An Implementation and Evaluation of Web-Based Appointment System for the Mindanao State University – Main Campus

Azimah D. Ampuan[1], Reymark Devila Delena[2]

[1,2]Faculty, Department of Information Sciences, College of Information and Computing Sciences, Mindanao State University – Main Campus, Marawi City, Lanao Del Sur, Philippines
Email: [1]azimah.ampuan@msumain.edu.ph, [2]reymark.delena@msumain.edu.ph

Abstract

The Office of the University President of the Mindanao State University in Marawi City has the reputation of being one of the busiest in the university. It handles a variety of concerns, ranging from employee matters to matters of concern coming from the other campuses in the university system. However, matters became greatly complicated when the pandemic began and the hard lockdowns that followed forced everyone to stay at home or work remotely. It was observed that an existing perennial problem at the Office of the President was a lack of an efficient system to handle appointments, which resulted in wasted time and tasks delayed or undone. Hence, the aim of the project was to improve client waiting time by implementing a web-based appointment system. The researcher used two (2) models: the System Usability Scale and Technology Acceptance Model to evaluate the system. As a result, the system has a high level of satisfaction with a percentage of 90.2 from the user based on the overall result from two (2) models used. Therefore, implementing a web-based appointment system will certainly improve client waiting time at the Office of the President and employees at the office can schedule appointments more conveniently.

Keywords: System Usability Scales, Technology Acceptance Model, Web-based Appointment System

1. INTRODUCTION

In life and in business one will often encounter a variety of appointments, be it a job interview, business meeting, or even just agreeing on a convenient time to meet up with old friends [1]. Appointments are important as it ensured that time will not be wasted and will be given the value that it commands. According to Qmatic from the article, The Guide to Appointment Scheduling [2] "Appointment scheduling removes friction by reducing waiting time." Many offices have plenty of visitors every day. If all these visits were solely walk-ins, a disordered environment is inevitable. The massive workloads which can occur during peak hours contribute to increased stress among employees.

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By enabling clients to schedule appointments, an office can improve the work environment. Setting an appointment creates opportunities for improved staff planning and will certainly avoid client dissatisfaction. Clients can schedule their arrival close to their appointment time, which can considerably improve their waiting time and therefore help to prevent crowds in the waiting room. This way, an office can keep control of the customer flow and optimize resources, while also reducing or even eliminating unexpected crowds.

Seemingly, offices often encounter dissatisfaction from clients because of the long waiting time. Clients complain about how tedious and time-consuming it was to make an appointment with employees, and the Mindanao State University – Main Campus specifically at the Office of the President is no exception. The Office of the President in Mindanao State University – Main Campus has a prevailing problem of a lack of an appointment setting system that contributed to clients wasting their time waiting to be entertained. Sometimes, clients were the ones who failed to show up or come on time to their appointments due to various reasons. Having an appointment system according to Dixie [3], was the simplest way to make sure clients do not need to spend time waiting at the premises and it gives employees less pressure. Additionally, having a systematic appointment will help and will certainly be able to accomplish key goals such as ensuring that offices have adequate time for planning and preparation for upcoming appointments and it was easy to achieve an appointment without spending time and money. According to Garry [4], from his article Online Scheduling System for an Independent Business Coach, he stated that "One obvious benefit you gain by using an online scheduling system was time. It was difficult to manage time especially if you were an independent consultant. You need to maintain everything starting from creating business plans, doing market research, discussing and delivering solutions to business problems, meeting clients and managing payment." With this statement, using a web-based appointment system will definitely help employees and clients manage their time as well as to accomplish tasks faster and more efficiently.

An appointment system was a solution that makes it easy for service providers to manage appointments. As stated in the article, Patient flow management for seasonal flu and COVID-19 vaccinations, Graham Gidley explained that an appointment booking system enabled you to keep the patient flow constant throughout the date, making slots available that match your capacity to provide service [5]. This way, you can prevent a rush of crowds in the lobby and other waiting rooms. Many service providers who implemented appointment systems, therefore, experienced improved operational efficiency. Appointment system was the simplest way to make sure your customers do not need to spend time waiting on premises until it was their turn to be served As John Wordingham expresses it in the article, Appointment scheduling: Beyond booking functionality; "Whether you were working in a company, a clinic or the public sector, appointment

scheduling creates opportunities for improved staff planning. You get a better overview of how many visitors arrive daily, enabling you to reduce their waiting time and to increase their customer experience [6]".

