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Ready, Click, Go! Evaluating the Readiness and Usability of an E-learning Portal from Students' Point of View

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Abstract: The world of education institutions has witnessed rapid developments in E-learning styles, especially in the past few years. These developments also included learning management systems (LMS). Such systems can be assessed using the technology acceptance model (TAM) and system usability scale (SUS). In this study, TAM and SUS were utilized to investigate the learning experience of engineering students on their LMS and their perception of its usefulness and accessibility. A field study of 200 users was conducted in this investigation. The results showed that 27% of students expressed a "good" and "excellent" usability experience with the LMS whereas 60% of students expressed an "average" experience. The results also showed that more than 50% of students agreed with the statements of perceived usefulness, but they were generally neutral with the ease-of-use of the LMS. Further, statistical results showed that students who had a positive experience with the LMS were statistically significantly more in agreement with its usefulness but not how easy it is to be used. This indicated that students could develop an attitude towards the LMS, thus affecting their actual use of the LMS. The study could potentially indicate the advantages and disadvantages of LMS's in terms of interaction and user experience from the students' point of view.

Keywords: E-learning, Education, TAM, SUS

Introduction

The teaching and learning processes are evolving swiftly worldwide now, transforming students and lecturers from traditional classrooms to virtual environments (Manasrah, et.al, 2022). This transformation was pushed by the availability of cheap communication devices like smartphones, tablets, and laptops as well as the accessibility of many free online platforms like YouTube, Facebook, Moodle, and others (Maziriri, et al., 2020; Turnbull et al., 2021). E-learning and distance learning are not new to education systems; however, they have gained plenty of attention after the COVID-19 pandemic has forced many communities to lockdowns (Qazi et al., 2021). Many schools and higher education institutes were forced to switch to online teaching globally in an effort to fight back the spread of the virus. As a result, many online platforms were adopted to deliver educational contents to different fields and sciences (Alkhalil et al., 2021).

However, with many free and commercial online platforms out there, the question remains: which of those platforms provides the optimal user experience? The optimal experience can be defined in the form of practicality, or ease of use for example. Or it can be defined in the form of fluency and minimal bugs. This question can *only* be answered from the users' point of view. In this case, students and teachers normally represent the largest section of educational online platforms users. Students, on one side, perceive the leaning process by achieving the offered activities like quizzes, assignments, and tests online. Therefore, they prefer user-friendly interface and a satisfying experience (Abdullah et al., 2021; Derbas et al., 2023). On the other hand, teachers and lecturers look for platforms that provide little technical problems and smart user interface (Jaber et al., 2021).

However, we can safely assume that students are considered the number one user for such platforms, especially when it comes to using learning management systems (LMS) as online educational portals. Therefore, getting students' feedback on LMS's can be a good tool to improve the quality of the portals which, in turn, may help improve the students' performance and productivity in their courses. The most common way to collect feedback is by performing online surveys. There are many survey templates out there that may or may not serve the purpose of such studies. However, certain surveys were designed to measure the usability of websites and online applications. The most common of which are: system usability scale (SUS) and technology acceptance model (TAM). Admittedly, the latter has been usually used to study factors that influence users' intention to use a certain product (Aburbeian et al., 2022). In this case, LMS is also considered an online product that students use. SUS is essentially a questionnaire that was developed in 1986 and still is widely used today (Vlachogianni & Tselios, 2022). TAM is also a questionnaire model that was developed in 1989 and the main purpose of it was to emphasize the idea that users do not use products based on the features but rather on their experience with the product (Oyman et al., 2022). These two survey models can be used to evaluate the readiness and usability of educational platforms and LMS.

Although many research studies have proposed comparisons between different educational platforms, there is still very little research covering the aspect of system usability of LMS using subjective industry-standard measuring scales. In this study, we launch an investigation on one of the most commonly used educational online platforms on the market; Moodle (Manasrah et al., 2023). The purpose of this study is to show how well Moodle is perceived by students, and whether their experience actually improved their academic performance. We hypothesize that students who perceive the usefulness of the LMS will have a positive behavioral attitude towards it which in turn affects their academic performance. To do so, SUS and TAM are used as reliable measures of the usability of Moodle. The study will help us explore the advantages and disadvantages of Moodle using the students' point of view. The study will also give insightful information about Moodle as an LMS in terms of interaction and user experience.

