

e-Learning Management System (e-LMS): A Comparative Analysis of Socio-Demographic Differences

University Putra Malaysia (UPM) e-LMS in Focus

Mukhtar Abubakar

Department of Computer Science and Information
Technology,
Federal University Dutsinma Katsina, Nigeria
mabubakar2@fudutsinma.edu.ng

Haruna Abdu

Department of Computer Science
Federal University Lokoja
Kogi State, Nigeria
haruna.abdu@fulokoja.edu.ng

Mahammad Muntasir Yakubu

Department of Computer Science and Information
Technology,
Federal University Dutsinma Katsina, Nigeria
ymmuhammad@fudutsinma.edu.ng

Suleiman Mohammad Mammam

Department of Computer Science, University
Putra Malaysia
smmamman16@gmail.com

Abstract— Nowadays, web-Usability is becoming of paramount important to various organizations all over the world in carrying out their academic and non-academic activities at affordable cost, irrespective of distance, time or location. In spite of this, web designers and developers do not take into consideration socio demographic background of various website users, who happen to come from different parts of the world with different socio-cultural demographic background. In line with this shortcoming, the need to harmonize these differences into one perception is of great concern to the web designers, developers in general and website users in particular. In our efforts to carry out this investigation, in connection to the earmarked field, this study finds it imperative to look into non-functional requirements in designing and developing any system in general and usability factors in particular. As such, this research narrows it investigation to the usability factors subjected to Learning Management System (LMS) of University Putra Malaysia (UPM). This research further investigates how different users from different background of age, gender, internet experience, and faculty perceive the usability of UPM: LMS from 376 students' perspectives. This is achieved by employing WAMMI-Nielsen usability questionnaire. In addition, this research proposed a new UPM: LMS that was subjected through post- test and expert evaluation. It was found that, there is improvement in fitting the said difference users' perceptions into one particularly users with different age. Different internet

experience of users was found to be the common factor that needs to be considered between both the existing and the proposed UPM: LMS.

Keywords—e-learning; comparative analysis; socio-demography; universities; perception.

I. INTRODUCTION

Society at large, financial and educational institutions in particular nowadays demonstrate convincing and enthusiastic welcome to the benefits information technology (IT) brings to the present world of technology. To be more precise, the services IT renders to all fields of human endeavors, science and academic institutions in particular, are not only indispensable to our lives, but have also become part and parcel to our daily activities. Acknowledgment of these services could be seen in the way and manner applied IT devices are being used by different institutions across the world, for both academic and non-academic purposes, among these devices include, worldwide internet services, which are not only being witnessed but are wholeheartedly accepted and used as fastest ways of exchanging information from any part of the world, irrespective of distance, time or location, and at a very affordable cost. These internet services are e-learning, e-research, e-commerce, e-banking, e-payment, e-government and other e- transactions in existence and yet to be researched. In fact, these services being used by mankind, in our present world, convince the beneficiaries of these services to regard this world as a sort of global

village. [1] explained the importance of e-learning, thus, strategic planning and implementation and good governmental technology and institutions are vital for the successful implementation of e-learning. In view of this, it has now become necessary to develop usable e-learning system of various institutions to enable them run their activities in an easily manner.

In the course of this study, e-learning and Learning Management System are being interchangeable used, and for the sake of clarity, the two terms need some elaboration, in the sense that, e-learning and Learning Management System LMS are synonymous words used to mean the same thing, as through adoption of various I.T discoveries, e-learning metamorphoses and becomes part and parcel of Learning Management System LMS, as such LMS is a key software to e-learning. In this regards [2] defined e-learning as a software that automates the administration of events.