Therefore, this project was undertaken to apply quality improvement techniques to address the said problem in the Office of the President in Mindanao State University – Main Campus. The MSU Office of the President currently uses an appointment slip to schedule clients' visits but these were sometimes bound to be misplaced. Hence, the aim of the project was to improve client waiting time by implementing a web-based appointment system. Having a web-based appointment system was a solution that allowed companies, organizations, service providers, and professionals to manage their scheduling appointments more conveniently.

2. METHODS

The researcher used two (2) ways of methods to have an accurate measures of the study. The ways are; Evaluation and Validation of the project in order to have a valid evaluation and result of the study.

2.1. Evaluation

Consist of procedures and protocols that ensure systemization and consistency in the way evaluations are undertaken. Methods focus on the collection or analysis of information and data; attempt to describe, explain, predict or inform actions.

2.1.1. Technology Acceptance Model (TAM) Assessment Tool

The researcher used the Technology Acceptance Model (TAM) Assessment tool designed by Davis [7] to evaluate the testing period of the system for its primary respondents. The TAM Assessment Tool was a Likert Scale questionnaire which consisted of fifteen (15) items in which the items were subdivided into four factors. Four (4) items are for Perceived Ease of Use - the degree to which a person believed that using a particular system would be free from effort [8]. Four (4) items are for Perceived Usefulness- refers to the extent to which individuals believed how useful the technology would be [8]. Four (4) items are for Attitude Toward Using - to measure the feeling of the user to use the new system [8]. Lastly, three (3) items are for Intention to Use - which reflects a user's desire to use the system in the future [9].

2.1.2. System Usability Scale (SUS) Test Questionnaires

The researcher also used the System Usability Scale (SUS) Test questionnaire created by John Brooke [10] for the evaluation of the system testing period. SUS is one of the most efficient ways of gathering statistically valid data and giving a

system a clear and reasonably precise score. The System Usability Scale was a Likert Scale which includes 10 items which users of the system will answer [11].

2.1.3. TAM and SUS Overall Results

The researcher also evaluated the overall result of Technology Acceptance Model (TAM) and System Usability Scale (SUS) results based on the total weighted mean to determine user perception and to assess the overall acceptability of the system and for the reliability validation of measuring the system usability for the SUS.

2.1.4. Using of Two (2) Models

The researcher used two (2) models, the SUS and TAM to conduct a reliability evaluation of the implemented system. Applying one model was good, using many models was even better, particularly in complex problem domains according to the Harvard Business Review [12]. Using two models for analyzing the data will give an accurate result. For this project, the System Usability will give a valid result for the usability of the system while Technology Acceptance Model will give a valid result for the acceptability and adaptability of the system.

2.2. Validation

Is a process that is used to demonstrate the suitability of an analytical method for an intended purpose. Validation procedures have been developed by a variety of industrial committees, regulatory agencies, and standards organizations for purposes of quality control and regulatory compliance.

2.2.1. System Usability Scoring

The researcher used the following to calculate the given score of the users for the System Usability Scale Test Questionnaire where for every odd-numbered question from SUS ten (10) questions were subtracted, one (1) from the score (X-1) while for every even-numbered question from SUS ten (10) questions was also subtracted the score from five (5) (5-X). After that, add the score from even and odd-numbered questions. Then multiply the total with two point five (2.5). Then the total was the final Score of your System Usability Scale Scoring. The highest SUS Score was One hundred (100) and the standard average of SUS Score was Sixty-eight (68) according to Lewis, et.al [13]. Table 1 was a general guideline on SUS Score interpretation:

Tabel 1. SUS Score Interpretation

SUS Score	Grade	Adjective Rating
>80.3	A	Excellent
68 – 80.3	B	Good
68	C	Okay
51 – 68	D	Poor
<51	F	Awful

2.2.2. System Usability Scoring

The Likert Scale was named after American social scientist Rensis Likert [14]. Today, Likert-type scales were considered some of the best survey tools for researching popular opinions. As a result, they are often used for customer or user satisfaction surveys or marketing research surveys. In a Likert scale, a person selects one option among several that reflects how much they agree with a statement. The scale generally consists of five or seven balanced responses that people can choose from, with a neutral midpoint. The researcher chose the 5-point Likert Scale for the evaluation of the weighted mean of each result. The Survey Legend provides quality support to its users: 1–Strongly Disagree 2–Somewhat Disagree 3–Neither Agree nor Disagree 4–Somewhat Agree 5–Strongly Agree.

