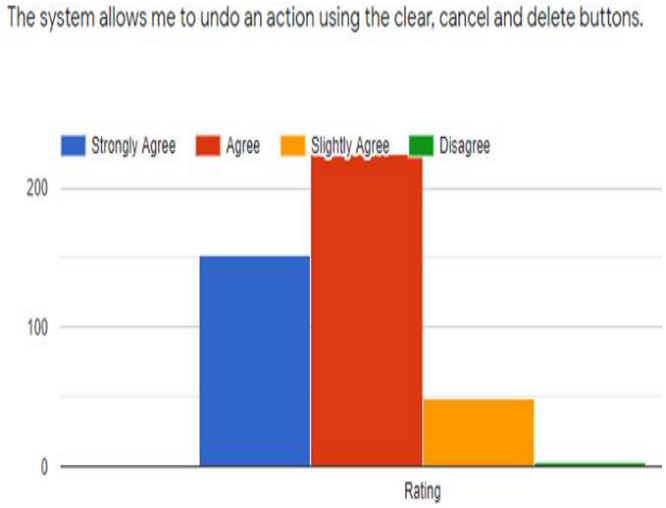

Fig.3: User Control and Freedom

Figure 4 presents the earned ratings of the consistency and standards criterion. There are 134 respondents (31.3%) strongly agreed that the OES uses the standard design and controls, 241 (56.3%) agreed, 48 (11.2%) slightly agreed, while 5 (11.7%) disagreed.

The system uses standard design and controls similar to other applications I am using which make it less confusing.

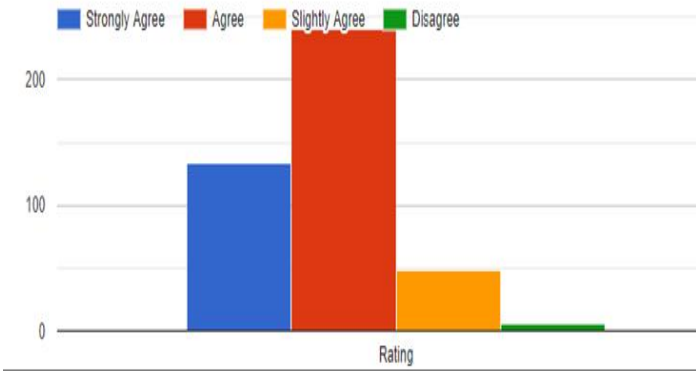

Fig.4: Consistency and Standards

Figure 5 shows the summary of responses regarding the error prevention capability of the system design. There are 152 (35.5%) Strongly Agrees, 231 (54%) agree on its error prevention capability, 41 (9.6%) slightly agreed, and 4 (0.9%) disagreed.

The system provides validation of my entries in important fields, thus, enabling me to minimize occurrence of errors when processing my enrollment.

Fig.5: Error Prevention

Figure 6 shows evaluation of the respondents with regards to the controls and navigation experience with the system. There are 163 (38%) who strong agreed on the easy recognition of buttons and functions, 217 (50.7%) agreed, 45 (10.5%) slightly agreed, and 3 (0.8%) disagreed.

The system elements such as buttons, interface, and functions are easy to recognize and to navigate.

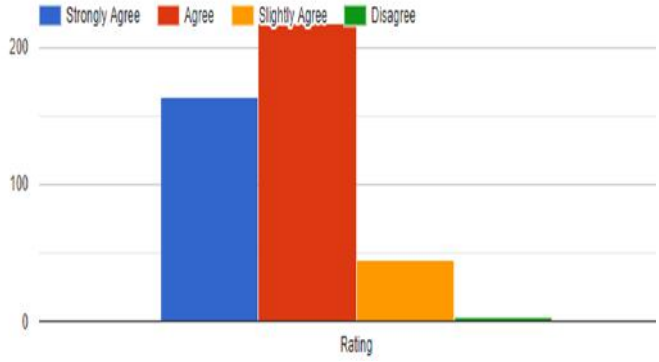

Fig.6: Recognition rather than recall

Figure 7 presents the results of the survey about system short-cuts that offer flexibility and efficiency. There are 156 (36.4%) strongly agreed on its availability, 213 (49.8%) agreed, 55 (12.9%) slightly agreed, and 4 (0.9%) disagreed.

