Evaluating the Technology Fit of Moodle among Students at the University of Belize

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Abstract

For the past year and a half we have been living through a worldwide pandemic. We have become dependent on technology to communicate with families, work and also to continue with schooling. With this we have learned to value and acknowledge the importance of technology and utilizing learning management systems in the education field. As we are aware, Moodle was not utilized as much before the pandemic. However, changes were made in order for the University of Belize to be able to continue school and merge over into fully online courses. A considerable amount of research has been conducted on Moodle, which is the learning management system used by students at the University of Belize. We took the approach from a personal observation as we too are students using this learning management system. Through this study we aimed to provide information about the weakness, effectiveness and usefulness of Moodle at the University, amongst its students. The study embraces Goodhue and Thompson (1995) developed a measure of task-technology fit that consists of 8 factors: quality, locatability, authorization, compatibility, ease of use/training, production timeliness, systems reliability, and relationship with users. Questionnaires were issued out and collected from students in order to obtain data for the study whereby students gave their honest opinions and recommendation to the University of Belize regarding the use of Moodle being its Learning Management System. From this research we have concluded that the goals of providing online learning to the students at the University of Belize are being accomplished. This detailed look on the LMS system will enlighten others on the usefulness of Moodle as we move forward into the new norm of being fully educated online.

Keywords: Moodle, Information System, Management, University of Belize, Task Technology Fit, Consumerization,

Introduction

Task-technology fit (TTF) is a construct between information technology and performance impacts. On the surface, its importance is evident; a technology can only have positive performance impacts if it fits the task that is being supported (Gadhue, 2006). In the past year and as a response to Covid 19, there has been a surge of investment and utilization by education institutions in learning management systems (LMS). However, much of the research on LMS has been limited to studies of adoption (MacGill & Kloba, 2009). In order to take advantage of the potential associated with LMSs, research that addresses the role of LMSs in learning success is needed (Tang, Wenge, Long, Chuantao, & Zhan , 2017).

The advancement of technology in the world is growing as the days go by. Everything has become easily accessible because of technology and a lot of business would crumble if it was not available. The University of Belize has been able to take advantage of technology and also be able to use it to their advantage. Mobile computing is a term used that refers to multiple devices that can access information from wherever. (Bucki, 2019). The University was able to invest in two mobile computing systems which are Moodle and Xenegrade which can be accessed through any mobile hardware. Modular Object-Oriented Developmental Learning Environment (Moodle) is one of a widely used open-source systems for learning process management. Moodle as a LMS is a powerful integrated platform that supports several activities performed by teachers and students during the e-learning process. LMS such as Moodle is used to develop web-based courses, notes, and quizzes, to communicate with students and to monitor and grade student progress. Students use it for learning, communication, and collaboration (Despotović-Zrakić, M., Marković, A., Bogdanović, Z., Barać, D., & Krčo, S. (2012).

LMS users such as students and teachers are individuals with varying degrees of characteristics and needs. The adaptation of e-education systems to an individual or to a group based on their characteristics, expectations, knowledge, and preferences of the students is of utmost importance. Evidently, adapting to e-learning is difficult considering the passage of COVID 19. It can be argued that having a platform that is considered a "one-size fits-all" concept will eventually fail. In this regard, it is imperative that there is some degree of understanding towards learner-oriented platforms that satisfy student's expectations, motivation, habits, learning styles, and needs.

This research focuses on consumerization attitudes towards the University of Belize LMS platform, perceived impact on learning from this LMS, and expected consequences of learning management systems at the University of Belize. The consumerization in this research are students attending the University of Belize. The research will examine 'Task–technology fit' positive or negative influence on expected consequences of organizational LMS use, its perceived impact on learning, and the expected positive or negative consequences of LMS use and its perceived impact on learning. The aim of this research is to determine how well the University of Belize's learning management system, moodle, fits with its students.

Literature Review

Technology can play a powerful and necessary role in the information-age paradigm of education. According to Reigeluth et al. (2008), The Learning Management System (LMS) is a comprehensive and integrated application of technology to the learning process, which all provide four primary roles for student learning: record keeping, planning, instruction, and assessment (p. 32). A key concern in Information Systems (IS) research has been to better understand the linkage between information stems and individual performance.