II. REVIEW OF THE RELATED LITERATURE

Within the frame work of the above outlined functions of LMS, and long the line of educational sector, people all over the world embrace LMSs and describe it as of paramount importance especially to the academic institutions. In spite that, LMS need to be subjected to further researches to make them more efficient to various institutions regardless to the fields of inquiry. Based on this, various studies have been conducted on LMSs some with specific reference to the people perceptions on the system as a whole or on their non-functional factors. Among the researchers carried out, include the work of [3] who investigated the perception of LMS from students point of view, In the investigation, a questionnaire evaluation techniques were adopted, which includes demographic factors, design factors, satisfaction level of navigation experience and user-interface factors. The result revealed that, too many features are correlated with the confusion features, navigation experience and user interface design satisfaction. Conversely, students and instructors' perception on confusion features factor does not affect their perception on layout consistent; rather it affects the remaining eight factors. However, consistent layout, visible hyperlink, knowing locations as well as explained features are termed to be correlated to each other; therefore, perception of each one affects the perception of the other. Moreover, confusion features, consistent layout, visible hyperlink, knowing location, well explained features and clear terms, significantly affect the navigation experience satisfaction and user interface design factors.

In a similar study conducted by [4] on the effect of gender differences in their perception behaviors, in the study three countries were selected from America, Asia and Europe, where 302 workers of airline industries were administered with the questionnaire. The result obtained showed that, there is no difference between the genders

toward the way they use email in their working places, rather differ in their communication behavior perception.

In another development, [5] conducted experiments to find out the effect of age on the perception of computer icons. A total of 51 users were subjected to the experiments comprised of 43 women and 8 men. The visual delicacy and brightness of their eyes were measured before and after the experiments. The size of icons small, medium and large were used, which correspond to 0.47, 1.067 and 1.42 degrees respectively, the result revealed that, there is high tendency for people with lower vision to experience difficulties with small icons, hence found it challenging when the icons are separated long distances apart from each other's. However, using big icons and placing them close to each

other can bridge the difference that exists between the low level and normal visions users in performing their task, as such the result of the study can be summarized as the "smaller and separated the icons are the lower the vision" whereas the "bigger and closer the icons are the higher the vision".

With reference to the above literature review pertaining to the people perception on LMS in general and usability factors in particular, which are the major factors of any LMS, as they can lead to successful implementation of any website. In line with the above objectives, coupled with the scope and limitation of this study, the research further narrowed its investigation with particular reference to the usability factors in relation to University Putra Malaysia, Learning Management System (UPM: LMS) The usability factors are Attractiveness, Controllability, Efficiency, Helpfulness, Learnability, Memorability, Error prevention and Satisfaction. These factors are Non-functional factors of usability which are derived from Nielsen and WAMMI usability evaluation instruments.

Records at our disposal show that, university Putra Malaysia inhabitants, comprises of under-graduates, and graduate students, lecturers, instructors as well as other academic and non-academic staff with different socio-cultural background, especially among international students. Based on these diversities among the inhabitants of university Putra Malaysia UPM, and the way they interact and intermingle among themselves and with university environment especially with their frequent use of the university LMS necessitates the need to design a usable UPM: LMS that could harmonize the existing diversities which is regarded as one of the current hurdles facing designers and developers of not only UPM: LMS but also those of other universities across the world. The Findings of these research will allow us know, whether there are significant differences on how users perceive UPM: LMS and to further examine the effect of socio-demographic background on the usability factors of UPM: LMS, besides that, website designers and developers will have an insight on how to develop a given website that

fits the different background and responsibility of the users. In support of this [6] suggested that, socio-cultural differences among the visitor of any LMS, requires technology that fits all the differences, so as to enable individual users of the system use the same system irrespective of their cultural differences. [7] further re-affirmed that, the technology model for designing and implementation of any LMS should merge individual perspectives by respecting users' strategic self-regulation and e-learning.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.822	0.823	8

III. METHODOLOGY

The research work adopted the WAMMI usability and Nielsen 2012 Usability factors, In merging the two factors efficiency and learnability are found to be common between the two factors as shown in figure 1 below thus, comprises of attractiveness, controllability, Memorability, efficiency, learnability, error prevention satisfaction and helpfulness. A questionnaire was used as means of collecting data, the questionnaire was divided into two parts comprising of demographic factors which are the independent variables and usability construct which are the dependent variables, thus each construct consists of 4 questions making 32 questions. In order to come up with an appropriate questionnaire, pilot study was carried out. Table 1 and 2 below shows the reliability result of the pilot and final study respectively.