The system allows me to use the usual short-cuts such as Ctrl+C (copy), Ctrl+V (paste), Ctrl+S (save), Ctrl+P (print).

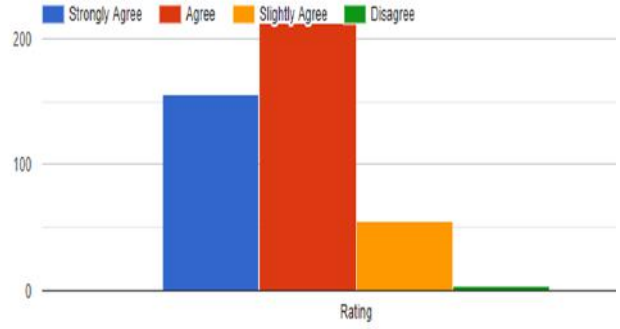

Fig.7: Flexibility and efficiency of use

Figure 8 illustrates the responses gained based on the adaptation of minimalist design. There are 147 (34.3%) strongly agreed that the system employs a simplistic design, 243 (56.8%) agreed, 35 (8.2%) slightly agreed, while 3 (0.7%) disagreed.

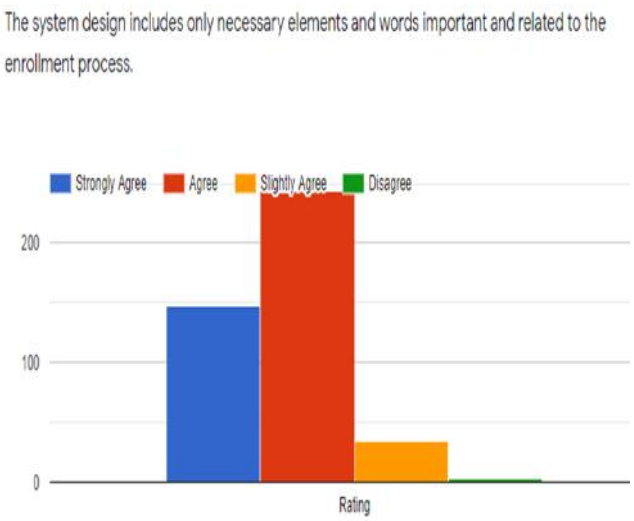

Fig.8: Aesthetic and minimalist design

Figure 9 illustrates the user responses about the user-friendliness and helpfulness of the error messages. There are 169 (39.5%) who strongly agreed that the system provides helpful error messages, 222 (51.9%) agreed, 35 (8.2%) slightly agreed, and 2 (0.4%) disagreed.

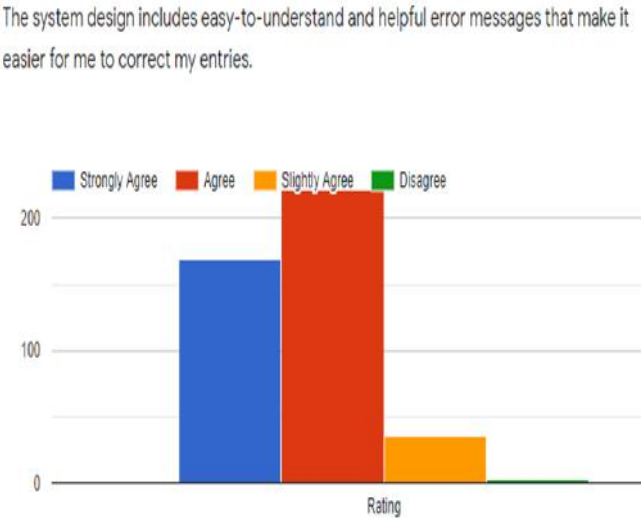

Fig.9: Help users recognize, diagnose, and recover from errors

Figure 10 shows the agreement level of the respondents with regards to the existence of help section and clear instructions. There are 179 (41.8%) strongly agreed, 216 (50.5%) agreed, 28 (6.5%) slightly agreed, and 5 (0.2%) disagreed.