Task-technology fit (TTF) is a theory which holds that IT is more likely to have a positive impact on individual performance and be used if the capabilities of the IT match the tasks that the user must perform (Goodhue and Thompson, 1995). Goodhue and Thompson (1995) developed a measure of task-technology fit that consists of 8 factors: quality, locatability, authorization, compatibility, ease of use/training, production timeliness, systems reliability, and relationship with users. Goodhue and Thompson (1995) found the TTF measure, in conjunction with utilization, to be a significant predictor of

user reports of improved job performance and effectiveness that was attributable to their use of the system under investigation.

The history of computers in education dates back to the 1950s well before the spread of personal computers (Reiser, 1987). Utilizing computers for education has become immensely efficient and critical to student's improvement in intellectual development. Online education is perceived by many instructors as innovation that has considerable potential for enhancing teaching and learning, promoting lifelong learning and reaching to non-traditional learners, about any degree type (Virkus, 2004). According to Watson & Watson (2007), Management System (LMS) is one approach to the application of computers to education which holds great potential and important concepts.

Online learning has made completing college and getting degrees easier as it is more flexible than the traditional face to face learning. However, the quality of online education is often subject to skepticism and criticism as well as economic success and sustainability of online courses. A Norwegian scholar named Morten Flate Paulsen, was an enthusiastic supporter of online education since the mid-1980s who wrote a book on the emerging phenomenon of online education which provides a comprehensive overview of various aspects of online teaching and learning (Virkus, 2004). As Paulsen believes, the tension between individual independence and collective cooperation within the dimensions of time, space, pace, medium, access, and content within distance education contexts and the theory of cooperative freedom argues that online education can foster both freedoms for the individual and group cooperation.

Methodology

Research Design

This research design for this study will be quantitative. According to Kent (2007) the quantitative research method entails a systematic empirical investigation of a phenomenon via statistical or computational technique. It is a type of research that focuses primarily on the construction and analysis of quantitative data (p. 570). As it relates to this study, this therefore

Means that quantifiable data was collected from locals (Belizean students who attend the University of Belize) using a survey as the research instrument. A survey research is a quantitative approach that features the use of self-report measures on carefully selected samples. It can be used to study a wide variety of basic or applied research questions (Price, 2013). In our study, as researchers, we ask students from the University of Belize who are our survey participants (who are often called in survey research) their opinions on the effectiveness and usefulness of Moodle at the University.

Sample Size

The best sampling method for this study is "convenient sampling". Reason for this is because it is economical, uncomplicated and very prompt. The researchers are also using this method because of time constraint and because of the Covid-19 Pandemic that limits our mobility. There are a total of approximately 2,000 students who make use of the Moodle every day, and 442 responses were conveniently chosen for this study.

Instrument

A structured quantitative survey (See appendix) was sent out to the student body who utilizes Moodle in order to collect data, from which a total of 422 responses were completed (yield 80%) within the week.

Research Model & Hypothesis

Developed for the LMS domain, instruments that were used from previous research on TCP were used as a starting point in this research. E.g. Moore and Benbasat (1991); Doll and Torkzadeh (1988) with additional

items being developed when needed. The existing measurement scale from a collection of previous quantitative research on TCP; utilized Bailey and Person's seven- item scale which ranged from Strongly Disagree (1) to Strongly Agree (7), rated from Very poor (1) to Outstanding (7), and rated from Never (1) to Often (7). The survey was first tested by all five students and then completed online due to the Covid-19 pandemic.

Using a multifaceted measure is how the task–technology fit was measured due to it having many different aspects to consider. Those being factored in for the task–technology fit included the scales. (Two items from Moore and Benbasat (1991)) being were work compatibility, (three items from Doll and Tork-zadeh (1988)) ease of use, ease of learning (three items from Staples and Seddon (2004)), and information quality (5 items from Doll and Torkzadeh (1988)). Also using the 7 point Likert scale, the 13 items were then measured and labeled from 'strongly disagree' to 'strongly agree'.

To come up with a measure of the *expected consequences* of LMS 8 items were used by Staples and Seddon (2004). The items employ the use of the same 7 point Likert scale labeled from 'strongly disagree' to 'strongly agree'.

The *perceived impact on learning* measures a student's perception of the impact of Moodle on their learning in general. The impact was measured using 3 items based on the work of Goodhue and Thompson (1995). These 3 items were measured on a 7 point Likert scale labeled from 'strongly disagree' to 'strongly agree'.