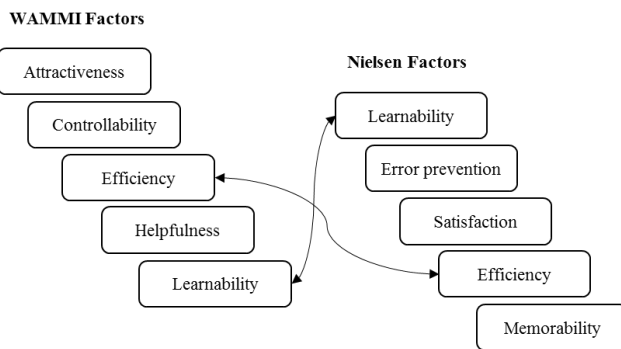


Fig. 1: WAMMI - Nielsen Usability factors.

From figure1 above, the WAMMI-Nielsen usability factors are derived and are the ones used for the study and named.

IV. PILOT STUDY

In this study, four faculties were randomly selected from the 15 faculties of university Putra Malaysia where 30 postgraduate students were subjected to the study and in the process of this research, comments, suggestions and ambiguities were met, and all possible corrections were

appropriately made before the result was taken into consideration. In addition to the pilot study, reliability and validity were used to determine the appropriateness of the questionnaire. According to [9] the value of alpha measures the internal consistency of the test and is defined as the number ranging from 0 – 0.9. [10] provides the following rules of thumb with their point > 0.9, > 0.8, > 0.7, > 0.6, > 0.5, < 0.5 with correspond with Excellent, Good, Acceptable, Questionable, poor, unacceptable respectively.

In this research, reliability test was conducted on the data procured from the pilot study and the results are showed below

TABLE I. PILOT STUDY

Table 1 above shows the reliability result of the pilot study and proves the questionnaire is good and appropriate for the study having the Cronbach alpha of 0.823.

TABLE2. FINAL SURVEY

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of items
0.896	0.897	8

Table 2 above shows the reliability of the final study with the Cronbach's alpha value of 0.897 thus, the value is appropriate for the study and has good reliability. Therefore, the results obtained in table 1 and 2 above shows that the Cronbach alpha result of both pilot and actual study is 0.823 and 0.897 respectively, hence it revealed that, the instrument embarked for the study is reliable and appropriate.

V. RESEARCH QUESTIONS

To achieve the said objectives of this research, there is need to ponder upon the research questions as describe below.

- Are the users of UPM: LMS with different socio demographic background of age, internet experience, faculty and gender perceive the dependent variables differently?
- Do different users perceive the existing UPM: LMS and the proposed one at the same level?

VI. HYPOTHESIS

- H1: Different gender (male or female) perceive the eight dependent variables of UPM: LMS differently.

- H2: Different users of different age perceive the eight dependent variables of UPM: LMS differently.
- H3: Different users of different internet experience perceive the eight dependent variables of UPM: LMS differently.
- H4: Different students (indigene or foreigners) perceive the eight dependent variables of UPM: LMS differently.
- H5: Different users perceive the existing and the proposed UPM: LMS differently.