2.2.3. Weighted Mean Formula

The researcher used the weighted mean formula to validate the total of scores from respondents on the Technology Acceptance Model (TAM) assessment tool and the formula also was used for the result of TAM and SUS to have an overall result for the validation and reliability of the system acceptability and usability. Below is the formula of getting the weighted mean:

$$\bar{x} = \frac{\sum_{i=1}^{n}(x_i * w_i)}{\sum_{i=1}^{n} w_i} \tag{1}$$

Where,

　　W = weighted average

　　n = number of terms to be averaged

　　Wi = weights applied to X values

　　Xi = data values to be averaged

2.2.4. Weighted Mean on Five (5) Likert Scale

The researcher scaled the total weighted mean of each average of questionnaires on 5-point Likert Scale from the Technology Acceptance Model (TAM) Assessment Tools and for the overall result from TAM Assessment tool and SUS

questionnaires based on their total weighted mean. Table 2 is a general guideline on weighted mean average for five (5) Likert Scale interpretation:

Tabel 2. Scale of Weighted Mean on Five (5) Likert Scale

Legends	Weighted Mean	Likert Scale
1	1.00 – 1.80	Strongly Disagree
2	1.90 – 2.60	Somewhat Disagree
3	2.70 – 3.40	Neither Agree nor Disagree
4	3.50 – 4.20	Somewhat Agree
5	4.30 – 5.00	Strongly Agree

For reversed items in the Likert Scale, Table 3 is the given formula for getting the overall result on reversed scoring:

Tabel 3. Reversed Item Scoring on Five (5) Likert Scale

Likert Scale	Reversed Scoring
If (Strongly Disagree = 1)	5
If (Somewhat Disagree = 2)	4
If (Neither Agree nor Disagree = 3)	3
If (Somewhat Agree = 4)	2
If (Strongly Agree = 5)	1

3. RESULTS AND DISCUSSION

3.1. Test Result and Discussion on System Usability Scale (SUS)

The figure below shows the result of the weighted mean of each question on System Usability Scale (SUS) Test questionnaires.
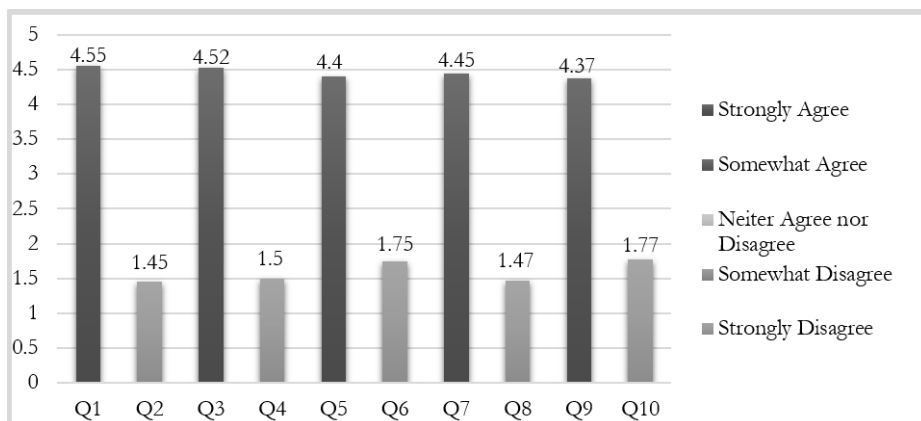