The final aspect to be measured was *consumerization attitude*. This area was broken down into two parts. The first, perceived fit, uses 3 items developed based on the work of Ifiendo (2018). The second, expected performance improvement, also uses 3 items developed based on the work of Ortbach, Bode, & Niehaves, (2013). These combine for a total of 6 items measured using a 7 point Likert scale labeled from 'strongly disagree' to 'strongly agree'.
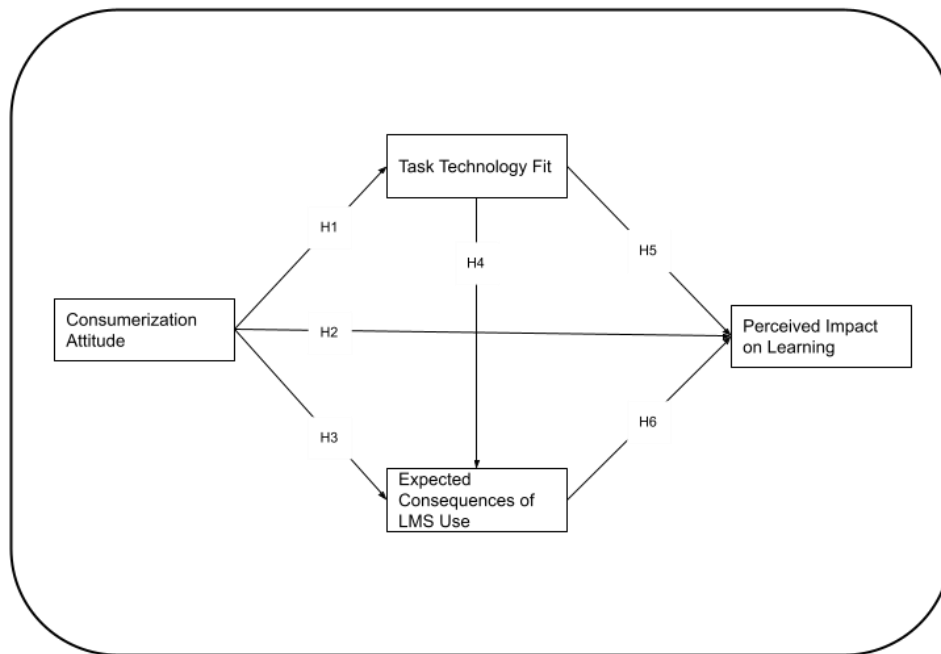
Figure 1.TESTED MODEL

Accordingly, the study hypothesized the following six hypotheses tested:

H1: Consumerization attitude will negatively influence perceived task-technology fit.

H2: Consumerization attitude will negatively influence perceived impact on learning.

H3: Consumerization attitude will negatively influence expected consequences of LMS use.

H4: Task–technology fit will have a positive influence on expected consequences of organizational LMS use.

H5: Task–technology fit will have a positive influence on perceived impact on learning.

H6: Expected consequences of LMS use will positively influence perceived impact on learning.

Data Analysis

The data gathered was an accumulation of 422 responses from the University of Belize. The demographics of the Survey are as follows:

Age	Count of Age
>40	2
16-18	85
19-22	202
23-25	42
26-30	51
31-40	39
Grand Total	421

Table 1. Age Data

Gender	Count of Gender
Female	250
Male	171
Grand Total	421

Table 2. Gender Data

Degree Program	Count of Education
Associates	180
Bachelor's	237
Grand Total	417
Grand Total	417

Table 3. Program Enrolled by Students

Year	Count of Year
Year 1	121
Year 2	173
Year 3	79
Year 4	46
Grand Total	419

Table 4. Year in Program

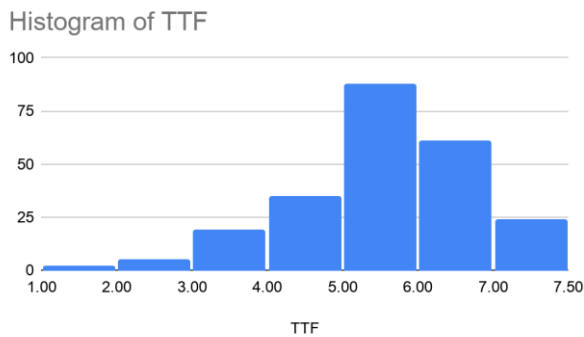| Faculty	Count of Faculty
FEA	144
FHS	38
FMSS	73
FST	156
Grand Total	411