Background

E-learning and distance learning have proved to be the most optimal teaching approaches since 2019. Of course, the rise of these teaching techniques was supported by the continuous improvement of online teaching platforms like Microsoft Teams, Moodle, Canvas, and many others. Therefore, those platforms have been the subject of many research studies that investigated the platforms' capabilities to provide better interaction for students. For instance, a previous study investigated the effect of preparing test questions using Moodle platform on the teachers' overall performance in developing test questions (Sastrawijaya et al., 2019). The results showed that there was a strong correlation between them. A more recent study showed that Microsoft Teams' usability scale is strongly correlated with the technology acceptance model (Pal &Vanijja, 2020). It also suggested that usability of the platform is not the only decisive factor of the user experience. These results agree with previous findings where it was shown that the quality of information in e-learning affects students' satisfaction and perceived learning outcomes (Perez et al., 2020; García-Murillo et al., 2020).

There have been, however, other studies that investigated the usability of e-learning platforms from the teachers' point of view. One study investigated teachers' perceptions of using Moodle's activities toolbox (Badia et al., 2019). The results showed that Moodle can provide new educational scenarios which impacts the perceived learning. Another research also showed that Moodle efficiently supports teaching and assessment evaluation but did not show any significant effect on the interaction between teachers and students (Saw et.al, 2019). This shows that e-learning platforms can have advantages and disadvantages from teachers' perspectives (Manasrah et.al., 2021). A similar study discussed this point and showed that the main demotivating features from those platforms were: the additional workload, technical problems, plagiarism, and many others (Aikina & Bolsunovskaya, 2020). This aspect, particularly, led to another line of research where comparisons between

platforms have been conducted like in (Krašna & Pesek, 2020; Khaster, & Khaster, 2022). However, assessing a certain LMS from students' point of view needs should be focused on usability, readiness, and user experience. In other words, SUS and TAM surveys should be conducted. One of the studies showed that the quality and self-efficacy of the system affected the perceived usefulness (Fearnley & Amora, 2020). Another study also conducted an SUS survey on the using e-learning tools (Chu et al., 2020). The study had an 80% SUS score which is a positive indication of perceived usability.

The study presented here focuses on evaluating the readiness and usability of an e-learning portal (in this case, Moodle) from students' point of view. SUS and TAM surveys will be used to assess our hypothesis. This study is somewhat different from pervious ones since the main factor here is how LMS can influence students' academic performance based on their perception of it.

Method

In this section, the methodology of the surveys and the procedure are described. Two hundred students participated in the surveys, all of them from the college of engineering from the civil, electrical, mechanical, and alternative energy departments. The surveys were conducted online through Al Zaytoonah University of Jordan's (ZUJ) e-portal during the academic year 2021-2022.

SUS and TAM

System Usability Scale (SUS) is a survey model that was developed in 1986 by Johan Brooke (Brooke, 1996). The survey aimed to assess the usability of online websites and apps through a series of 10 statements. A five-point Likert scale is often used to answer these statements, ranging from "strongly agree" which takes five points (the highest score) all the way to "strongly disagree" which takes one point on the scale (the lowest score). The scale focuses on the on the usability of an online system from the user's point of view in order to compare it with other similar systems. The scale spits out a figure number that is between 0 and 100 which can be considered a benchmark of the system's usability. The higher the number, the better the score and the opposite is true. Table 1 shows the ten SUS statements that were used in this survey.

Table 1. System Usability Scale questionnaire.

Number	Statement
1	I think that I would like to use this system frequently.
2	I found the system unnecessarily complex.
3	I thought the system was easy to use.
4	I think that I would need the support of a technical person to be able to use this system.
5	I found the various functions in this system were well integrated.
6	I thought there was too much inconsistency in this system.
7	I would imagine that most people would learn to use this system very quickly.
8	I found the system very cumbersome to use.
9	I felt very confident using the system.
10	I needed to learn a lot of things before I could get going with this system.