VII. PROCEDURE AND PARTICIPANTS

The study was carried out in University Putra Malaysia from the students' point of view, where the university was divided into two clusters, cluster A and B, where Cluster A comprises of institute and B comprises of faculties. Simple random sampling was applied where cluster B happens to be the chosen cluster. There are 15 faculties in University Putra Malaysia and where labeled folded from A to O in a piece of paper. The labeled folded papers were thrown in a bowl to allow representation; thus, four faculties were randomly selected which happen to be faculty of economics and management, Engineering, Computer science and Sciences. To know the number of sample size slovins formula of [11] was applied:

$$n = N / (1 + Ne^2) \tag{1}$$

Where n = number of respondents

N= total population

e = error tolerance

$$n = 9585 / (1 + 9585 (0.05)^2)$$

$$= 383.9$$

$$= 384$$

The slovins formula was compared with (krejcie & Morgan, 1970) which shows that there is a negligible difference between the slovins formula and the krejcie & Morgan, thus slovins formula was taken into account. In order to get the exact sample size, 10% of the sample size was added which make the sample size to be 422.

A. Test of Nomality

Research has proved that, there are various methods that are used to determine whether a variable is normally distributed or not [12]. Q-Q plot and histogram is among

the ways that shows if data is normally distributed or not and this can be achieved by having all the cases in a straight line or within Q-Q plot line and dumb bell shape histogram as showed in appendix A.

To answer hypothesis H1-H5, one way (ANOVA) test was carried out with 95% confidence level and 5% margin error.

TABLE 3. ANALYSIS OF VARIANCE OF EXISTING UPM: LMS

Variable	Att	Help	Effi	Learn	Error	Sat	Contr	Mem
Gender	0.7 36	0.2 34	0.4 66	0.0 59	0.5 81	0.6 16	0.5 15	0.3 48
Age	0.2 26	0.6 91	0.9 20	0.1 01	0.0 43	0.8 23	0.6 04	0.4 73
Experience	0.8 22	0.4 50	0.4 91	0.6 62	0.1 86	0.5 66	0.5 01	0.1 11
Faculty	0.8 68	0.0 01	0.2 50	0.2 27	0.0 57	0.1 29	0.1 61	0.8 21

Significant at < **0.05**

Table 3 above, shows the result of hypothesis of H1-H5 with their point of interaction between the dependent and independent variables. All the dependent variables were found to be in-significant with the independent variables with the exception of error prevention and helpfulness which differ significantly with age and faculty respectively. Users of different age perceived the error prevention of UPM: LMS differently, therefore different age of people perceived severity of errors differently. Also, if a user finds it easy for him to rectify a login problem thus, another user may find it difficult for him to know that there is login problem. Among all the independent variables only helpfulness shows the difference between the paired mean exist in faculty as P=0.001 hence, we reject H0 and accept H1. Therefore, if a user find the system to be helpful to him another user may find the system to be unhelpful to him. Table 8 below shows the mean value of all the variables.

B. Control Variables

In order to evaluate the proposed UPM: LMS, there are certain factors that need to be considered, because some of the factors that were evaluated in the pre-tests may not be evaluated during the post test. Looking at table 4 below shows that, only 5 variables were evaluated out of 8. Memorability, learnability and efficiency were not evaluated as shown in table 4 below therefore, it is not possible for the users to memorize the features of the system for the first time of using the system, also learning is a process that requires time, however the users cannot learn the system for the first time, that is why learnability

factor was not evaluated as we cannot compare between the users that are already familiar with the existing UPM: LMS with the proposed one. Efficiency of the system refers to the time requires for the system to response without putting much effort, therefore the time requires for a given system to response to one user is in-comparable with the time requires for the system to response to 1000 users.

VIII. PROPOSED UPM - LMS

The result obtained from table 3 above shows that, there is need to enhance the existing UPM: LMS by designing a better LMS that fit all the difference into one, irrespective of users with different background. In order to achieve this objective, a proposed UPM: LMS was developed and tested by three usability experts and 30 students. Each one navigates through the proposed system and found that, the system is more usable as compared with the existing one. Table 4 below shows the ANOVA result of the proposed UPM: LMS. All the independent variable were found to be in-significant with the dependent variables with the exception of internet experience which differ significantly with helpfulness thus, this result reveals that, different users of different internet experience perceive the system differently therefore, if a user finds the system to be helpful to him another user may finds the other way round of not been helpful to him.