Figure 1. Weighted Mean of each SUS Test Questionnaire

Figure 1 shows the result of weighted mean in each test question on System Usability Scale (SUS). As shown in the figures, respondents were strongly agreeing with question number 1, with a 4.55 weighted mean, which means that respondents understand the content of the MSU Appointment System. For question number 2 it has a total weighted mean of 1.45 that fell on strongly disagree based on Likert scale, this demonstrates that respondents strongly disagreed that the MSU Appointment System was unnecessarily complex. For question number 3, as shown on the Likert Scale, the weighted mean 4.52 fell on strongly agree which means it was easy for the respondents to manage appointments and schedules on the MSU Appointment System. For question number 4, the total weighted mean was 1.5 and based on the Likert scale, it fell on strongly disagree, this means respondents strongly disagreed that they would need the support of a technical person to be able to use the MSU Appointment System. For question number 5, the total weighted mean was 4.4 and it fell on strongly agree, this means that respondents found the various functions on the MSU Appointment System well integrated and recognizable. For question number 6, the total weighted mean was 1.75 and fell on strongly disagree, this demonstrates that respondents thought there was too much inconsistency in the MSU Appointment System. For question number 7, the total weighted mean was 4.45 and fell on strongly agree based on Likert Scale, these mean respondents were strongly agreed that MSU Appointment System has a clear purpose. For question no.8, the weighted mean was 1.47, this showed that respondent strongly disagreed that they found the MSU Appointment System very cumbersome to use, as the total weighted mean fall on strongly disagree scales For question no.9, the total weighted mean was 4.37, and it fall on strongly agree on Likert scale, this means, respondent strongly agreed that they felt very confident using the MSU Appointment System. And lastly, for question no.10, the total weighted mean was 1.77, this demonstrates that respondent strongly disagreed that they needed to learn a lot of things before they could get going with the MSU Appointment System, as the total weighted mean fall on strongly disagree based on Likert scale.

The overall result of System Usability Scale (SUS) based on System Usability Scoring is shown in the Table 4.

Table 4. Overall Result for System Usability Scale (SUS)

	SUS Row Score	SUS Final Score
Weighted Mean:	34.35	85.87

Table 4 shows the overall result of System Usability Scale Test Questionnaire from the forty (40) respondents of the project. The SUS Raw Score was 34.35 and if multiplied by 2.5 based on the given way of calculating SUS, the final score was equal to 85.87 and based on the guideline on SUS Score interpretation, the

weighted mean 85.87 fell on Grade A with an adjective rating of Excellent as shown in the Table 5.

Table 5. SUS Score Interpretation

SUS Score	Grade	Adjective Rating
>80.3	A	Excellent
68 – 80.3	B	Good
68	C	Okay
51 – 68	D	Poor
<51	F	Awful

Therefore, implementing an Appointment System according to System Usability Scale (SUS) was excellent based on the evaluation calculated on System Usability Scoring as it was beyond the standard average of SUS score which was 68. Overall, implementing an Appointment System was an excellent idea, reliable and usable for its primary respondent of the project based on the overall evaluation on System Usability Scale result.

3.2. Technology Acceptance Model (TAM)

Figures followings were the discussion of each and overall results of Assessment Tools on Technology Acceptance Model (TAM) which was divided into four (4) factors to determine user perception and to assess the overall acceptability of the system. These were the Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitude Toward Using (ATTITUDE) and lastly, the Intention to Use (ITU) of the participants in the system.

3.2.1. Perceived Ease of Use (PEOU)

The degree to which a person believed that using a particular system would be free from effort [8]. Therefore, figure below were the overall test result and discussion for Perceived Ease of Use Test Questionnaires.
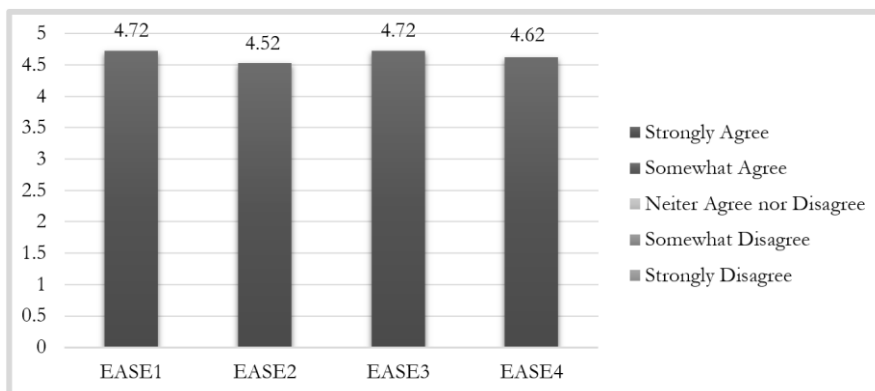