Table 5. Academic Faculty

For the purpose of this study, the researchers will not be doing hypothesis testing and as a result will be using applied research to discuss and analyze the data. The following are the results of the data collected from the surveys, broken down into 4 concentrations to analyze the LMS (Moodle) of the University of Belize. All Histograms show a 7 point rating scale, of which 1 represents strongly disagree and 7 represents strongly agree.
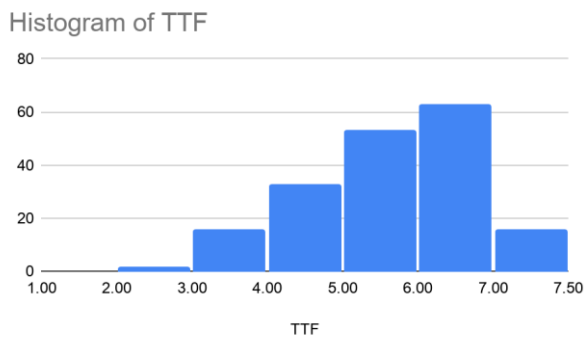
The Histograms on the left depict the responses as it relates to how well the LMS fits the needs of students. Looking at all the respondents in Figure 1.1, most students are in agreement of the fit of the available technology, as the data is aggregated from 5-7 while a moderate amount are impartial and a minority do not agree.
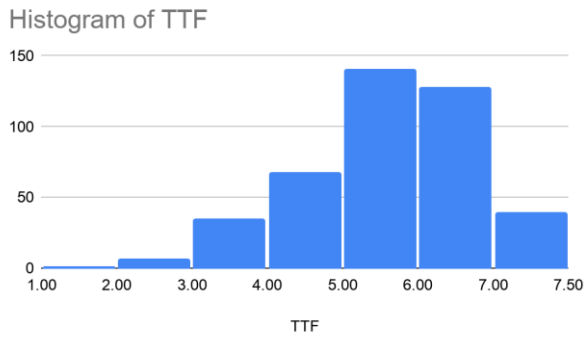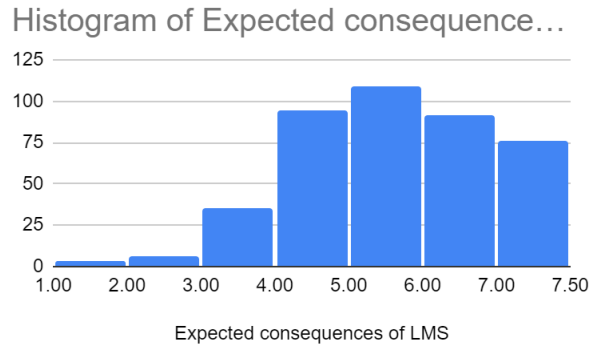
Figure 1.1 All respondents

Figure 1.2 is almost identical to Figure 1.1. Most students are on the agree side of the graph with the most rating 5 while the second most popular rating being 6. Very few rated 3 or below.
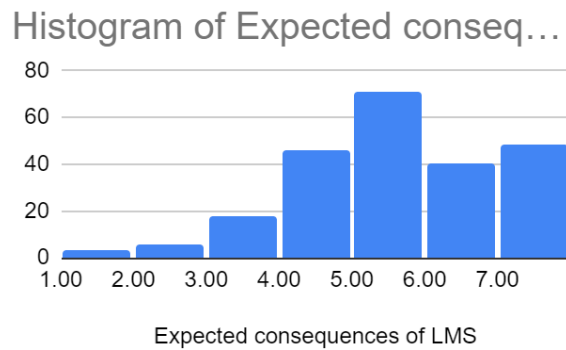
Figure 1.2 Used Other LMS

Figure 1.3 Continues the trend with the majority of respondents being on the agree side of the scale. Here those students who only used Moodle agree more with the task technology fit as most of the respondents rated 6, followed by the second rating 5.

Figure 1.3 Only Used Moodle

Here, the expected consequences of the LMS are measured. A score closer to 7 means that students expect certain outcomes of using the LMS. Figure 2.1 depicts all respondents, Quite similar to the data above, most students rated 5-7 and agree, while a larger amount are impartial than the previous category and a minority do not agree.
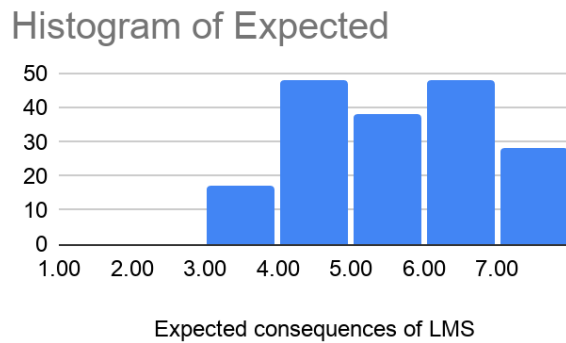
Figure 2.1 All respondents