TABLE 4. ANALYSIS OF VARIANCE OF PROPOSED UPM: LMS

Variables	Att	Help	Error	Sat	Contr
Gender	0.665	0.132	0.379	0.391	0.343
Age	0.936	0.452	0.568	0.966	0.855
Internet Experience	0.444	0.030	0.147	0.91	0.070
Faculty	0.742	0.921	0.167	0.529	0.668

Significant at < 0.05

Table 4 above, shows the ANOVA test result of the proposed UPM: LMS which tested the same hypothesis of H1-H5. Upon all the usability factors, only helpfulness differs significantly with internet experience, this reveals that, different internet experience of users perceives the helpfulness factor differently hence, the proposed UPM: LMS was not helpful to the users in carrying out the learning activities.

IX. SUMMARY

The whole research work was summarized as described below.

TABLE 5. EXISTING UPM: LMS

NO	Hypothesis	Significant
1	Different gender (male or female) perceives the eight dependent variables of UPM: LMS differently.	No
2	Different users of different age perceive the eight dependent variables of UPM: LMS differently.	Yes-Error
3	Different users of different internet experience perceive the eight dependent variables of UPM: LMS differently	Yes - Help
4	Different students (indigene or foreigners) perceive the eight dependent variables of UPM: LMS differently.	No
5	Different users perceive the existing and the proposed UPM: LMS differently.	Yes - Error and Help

TABLE 6. PROPOSED UPM: LMS

NO	Hypothesis	Significant
1	Different gender (male or female) perceives the eight dependent variables of UPM: LMS differently.	No
2	Different users of different age perceive the eight dependent variables of UPM: LMS differently.	No
3	Different users of different internet experience perceive the eight dependent variables of UPM: LMS differently	Yes - help
4	Different students (indigene or foreigners) perceive the eight dependent variables of UPM: LMS differently.	No
5	Different users perceive the existing and the proposed UPM: LMS differently.	Yes - help

Table 5 and 6 above summarized the whole research, which lead to conclusion and recommendation for future research. With regards to hypothesis H2-H5, only users with different age and users from different faculties affect the perception of error prevention and helpfulness respectively whilst others perceptions remain insignificant. Similarly for the proposed system, all the independent variables were found to be insignificant with the exception of internet experience which differ significantly with helpfulness thus, different users with different internet experience perceived the helpfulness of UPM: LMS differently. Among all the factors, only helpfulness was found to be a common factor that differ differently from both the existing and the proposed system therefore, further research need to be carried out to find out what cause the differences.

X. CONCLUSION AND FUTURE WORK

From the findings of many researches on LMS, together with the comments and suggestions from numerous visitors of LMS, especially those linked to the educational sectors summed up the functions of LMS which include among others proper management of courses and programs, administrating course registration, scheduling of courses and many more. In any system, there are various users with different socio-demographic factors that use such a system therefore, there is great need to consider different background of users from different perception when designing or developing any system. The main challenges facing various designers when designing any system is how to merge different people perceptions into one irrespective of their background. This paper investigated how different users from different background of age, gender, faculty and internet experience perceive the usability of UPM: LMS from the eight usability factors i.e. attractiveness, helpfulness, efficiency, learnability, error prevention, satisfaction, controllability and memorability. A proposed UPM: LMS was developed with the aim of improving the existing one and comparisons were made between the two systems. Among all the dependent variables only age and faculty were found to differ significantly with error prevention and helpfulness respectively. Therefore, age and faculty are the most significant factors that affect different users of age and different users from different faculties; however, these different users of age and different users from different faculties have different perception on error prevention and helpfulness respectively. Furthermore, the proposed UPM: LMS was also evaluated using ANOVA test thus, the result obtained shows that, there is improvement on the gender and faculty in the perception of UPM: LMS hence, the two factors were found to be insignificant which allow different users of age and different users from different faculties to fit their different perception into one. Conversely internet experience was found to differ significantly with helpfulness with the P value of 0.030 hence, this lead to different users from different internet experience perceive the helpfulness factor in different ways. However, not all users have the same satisfactory level of both the existing and the proposed UPM: LMS, thus, some users find the system to be frustrating whereas some were satisfied with the system.