The survey is structured in a way were the positive statements are presented in odd numbers and the negative statements are presented in even numbers. The students answer to each of these statments in the Likert scale, and then each one of the answers is given a score from 1 to 5 as mentioned earlier.The first step to calculte the SUS score is to collect the answers from all odd-numbered statements and substract 1 from each one of the asnwers (X-1). For example, if a student responded to statement 5 for instance with "agree" (i.e., score = 4 points), the score becomes 3 and so on and so forth.

$$SUS\ score = \left(\sum_{x=odd}^{10} (x-1) + \sum_{x=even}^{10} (5-x) \right) * 2.5$$

The second setp is to collect the answers from all even-numbered statements and then substract the answer score from 5 (5-X). This way, if a student asnwered "strongly disagree" to statement 10 for eample (i.e., score = 1), the score becomes 4. Then all the adjusted scores for each user are then added together and then multiplied by 2.5. Equation 1 summarizes the calculation process for each user. A score of 80 and above is considered

"excellent", whereas a score between 68 and 79 is "good". A score between 51 and 67 is "average" and a score below 51 is "poor".

The Technology Acceptance Model (TAM) is a survey model developed by Fred Davis in 1989 (Granić, and Marangunić, 2019). This model focuses on the users' perception and experience with the platform more than it focuses on its features and tools. In other words, the intention to use the platform depends largely on the students' attitude towards using it. This attitude is heavily influenced by the "perceived ease of use" and "perceived usefulness". However, the latter has a larger influence. The two terms are also affected by some external variables like word of mouth, friends and colleagues, and previous experiences. Figure 1 shows the full scheme of the TAM:

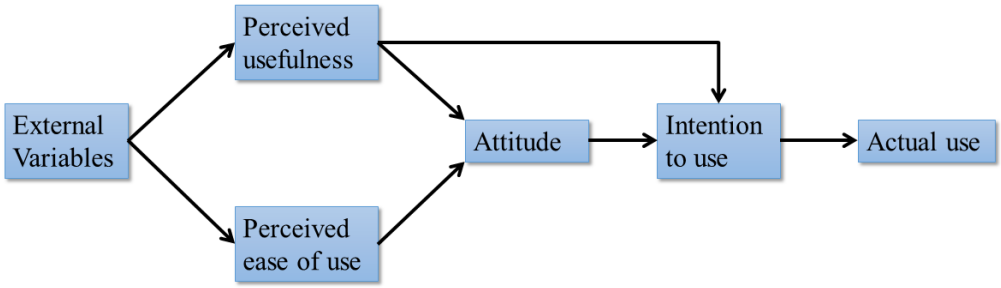

Figure 1. The scheme of technology acceptance model TAM (Bailey et al., 2022).

There are six survey statements for the perceived usefulness and perceived ease of use. Table 2 shows the statements that were used in this study.

Table 2.Technology Acceptance Model questionnaire.

Number	Perceived usefulness	Perceived ease of use
1	Using the LMS helps me complete tasks faster.	Learning how to handle the LMS would be easy for me.
2	Using LMS improves my HW performance.	I would find it easy to let the LMS do what I want it to.
3	Using LMS increases my productivity.	My interaction with the LMS would be clear and smooth.
4	Using increases my effectiveness at work.	I would find the lMS flexible to work with.
5	Using LMS makes it easier to do my job.	It would be easy for me to become agile with the LMS.
6	I would find this LMS useful at school.	I would find it easy to use.

Procedure and Participants

The surveys were conducted online originally to use them as an indirect assessment of the e-learning system at Al Zatytoonah University of Jordan (ZUJ). The results of the surveys would then be utilized in ABET self-study reports. The surveys would be announced to students in electronic formats across the e-learning portal and all social platforms. There was no time window for when students should fill in the surveys. Students from all engineering backgrounds at the ZUJ participated in this survey. Figure 2 shows the majors of the participants.

Results

The results of the system usability scale SUS showed an overall score for each student, based on the equation (1). An SUS score of 80 and above is considered "excellent" for the usability of the LMS, while a score between 68 and 79 is considered "good". A score between 51 and 67 is considered "average" and a score below 50 is considered "poor". Figure 3 shows the number of students in each category. The general results of the SUS survey showed that about 60% of students expressed an "average" usability experience with the LMS and about 27% expressed an experience between excellent and good. However, 12% of students experienced a "poor" encounter with the LMS. This is an indication of usability where the LMS basically does the job, but not quite. It is an understandable result given that university students were the main "users" here.