Figure 2.2 depicts those individuals who have used other LMS' other than Moodle and histogram Quite similar to the data above, most students rated 5-7 while a moderate amount are impartial and a minority do not agree. The highest frequency of a single rating is 5 followed by 7 and 6.
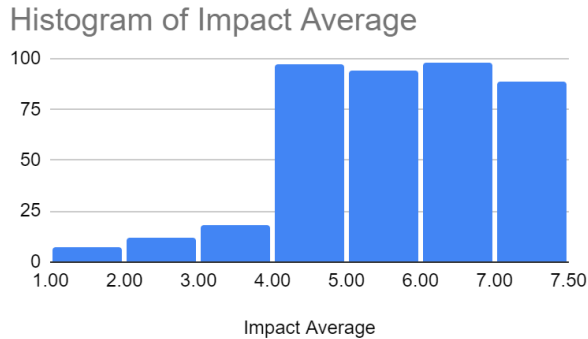
Figure 2.2 Used Other LMS

Figure 2.3 depicts respondents who have only used Moodle. Here the highest frequency in a single category is a rating of four which is impartial. This is followed very closely by the rating of 6, 5 and 7, respectively. No students in this category answered with a rating of 1-2.

Figure 2.3 Only Used Moodle

Histogram of Impact Average

Figure 3.1 All respondents

This set of data is geared toward the assessment of how much Moodle impacts online learning. For this purpose a rating closer to 7 means that it is very impactful. Here in figure 3.1 it can be seen that most individuals responded positively towards the impact of the LMS it is interesting to see that the spread across responses 4 - 7 is relatively flat meaning that there is a similar amount of individuals responding at these levels.

Histogram of Impact Average
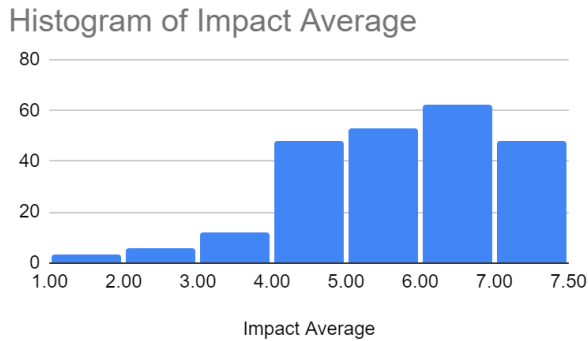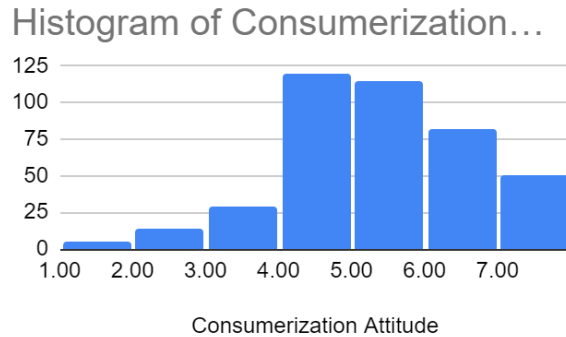
Figure 3.2 Used Other LMS

In Figure 3.2 it can be seen that most students agree with the most popular ratings being above 4. The highest frequency being a rating of 6 followed closely by 5 and 4 respectively. Very few rated below 4

Histogram of Impact Average
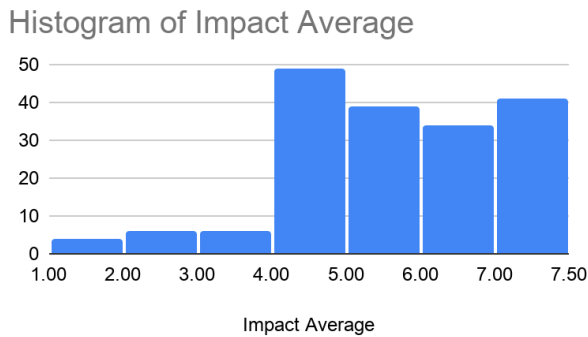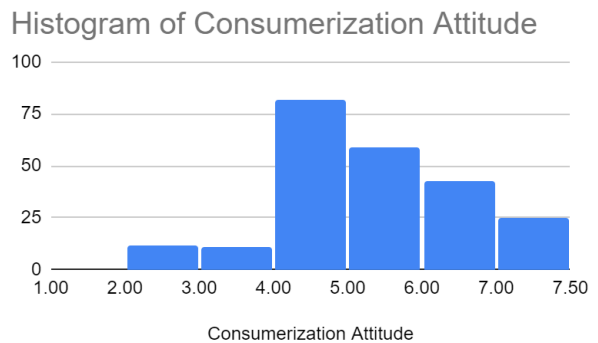
Figure 3.3 Only Used Moodle