Figure 2. Weighted Mean of each PEOU Test Questionnaires

Figure 2 showed the discussion of overall result on PEOU Assessment that accordingly to figure 3.2 on PEOU test questionnaire no.1 and no.3 the weighted means was 4.72 and according to the Scale on Likert as shown in Table 2, 4.72 falls on Strongly agreed scales, this means that MSU Appointment System was strongly agreed found that it was easy to use and also, strongly agreed that the interaction with the MSU Appointment System was clear and understandable. for the PEOU test questionnaire no.2, the weighted mean was 4.52 in which it falls on strongly agree also, this means respondents were strongly agreed that learning to operate this MSU Appointment System was easy, while for PEOU test questionnaire no.4, the weighted means was 4.62 and falls on strongly agree also based on Likert Scale, this means, respondents were strongly agreed that MSU Appointment System would be easy to find information at the Appointment System.

3.2.2. Perceived Usefulness (PU)

Refers to the extent to which individuals believed how useful the technology would be [8]. Figure below were the overall test result and discussion for Perceived Usefulness Test Questionnaires.
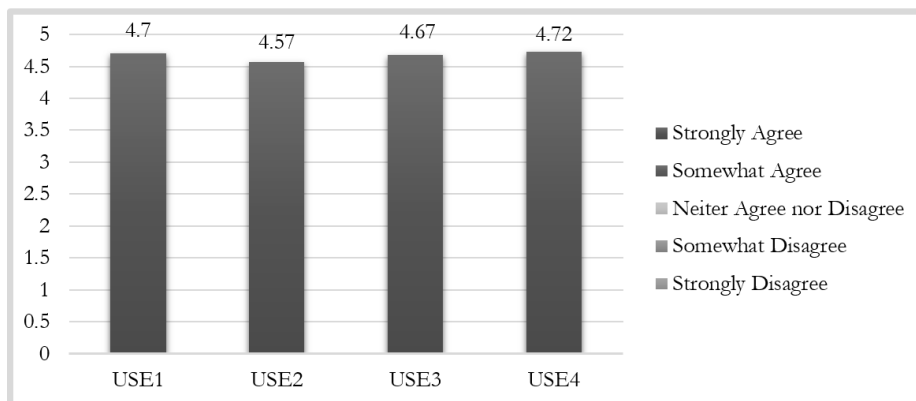

Figure 3. Weighted Mean of each PU Test Questionnaires

Figure 3 showed the discussion of overall result on PU test questionnaires that accordingly to figure 3.3 on PU test questionnaire no.1, the weighted mean was 4.7, and accordingly to the Table 2 Likert Scale, the mean fall on strongly agree scale, which mean it was strongly agreed that using the MSU Appointment System would enhance the effectiveness on setting an appointment with client and Reservation on Schedule. And PU test questionnaire no.2, the weighted mean was 4.57 and according to the Scale on Table 2, 4.57 fall on Strongly agree scales, this means that using the MSU Appointment System was strongly agreed that it would improve management performance. And for the PU test questionnaire no.3, the

weighted mean was 4.67 and fall on strongly agree also, this means it was strongly agreed that using the MSU Appointment System would increase the productivity for respondents. While PU test questionnaire no.4, the weighted mean was 4.72 and according to the Scale, the total weight falls on strongly agree scales, this demonstrate that the system was strongly agreed that respondent found the MSU Appointment System useful.