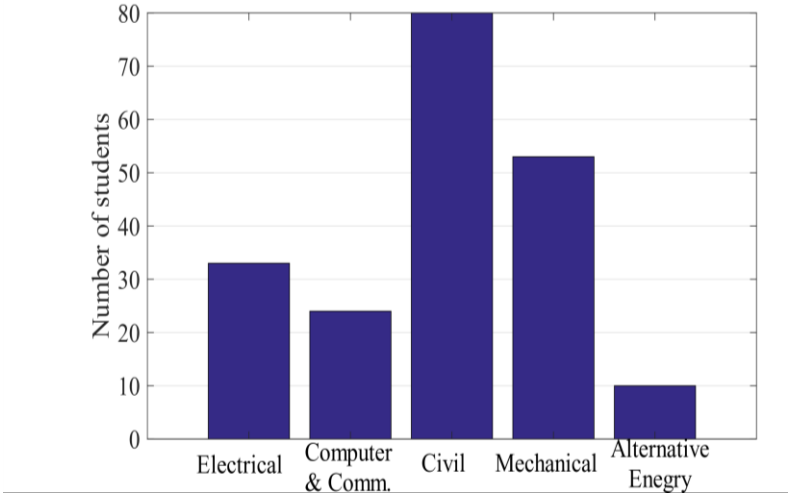

Figure 2. Majors of the participants.

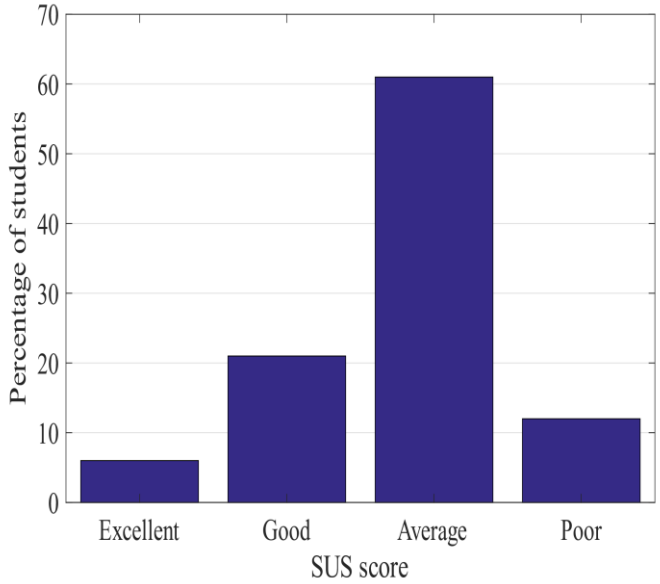

Figure 3. Sum of SUS scores for students.

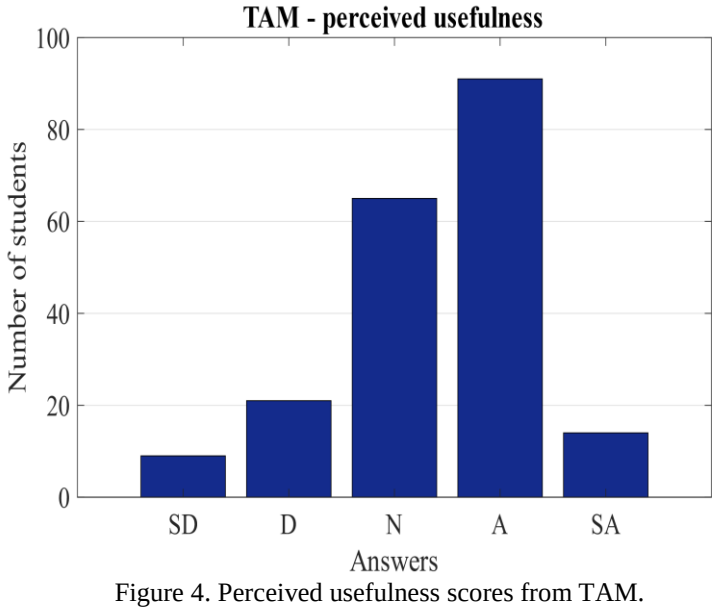

Figure 4. Perceived usefulness scores from TAM.