In Figure 3.3 very similar results can be observed to that of Figure 3.2. Here the highest frequency of responses is 4 which is impartial, however the majority of rating overall is leaning in the direction of agreeing with the second highest rating being 7, and closely followed by 5 and 6 respectively.

This last set of data in the series looks at Consumerization. Again, just like the case of all the previous data, in Figure 4.1 the majority of respondents rated 5-7 leaning towards strongly agreeing. The Highest single rating however is 4 which is impartial and again ratings of 1-3 have very few responses in comparison

Figure 4.1 All respondents

In Figure 4.2 which covers individuals who have used other LMS', we can see that here a majority of the respondents feel much more impartial in their responses, with 4 having the highest frequency. Going from 5-7, it can be seen that the frequency has a gradual drip off. Very few respondents rated 2-3, while none had a rating of 1.

Figure 4.2 Used Other LMS

Looking at individuals who have only used Moodle, Figure 4.3, a majority of the individuals responded with a rating of 5, followed by the impartial score of 4, then 6 very close behind and then 7. Ratings of 1-3 again are very low in comparison.
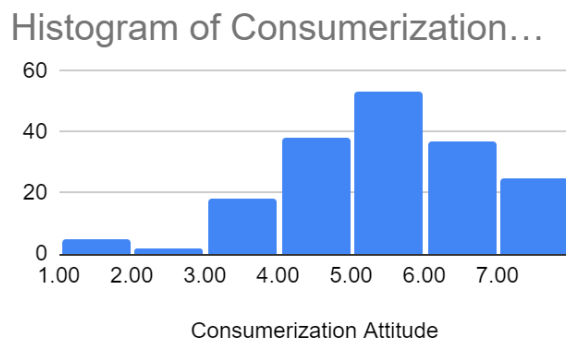
Figure 4.3 Only Used Moodle

Discussion

The aim of this research is to see how well the University of Belize's learning management system, Moodle, fits with its students. The model used to assess the fit of this LMS was developed based on an accumulation of proven and tested work as it relates to the fit of management systems. The model analyzes the task technology fit, consequences of use, perceived impact of learning and consumerization attitude to measure the effectiveness of Moodle.

In the first concentration which looks at the task technology fit we can see a common consensus among both groups which have, and have not used another LMS's. The data shows that students agree with the task technology fit. This means that Students of the University of Belize find that Moodle fits in well with the way they learn and they are able to effectively use the platform to carry out tasks as students. In this area, whether students had or had not been exposed to another LMS did not seem to play a role as the data shows similar averages in Histograms 1.2 and 1.3 respectively.

The second concentration of the study aims to understand the expected consequences of using Moodle. In this case expected consequences refer to outcomes which students hope to achieve as a result of using Moodle. These results encompass productivity, effectiveness and quality of learning using the LMS. The data shows that overall most students expect that Moodle will help them in the aforementioned areas, with the majority of the students responding 5-7 which correlates to agreeing. However, it is interesting to note that a lot of students who have only used Moodle seem to be indifferent to the expected consequences. The data also shows that some students which have also used other LMS', don't see themselves experiencing these outcomes as depicted in Histogram 2.2.

In the third area the model seeks to assess the perceived impact which the LMS has on learning. Individuals who rate 5-7 believe that Moodle is beneficial to the way they learn online. Again continuing with the trend the data is aggregated on the right which means that most students do find that Moodle positively influences the way they learn online. The spread of students is consistent overall from moderate to strongly agree. However in Histogram 3.2, where students have used other LMS' we can see that students are slightly more in favor, while those who have only used Moodle in Histogram 3.3 are slightly more impartial as the highest frequency of responses are focused at 4. Overall, this data is saying that students see that having an LMS like Moodle is very beneficial to their attempts at virtual learning, and that generally it is good to have a system to provide structure.