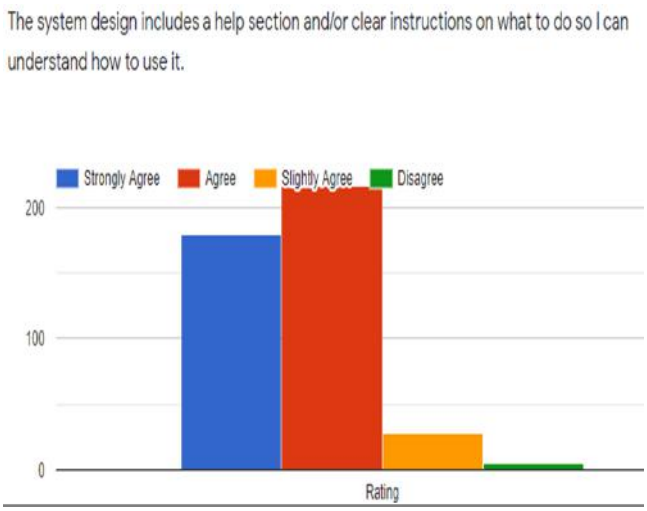

Fig.10: Help and Documentation

Table 3 below shows the summary of the findings of the study. The student-respondents evaluated the enrolment system with a Very Satisfactory rating as evidence by the computed weighted mean of 3.27. This result implies that the NEUST enrolment portal satisfies its users as far as the heuristic usability of the system is concerned.

Table 3. Summary of Results

Heuristic	Weighted Mean	Verbal Interpretation
Visibility of the system status	3.33	Very Satisfactory
Match between system and the real world	3.39	Very Satisfactory
User control and freedom	3.23	Satisfactory
Consistency and standards	3.18	Satisfactory
Error prevention	3.24	Satisfactory
Recognition rather than recall	3.26	Very Satisfactory
Flexibility and efficiency of use	3.22	Satisfactory
Aesthetic and minimalist design	3.25	Satisfactory
Help users recognize, diagnose, and recover from errors	3.30	Very Satisfactory

Heuristic	Weighted Mean	Verbal Interpretation
Help and documentation	3.33	Very Satisfactory
GRAND MEAN	**3.27**	**Very Satisfactory**

In particular, respondents evaluated the system "Very Satisfactory" on these areas: (1) help and documentation; (2) error recognition; (3) recognition rather than recall; (4) visibility; and (5) match in the real world.

IV. CONCLUSION

Based on the findings discussed above, the researcher was able to come up with the following conclusions:

For research problem number 1, the NEUST-OES garnered a Very Satisfactory result from the respondents' heuristic evaluation. Incorporating Nielsen's Ten Usability Heuristics, the researchers came up with relatable scenarios to help the respondents rate the system better.

For research problem 2, based on the findings, visibility of system status, the match between the system and the real world, recognition rather than recall, error recovery, and help and documentation are the strongest suits of OES in terms of usability and user experience. However, user control and freedom, consistency and standards, error prevention, flexibility and short-cuts, and aesthetics resulted in satisfactory results, which can prompt further improvement.

For research problem 3, the University can utilize the research results by coming up with a system design proposal based on the areas that need improvement presented in this study. Furthermore, the systems analysts, designers, and programmers can use the summary of products as a basis for design consideration as part of the continuous development and enhancement of the system.

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