3.2.3. Attitude Toward Using (ATTITUDE)

To measure the feeling of the user to use the new system [8]. Therefore, figure below were the result of assessment for the ATTITUDE test questionnaires.
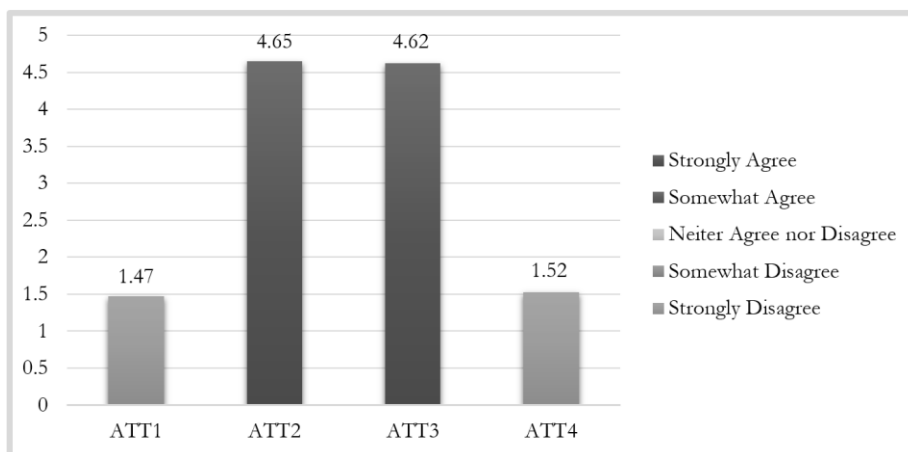

Figure 4. Weighted Mean of each ATTITUDE Test Questionnaires

Figure 4 showed the discussion of overall result on ATTITUDE test questionnaires that accordingly to figure 3.4 on ATTITUDE test questionnaire no.1 and no.4, the weighted mean was 1.47 and 1.52 and according to the Scale range on Table 2, it falls on Strongly Disagree scales, this means that respondents was strongly disagreed of disliking the idea of using the MSU Appointment System and it was strongly disagreed that using the MSU Appointment System was a foolish idea. For test questionnaire no.2, the weighted mean was 4.65 and it fall on strongly agree Scale, this means that respondents have a generally favorable attitude toward using the MSU Appointment System, while ATTITUDE test questionnaire no.3, the weighted mean was 4.62 and according to the Likert Scale, the average fall on strongly agree scales, this demonstrate that respondents were believed that it would be a good idea to use the .MSU Appointment System for work.

3.2.4. Intention to Use (ITU)

Reflects a user's desire to use the system in the future [9]. Therefore, chaet below were the result of assessment for the ITU test questionnaires.
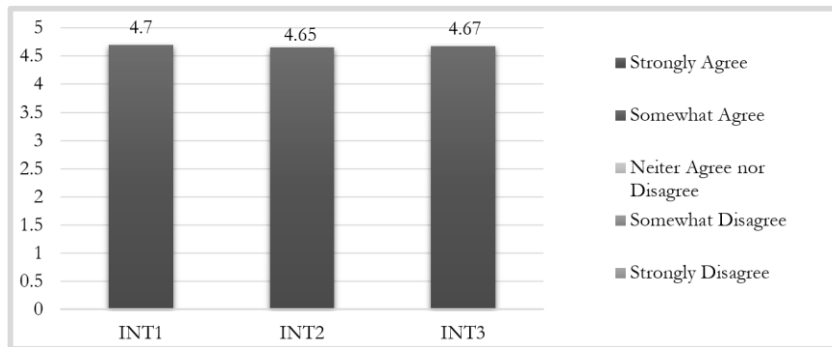

Figure 5. Weighted Mean of each ITU Test Questionnaires

Figure 5 showed the discussion of overall result on ITU test questionnaires that accordingly to figure 3.5 on ITU test questionnaire no.1, no.2 and no.3, the weighted mean was 4.7, 4.65 and 4.67 and according to the Likert Scale on Table 6, it all falls on Strongly agree scales, this means that respondents were strongly agreed to intended to use the MSU Appointment System and it were strongly agreed to return to the MSU Appointment System often. And lastly, respondents strongly agreed that respondent intended to visit the MSU Appointment System frequently for work.