The last concentration is to look at the consumerization attitude of the students. This area seeks to identify if students feel as though they would benefit if their teachers had, and exercised, the option to use a learning management system other than Moodle. Here we can see in histogram 4.3 that the data reflects very closely to other data collected where the majority agree and feel as though if teachers chose their own LMS it would benefit them. However, when we move onto the group of students who have used other learning management systems as depicted in Histogram 4.2, we can see that students are more neutral. This is saying that those who have experienced other LMS' are less on board with teachers having consumerization. These students would prefer to have one central area to carry out their online learning.

It is important to note that with this data and research assumptions cannot be made. There may be a host of factors which may be affecting the data to accumulate in the way it does. There may be several reasons why those who have experienced other learning management systems feel different from those which have only used models. However, to find out the reasons and to make further assumptions, further research must be done using qualitative methods, such as interviews, to sit down with individuals to find out what is influencing these ratings/choices.

Conclusion

The purpose of this research was designed to evaluate the level of success of the Information System (Moodle), of the students at the University of Belize. The results from the topic of the questions asked: task technology fit, consequences of use, perceived impact of learning, and consumerization attitude to measure

the effectiveness of Moodle to show that this Information System (Moodle) fits in well with the way they learn and accomplishing their work as students.

Based on empirical results, we can conclude that the results encompass productivity, effectiveness, and quality of learning using the LMS; it was determined that there were correlations between most of the platform elements evaluated. The quality of the content on the platform and the usefulness of the materials presented were evaluated the highest. Interestingly, a lot of students who have only used Moodle seem to be indifferent to the expected consequences. The results are particularly useful for students and managers (teachers and administrators) of Moodle LMSs at the University of Belize. This research recommends taking advantage of the various features supported by Moodle in order to obtain a useful and usable LMS. The recommendations presented in this research provide guidance regarding the features and usability issues that should be taken into consideration when designing and/or evaluating an LMS to achieve a more useful and usable system that satisfies the needs of the students.

Finally, an education institute's management such as the University of Belize needs to know how to ensure users' effective usage of e-learning systems. The data in this survey reveal important information about student satisfaction with Moodle and their perceptions of its functionality. In addition, this survey discovered important information about student habits when using Moodle. Improving students' and educators' knowledge about the e-learning systems should lead to the effective usage of such systems. If they do not have much knowledge of these systems, they are less likely to use them or they may not be able to gain the full benefits of such systems, which may result in ineffective online collaboration. In turn, ineffective collaboration may negatively impact student learning. Therefore, the university should provide better training for both students and educators on how to use their particular e-learning systems most effectively.

Limitations and Future Research:

This study was not without its limitations. First, there was no qualitative data taken in this survey, so further examination of student attitudes is impossible, and one cannot begin to understand the student answers or habits in any great detail. This research however, has several limitations. The first relates to the fact that it reflects the viewpoints only of students regarding aspects of Moodle; other users including teachers and administrative staff were not considered. The second relates to the fact that it employed only open-ended questionnaires to identify the usability problems on Moodle's interfaces. This method is considered to be an indirect usability method because it does not study Moodle's interfaces directly. Other direct usability methods, such as user testing which can be used to observe and record actual users' interactions with the interface, were not employed. One of the other limitations of the research is, we did not take into account other individual factors (e.g. motivation) and external factors (e.g. contents quality, previous training in Moodle, instructor factors, technological characteristics of the Moodle platform). These factors should be the subject of our further research in the near future. Moreover, future research could also broaden the scope of the current study. Finally, additional studies should seek to analyze the data from different study programs in order to increase the validity of results for the entire University of Belize. To conclude, the study results can still serve as important background material when deciding on the future development of e-learning at the Faculty of Administration as well as on the introduction of e-learning platforms at other faculties within the University of Belize. The empirical results pointed out the main challenge: how to use the Moodle platform for a better quality of learning to increase the productivity and effectiveness of using this Learning Management System at the University of Belize.

Appendix:

Instrument

*A task–technology fit view of learning management system impact
**What Influences Technological Individualization? –An Analysis of Antecedents to IT Consumerization Behavior
***Roles of perceived fit and perceived individual learning support in students' weblogs continuance usage intention

Background Information

Gender: Male Female
Age: 16-18, 19-22, 23-25, 26- 30, 31-40, >40
Student: Associates Bachelors
Year: 1, 2, 3, 4
Faculty: FST, FMSS, FEA, FHS
I took one or more online classes prior to the pandemic.