To get more insight into these results, the technology acceptance model TAM results are illustrated in Figures 4 and 5. As shown in Figure 1, users' attitude is influenced by the perceived usefulness and perceived ease of use of the LMS. These two factors are presented in TAM in Table 2. Figure 4 shows the perceived usefulness results of TAM where more than 50% of students agreed or strongly agreed with the statements of perceived usefulness whereas only 15% disagreed with them. However, the results of the perceived ease of use, shown in Figure 5, were generally neutral with the statements with a notable disagreement. Both of the results complement the SUS "average" scores. Students agreed with the usefulness of the LMS but not with its ease of use. In other words, students' experience on usefulness and ease of use defined a "user attitude" towards the LMS, which in turn resulted in a 60% "average" usability in SUS.

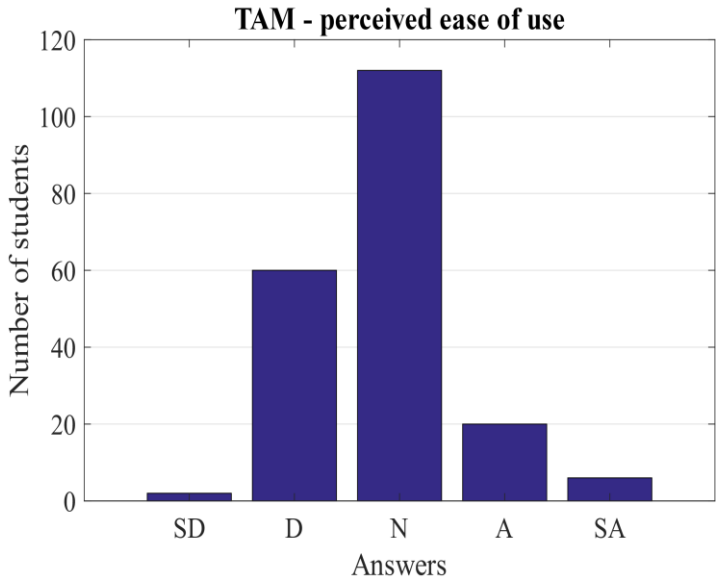

Figure 5. Perceived ease of use scores from TAM.

Though diving deeper into TAM results, shows that students mostly agreed that the LMS would increase their productivity and improve their academic performance. Figure 6 illustrates these results where more than 50% of students agreed or strongly agreed with statements 2 and 3 from TAM's perceived usefulness. This is also an indicator of a good practical experience on the usefulness of the LMS, but not on the quality of the experience.

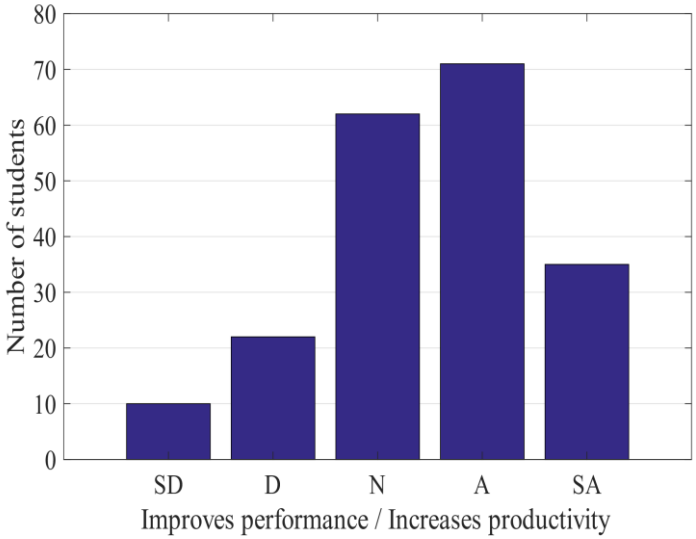

Figure 6. Sum of answers from statements 2 and 3 (perceived usefulness).