The current study is not without limitations, therefore there is need to conduct further research in the future. Firstly, in the post-test, the research should be expanded by adding more numbers of students and usability experts in evaluating the system. Secondly, undergraduate students should be considered as their socio- demographic factors may differ significantly from the postgraduate students by so doing; it will help the website designers to get more information about their own perception on the system. Thirdly instructors should also be on the further research line as their roles differ from the students' roles hence; there is tendency that, their perception will affect usability

of UPM: LMS. Fourthly, the research cannot be limited only to academic environment alike; extending the research to companies, industries and other organizations will no doubt help in designing a usable system. Lastly the research can also be extended to other institutions beside UPM.

REFERENCES

- [1] M. A. Embi, "E-learning in Malaysian higher education institutions: Status, trends, & challenges", 2011.
- [2] P. Cristiano, et al, "Learning Management Systems (Lms) And E-Learning Management: An Integrative Review And Research Agenda", JISTEM - Journal of Information Systems and Technology Management. Vol. 13, No. 2, Mai/Ago., 2016 pp. 157-180 ISSN online: 1807-1775 DOI: 10.4301/S1807-17752016000200001, 2016.
- [3] Management System. *International Journal of Software Engineering and Applications*, 4(5), 15–35. Retrieved from <http://airccse.org/journal/ijsea/papers/4513ijsea02.pdf>
- [4] D., Gefen, & D. W., Straub, "Gender differences in the perception and use of e-mail: An extension to the technology acceptance model". *MIS Quarterly*, 21, 389–400. doi:10.2307/249720, 1997.
- [5] T., Lindberg, R., Näsänen, & K., Müller, "How age affects the speed of perception of computer icons". *Displays*, 27, 170–177. doi:10.1016/j.displa.2006.06.002, 2006.
- [6] L., Damodaran, "User involvement in the systems design process-a practical guide for users. *Behaviour & Information Technology*", 15(March 2015), 363–377. doi:10.1080/014492996120049.
- [7] F., Klett, & P., Pharow, "How to achieve user satisfaction in complex E-learning environments". 7th International Conference on Information Technology Based Higher Education and Training, ITHET, 773–785. doi:10.1109/ITHET.2006.339699, 2006.
- [8] R. V., Krejcie, & D. W., Morgan, "Determining sample sizes for research activities". *Educational and Psychological Measurement*, 607-610, 1970.
- [9] L. J., Cronbach, "My current thoughts on coefficient alpha and successor procedures". *Educational and Psychological Measurement*, 64 , 391 418, 2004.
- [10] G. L., Koonce, & M. D., Kelly, "Analysis of the Reliability and Validity of a Mentor's Assessment for Principal Internships", 15(2), 33–48, 2014.
- [11] M., Ariola, "Principles and methods of research, slovin's formula", (7), 140-141, 2006.
- [12] Jennifer, Belinda. (2005) "Medical Statistic: A guide to data analysis and critical appraisals".

[13] ISO, "Ergonomics Requirements for Office Work with Visual Display", 9241-11, 1998.