I prefer face to face classes than online classes
I am a more efficient student in face to face classes than in online classes
I learn more in face to face classes than in online classes

I would want to take some online courses after the University resumes face to face teaching.
I would want to take all my courses online after the University moves back to face to face teaching.
I would not want to take any online courses after the University moves back to face to face teaching.

Number of semesters using Moodle
One or more of my teachers used Moodle to teach face to face classes (prior to online delivery)
One or more of my teachers utilized an LMS other than Moodle

If YES
How many semesters have you attended classes that used an LMS other than Moodle
I attended classes that used an LMS other than Moodle in face to face classes (prior to online delivery)

It would be beneficial to me to attend courses that use Moodle after the University returns to face to face teaching.
It would be beneficial to me to attend courses that use an LMS other than Moodle after the University returns to face to face teaching.

Please complete the following questions about ONLINE LEARNING.

1. TASK–TECHNOLOGY FIT

Moodle fits well with the way I like to study online.
Moodle is compatible with all aspects of my online study.
Moodle is easy to use.
Moodle is user friendly.

It is easy to get Moodle to do what I want it to do.
Moodle is easy to learn.
It is easy for me to become more skillful at using Moodle.
New features of Moodle are easy to learn.
Do you think the output from Moodle is presented in a useful format?
Is the information from Moodle accurate?
Does Moodle provide you with up-to-date information?
Do you get the information you need in time?
Does Moodle provide output that seems to be just about exactly what you need?

2. EXPECTED CONSEQUENCES OF LMS USE

Using Moodle for online classes will help me to accomplish my study more quickly.
Using Moodle for online classes will improve my performance in units.
Using Moodle for online classes will increase my productivity.
Using Moodle for online classes will enhance my effectiveness in my program of study.
Using Moodle for online classes will make it easier to complete my learning tasks.
Using Moodle for online classes will give me greater control over my learning tasks.
Overall, I think that Moodle will be useful in my online studies*
Using Moodle will improve the quality of my online learning*

3. PERCEIVED IMPACT ON LEARNING

Moodle has a large positive impact on my effectiveness and productivity as a student in online classes.
Moodle is an important and valuable aid to me in my online studies.
I learn better online with Moodle than without it.

4.1 CONSUMERIZATION ATTITUDE - PERCEIVED FIT

PIF_1 ...it would fit well with learning online.
PIF_2 ...it would fit well with helping me to be efficient in learning online.
PIF_3... It would be compatible with my online learning.

4.2 CONSUMERIZATION ATTITUDE - EXPECTED PERFORMANCE IMPROVEMENT

If my teacher could choose their own Learning Managements System...
EPI1: ...my online learning performance would improve.
EPI2: ...my online learning productivity would improve.
EPI3: ...I would work faster while learning online.

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20. Peer reviewer's remarks (suggestions for changes, improvements, etc.):

1. The abstract is not clear and needs to be fixed, be more specific about what the research is about. Give a brief description.

2. There are minor mistakes in the introduction "wording" that needs to be fixed. The second paragraph where it stated " Modular Object-Oriented Developmental Learning Environment (Moodle) is one of a widely used open-source systems for learning process management is Moodle."

20.2 Give "Action-able" Advice

An advice towards this research paper if for the researches to read over the paper to correct mistakes and I believe that more information can be added. The graphs also needs to be labeled properly and the descriptions can be removed.

20.2.1 Sample feedback: I have three major concerns. They are…

I have four major concerns and they are as followed

1. Instructions base on the guidelines provided by the lecturers were not followed

2. Wording in this research needs to be amended

3. Charts needs to be adjusted and labeled properly

4. The references needs to be corrected

20.3 Provide Both (1) Your General, Overall Reaction and (2) a List of Specific, Numbered Point-by-Point Comments

(1) this research paper is good, I believe that it just needs some amendments and it shall be better.

(2)

1. Instructions base on the guidelines provided by the lecturers were not followed

2. Wording in this research needs to be amended

3. Charts needs to be adjusted and labeled properly

20.7 While Recommending a Revision, Spell Out Alternative Scenarios for How the Revision Could be Done

1. **Find Focus of the paper**

2. **Take the reader on a journey by creating a flow**

3. **Clarify and justify the message**

4. **Read and edit sentences that needs to be edited**

5. **Proofread the paper**

6. **Do a last revision of the paper**