3.2.5. Overall Result for Technology Acceptance Model (TAM)

Based on Technology Acceptance Model Evaluation and result conducted by the researcher showed that implementing an appointment system was reliable and acceptable that will help the clients, the employee to conveniently access and choose to make an appointment that improved client waiting time and manage their scheduling appointments more conveniently at the MSU office of the President. As shown in the Figure 6, it showed the overall result of the TAM assessment tool from the scoring of students for fifteen (15) items TAM test questionnaires.

Tabel 6. Scale of Weighted Mean on Five (5) Likert Scale

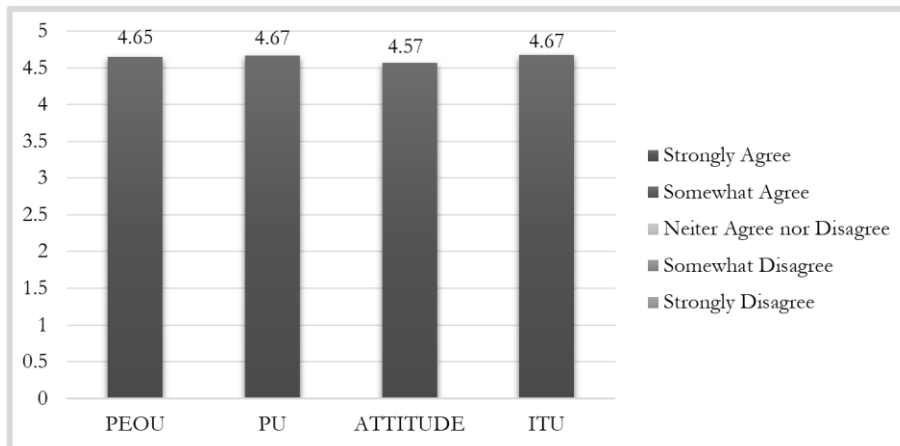| Legends	Weighted Mean	Likert Scale
1	1.00 – 1.80	Strongly Disagree
2	1.90 – 2.60	Somewhat Disagree
3	2.70 – 3.40	Neither Agree nor Disagree
4	3.50 – 4.20	Somewhat Agree
5	4.30 – 5.00	Strongly Agree

Figure 6. Total Wieghted Mean of each TAM Factors

Figure 6 showed the overall result for the TAM assessment tool from respondent scoring on the researcher provided questionnaire for TAM. That Perceived Ease of Use has a total weighted mean of 4.65, and it showed on the Likert Scale it falls on strongly agree, these mean, it was strongly agreed that the system was easy to use. And for the Perceived Usefulness, the total weighted mean from four (4) test questionnaire for PU was 4.67, and if you scale it on the table 4, the scales fall on strongly agree also, this specifically mean, it was strongly agreed and believed that implementing an MSU Appointment System was useful. And for the Attitude toward using of the system, the weighted mean was 4.57 and it fall on strongly agreed also, this demonstrates that the feeling of the user to use the new system was strongly agreed. For the Intention to Use, the weighted mean was 4.67 and if you scaled it on the table above, it falls on strongly agreed, this also means, that user's desire to use the system in the future was strongly agreed. Therefore, the overall weighted mean on Technology Acceptance Model was 4.64 as shown in the Table 7. And if you scaled it based on the Likert Scale on Table 2, it also falls on Strongly Agree, this specifically means that respondent have a strong favorable and inclination toward using the system.

Tabel 7. Total Wieghted Mean of each TAM Factors

	Total Weighted Mean
Perceived Ease of Use (PEOU)	4.65
Perceived Usefulness (PU)	4.67
Attitude Toward Using (ATTITUDE)	4.57
Intention to Use (ITU)	4.67
TAM Overall Weighted Mean	4.64

3.3. Discussion on the Overall Result of Two (2) Models: SUS and TAM

To have an overall evaluation of the system, the researcher discussed the overall evaluation on System Usability Scale (SUS) and on the overall evaluation on Technology Acceptance Model (TAM) using the formula of weighted mean to have an overall result for the reliability of the system. Based on the weighted mean formula, the total weighted mean on System Usability Scale was 4.38 and for the Technology Acceptance Model the total weighted mean was 4.64 as shown in the Table 8.