APPENDIX

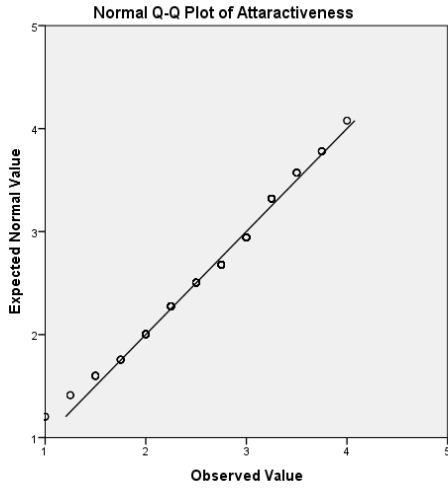


Figure A.1 Q-Q plots of Attractiveness

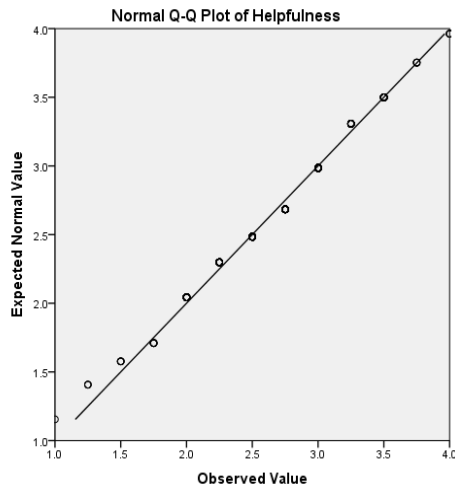


Figure A.2 Q-Q plots of Helpfulness

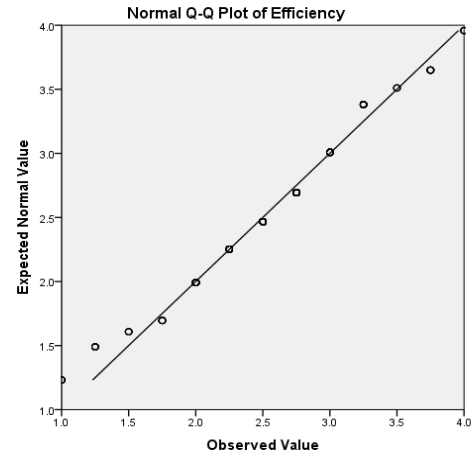


Figure A.3 Q-Q plots of Efficiency

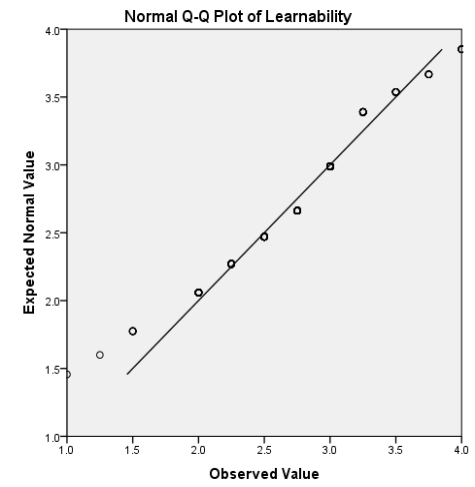


Figure A.4 Q-Q plots of Learnability

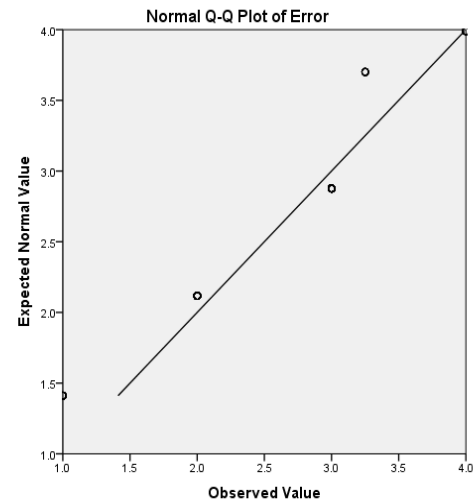


Figure A.5 Q-Q plots of Error prevention