To prove these results statistically and to test our hypothesis, multiple-way ANOVA's were conducted on the results. A Chi-square goodness-of-fit test was conducted on the data and showed that the sample had a normal distribution which allowed the use of the analysis of variance. The first ANOVA was conducted with a dependent variable of "perceived ease of use" and two independent variables of "agreeing to SUS negative

statements" and "agreeing to SUS positive statements". When the data showed statistical significance, a Tukey honest significant difference (HSD) for a post-hoc test with a 5% alpha value. The results did not show significant statistical differences between the agreement with TAM's perceived ease of use and the agreement with SUS positive and negative statements. Figure 7 shows the means and confidence intervals of the tested groups.

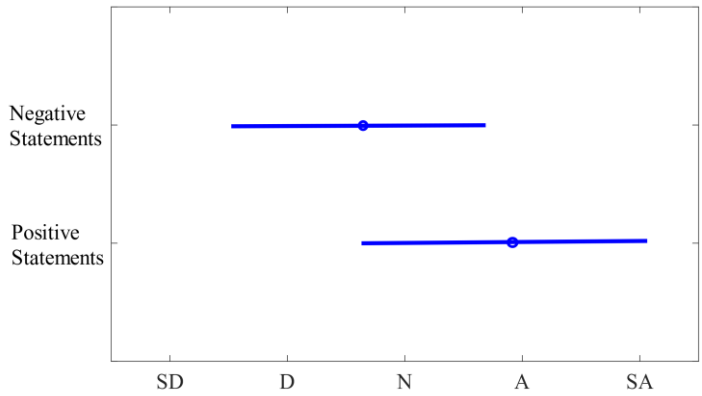

Figure 7. Means and confidence intervals between agreeing with positive/negative statements of SUS and perceived ease of use.

The second ANOVA was conducted with a dependent variable of "perceived usefulness" and the same two independent variables. The results showed that students who generally "agreed" with the positive statements of the SUS were statistically significantly more in agreement with perceived usefulness of the LMS as shown in Figure 8. This result shows that students who have a positive experience with the LMS statistically will find it useful when they work with it. This goes to show that students can indeed develop an "attitude" towards using the system which influences the actual use of the LMS, as illustrated in Figure 1.

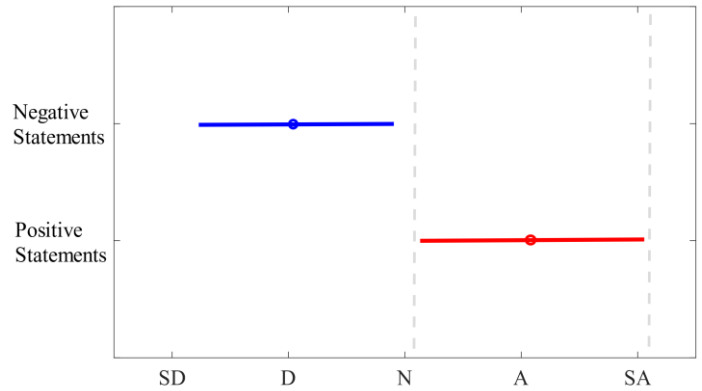

Figure 8. Means and confidence intervals between agreeing with positive/negative statements of SUS and perceived usefulness.

Conclusion

This study investigated the usability and perceived experience of a learning management system (LMS) at Al Zaytoonah University of Jordan from students' point of view. Two survey models were used in the investigation: the system usability scale SUS and the technology acceptance model TAM. The hypothesis was that students who perceive the usefulness of the LMS will have a positive behavioral attitude towards it which in turn affects their academic performance. The investigation was carried out through online surveys with a 200-student sample. The results showed that 60% of students expressed an "average" usability experience with the LMS and 27% of students expressed a "good" and "excellent" experience. The results also showed that more than 50% of students agreed or strongly agreed with the statements of perceived usefulness, however, they were generally neutral with the ease-of-use statements. The statistical results showed that students who had a positive experience with the LMS were statistically significantly more in agreement with its usefulness. This indicated that students attitude towards the LMS affected their actual use of the LMS.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

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