Tabel 8. Total Wieghted Mean of each Model

	Total Weighted Mean
System Usability Scale (SUS)	4.38
Technology Acceptance Model (TAM)	4.64
Overall Total Weighted Mean	4.51

Weighted Mean 4.38 was fall on Strongly Agree based on Likert Scale while weighted mean 4.64 fall on Strongly Agree also. This specifically demonstrate that the overall result of System Usability Scale based on weighted mean formula on Likert Scale was that respondents were strongly agreed with the usability of the system while for Technology Acceptance Model based on weighted mean formula on Likert Scale, respondents were strongly agreed also with the adaptability and acceptability of the system. Based on the result also, the total weighted mean of each model was different, this means Technology Acceptance Model has a high weighted mean rather than on System Usability Scale, this showed that respondents have high level on the acceptability of the system rather than on the usability of the system based on the weighted mean formula, but overall, both weighted mean of each model falls on strongly agree based on Likert Scale. This specifically means, both models have high a level of agreeable with the usability and acceptability of the system. Further for the overall result of the used two (2) model for the evaluation and validation of the system where respondents have a more inclination toward the usability and acceptability of the system based on the total result on Technology Acceptance Model and System Usability Scale as shown in the Table 7. And for the overall total of two (2) models as shown in Table 8 which has a total weighted mean of 4.51, and based on Likert Scale, total weighted mean 4.51 fall on Strongly Agree as shown in the Table 9.

Tabel 9. Scale of Weighted Mean on Five (5) Likert Scale

Legends	Weighted Mean	Likert Scale
1	1.00 – 1.80	Strongly Disagree
2	1.90 – 2.60	Somewhat Disagree
3	2.70 – 3.40	Neither Agree nor Disagree
4	3.50 – 4.20	Somewhat Agree
5	4.30 – 5.00	Strongly Agree

Furthermore, the project Entitled "A Web-based Appointment System for Office of the President in Mindanao State University – Main Campus" was a software solution that fulfill the satisfaction of the users as the overall result showed that users of implemented system were strongly agreed with the implementation of the project with an overall total weighted mean of 4.51 based on System Usability Scale and Technology Acceptance Model. Comparable with the study of Debajyoti Pal, et.al (2020), Perceived usability evaluation of Microsoft Teams as an online learning platform during COVID-19 using system usability scale and technology acceptance model in India [15], using two model for analyzing the data will give an accurate result. While applying one model was good, using many models was even better, particularly in complex problem domains according to the Harvard Business Review [16]. For this project, System Usability Scale will give result that was valid – it can effectively differentiate between usable and unusable system, it was the very easy scale to administer the respondents and also will give a reliable result while Technology Acceptance Model will lead the project to a better prediction of the use of new information resources, it can lead to better productivity of the system. Both models used in the project the SUS and the TAM have high levels of reliability of the system, as users were strongly agreed with the usability of the system based on result on SUS evaluation and excellent based on Adjective Scoring on System Usability Scoring while strongly agreed also on the acceptability and adaptability of the system based on the result on TAM evaluation. Further implementing an Appointment System was reliable as the users had a stronger favorable and inclination toward using the system.

4. CONCLUSION

The capstone project entitled "A Web-based Appointment System for Office of the President in Mindanao State University – Main Campus" was a software solution that satisfies the users of the implemented system. It successfully met the major requirements of the end-users; the purpose of the system was fulfilled. The system was able to meet the user's wants, needs and satisfaction based on the results from the System Usability Scale and Technology Acceptance Model because the overall result showed that most respondents strongly agreed with the implementation of the project which resulted to a descriptive rating of excellent according to the System Usability Scale and the implemented appointment system was strongly reliable and acceptable based on the result of the evaluation on technology acceptance of the system where it was shown that participants have a strong inclination towards using the system. Based on the findings, users were favorable toward the usability and acceptability of the system based on the overall results on Technology Acceptance Model and System Usability Scale in which

both have a high level of agreeable. Overall, the reliability of the system has a high level of satisfaction with an average percentage of 90.2 from the users based on the overall result from two (2) models used. Therefore, implementing a web-based appointment system will certainly improve client waiting time when meeting the employees of the Office of the President and will allow them manage their appointments more conveniently as the overall result of finding proved that users have a strong and positive opinion regarding the usability and acceptability of the system.

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