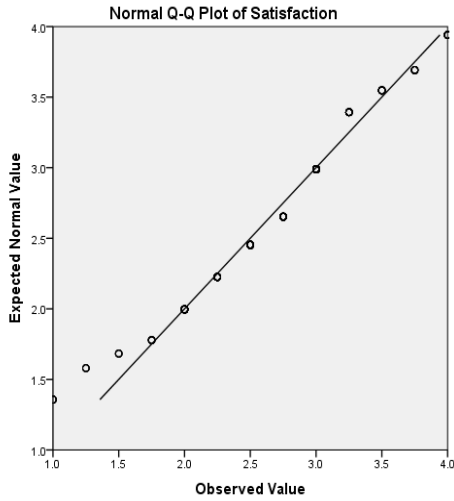


Figure A.6 Q-Q plots of Satisfaction

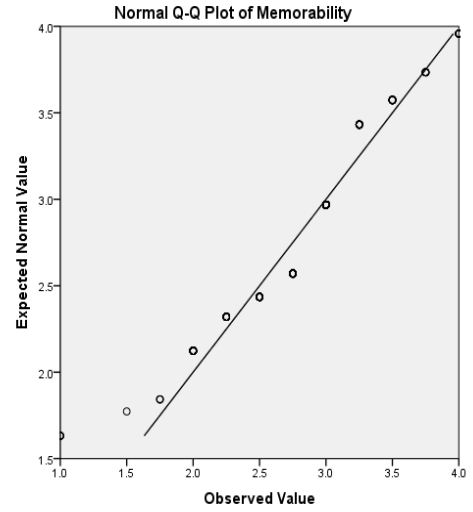


Figure A.8 Q-Q plots of Memorability

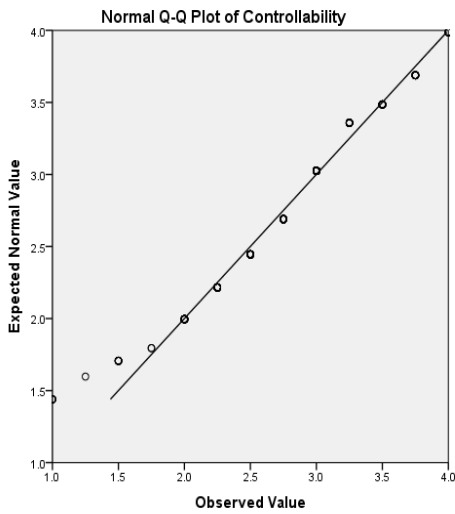


Figure A.7 Q-Q plots of Controllability

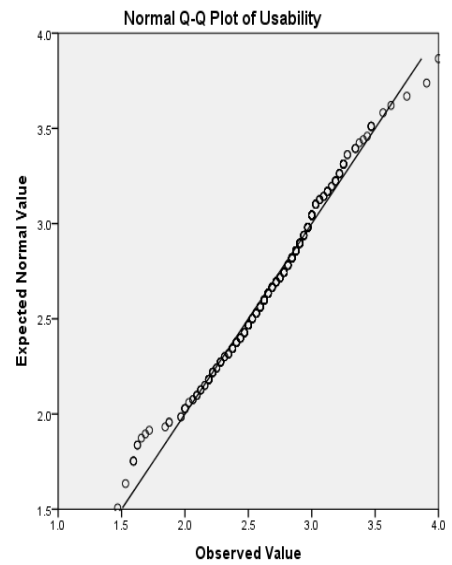


Figure A.9 Q-Q plots of Usability

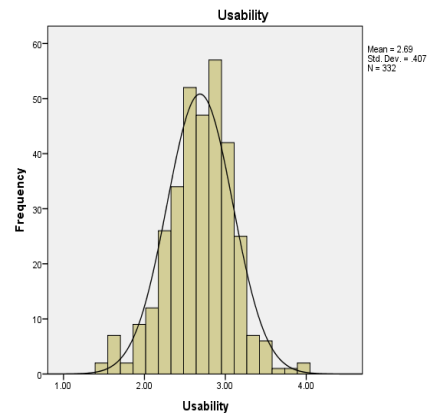


Figure A10 overall usability Histogram