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BUSINESS MANAGEMENT PROJECT

Factors Discriminating Millennials' Preference of E-learning Platforms: Moodle versus the rest of LMS

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BMP TURNITIN SAAKSHI

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Dimah Al-Fraihat, Mike Joy, Ra'ed Masa'deh, Jane Sinclair. "Evaluating E-learning systems success: An empirical study", Computers in Human Behavior, 2020 Publication	3%
2	Abdullah Alhabeeb, Jennifer Rowley. "E-learning critical success factors: Comparing perspectives from academic staff and students", Computers & Education, 2018 Publication	1%
3	Submitted to Higher Education Commission Pakistan Student Paper	1%
4	link.springer.com Internet Source	1%
5	Abdullah, Fazil, and Rupert Ward. "Developing a General Extended Technology Acceptance Model for E-Learning (GETAMEL) by analysing commonly used external factors", Computers in Human Behavior, 2016. Publication	1%

PREFACE

The unprecedented growth of the Internet together with the progress of web technologies has given rise to widespread use of many electronic-based applications such as E-learning, e-business and e-government across many different disciplines. Moreover, the increasing availability of wireless and mobile technologies makes these kinds of internet-based electronic platforms even more ubiquitous and pervasive.

As internet participation increases, technology acceptance or adoption has received considerable attention in the last decade. And with more and more millennials entering higher education and workforce, it becomes imperative to understand what their preferences and concerns are, as maximizing their knowledge and skills and retaining them in the workforce is essential for the success of nation driven by innovation.

Thus, the inspiration of this study came from an understanding that as costs of education grow around the world, E-learning could be the solution to find chepaer alternatives to obtain knowledge and skills. And as technology and the internet become more reliable, a deeper understanding of Learning Management Systems (LMS) and needs and concerns of the end users could benefit several groups of stakeholders, the software developers, the universities, the lecturers, corporations and employers.

I would also like to extend my utmost gratitude and appreciation to my supervisor Prof. Jayaraman for his support and guidance during this research.

EXECUTIVE SUMMARY

As technology has evolved, education sector has grown rapidly, stimulating adoption of E-learning, an integration of education and technology. This digital revolution has created a generation of technologically advanced and sophisticated millennials. These digital natives have explicit cultural expectations about use of technology when they enter higher education institutes and workplaces. This influence must be considered heavily when determining ideal learning mechanisms of millennials. Global players are focused on innovating and improving their LMSs to strengthen their product offering. This study applied Technology Acceptance Model 1 to determine factors discriminating Millennials' preference of E-learning platforms (Moodle versus the rest of LMSs). An online survey among 77 respondents was conducted and answers to determine the predictor variables as well as open ended answers were collected. The significant findings of this study were: the 4 predictors (Technology Infrastructure, Instructor Characteristics, Student Characteristics and E-learning Resources) were successfully able discriminate between millennials' preference for Moodle versus rest of LMSs. Moodle was preferred by the respondents as compared to rest of LMSs. The Perceived ease of use did not significantly influence the choices between the two groups for the respondents based on the predictors. Student Characteristics was found to have the highest discriminatory ability amongst all the predictors and overall post mediator, 70.1% of the cases were correctly classified by this framework. These findings will be useful for the E-learning platform developers, universities and corporations to modify and customize LMSs in accordance with the requirements of the end-users. Further, the framework constructed in this research can be customized by addition of predictors that are contextually relevant for the future researchers.

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CHAPTER 1: INTRODUCTION

1.1 Background of the Project

With the advent of the internet and rapid development of Information Technology (IT), there have been significant improvements in the field of business, finance, health and education. As technology evolved, education sector grew rapidly, stimulating adoption of E-learning, an integration of education and technology that became a powerful medium for acquisition of skills and knowledge (Al-Fraihat, Joy & Sinclair, 2017). As educators and learners move towards E-learning, this Information and communication technologies (ICT) based system becomes more mainstream in the education sector and has been increasingly adopted in higher education institutions worldwide.

The term 'E-learning' came into existence in 1999 during a CBT systems seminar in Los Angeles, USA. Along with the frequently used terms 'online learning and virtual learning', E-learning can be defined as 'a way to learn based on the use of new technologies allowing access to online, interactive and sometimes personalized training through the Internet or other electronic media (intranet, extranet, interactive TV, CD-ROM, and so on), so as to develop competencies while the process of learning is independent of time and place (Barth et al., 2014).

Traditional classroom learning and E-learning have now become two major knowledge sharing systems in higher education. Traditional classroom learning gives access to learning materials to a restricted group of individuals. Collaboration and communication are also becoming limited to those few students.

But, today, through E-learning, a technology-based system is used to deliver learning materials electronically to a remote learner via the internet. Hence, ICT is now being used to supplement face-to-face education to create a mixed mode or

blended learning and, in some cases, full online mode or distant learning (Kumar et al., 2014). Various devices like smartphones, laptops and tablets can now be used to access learning resources and materials. This has revolutionized the education and teaching landscape in the 21st century.

A plethora of learning materials and resources are available in different formats such as texts, audio, video, images available via the E-learning system fostering a healthy self-paced style of learning and helping to trascend geographical boundaries. This in turn also offers a great number of opportunities for interactive, two-way communication and collaboration through features such as wikis, forums, chats and peer-to-peer activities (Al-Fraihat et al, 2017).

Hence, the advantages of learning through the World Wide Web are manifold: the independence of time and place, self-paced learning, organization of all learning materials and resources in one place and constantly updates and processed information all around the world. E-learning has therefore proven to be efficient, flexible and affordable. Utilized in or out of classroom, including asynchronous learning (self-paced) or an instructor-led synchronous learning (Klašnja-Milićević et al., 2017).

The core principles that form the basis of E-learning can be traced back to the 19th century. Long before the internet came into existence, distance courses on certain subjects were being offered to students from far away countries. Isaac Pitman, a highly qualified professor, taught his students shorthand using the mail system and would also send them more work to be completed (Klašnja-Milićević et al., 2017).

As E-learning tools and delivery expanded with the internet and computers, virtual learning environments began to gain traction. At the tail end of the 90s, the first learning management system (LMS) began to be used to gain access to the richness of online information. Although some universities designed and created their own

systems, a more conventional and easy way for the institutes was to purchase these systems off the market. Blackboard was one of the first commercialized LMS platforms to be offered by the American company of the same name (Bradford et al. 2007).

Along with that, several LMSs have been developed and are easily available in the market today. In the education sector, predominantly open-source MOODLE system has been used worldwide (Aranda 2012; Horvat et al., 2015). Such a system provides students and teachers a wide range of functions including exchange of learning material, availability of books, journals and articles by professors and experts from around the world, tests, peer to peer and student-teacher communication, progress tracking and so on. In 2000s, companies worldwide also started using E-learning to train employees. This also benefited the workforce to improve upon their industry knowledge, upgrade and expand their skill set. At home, individuals could now access various degree programs and develop their information base.

As of today, E-learning is more mainstream than ever and offers an infinite number of opportunities to universities, companies and individuals, through formal and informal learning. This new age educational philosophy has three major players, the teacher, the student and the technology. A smooth interactive process amongst these three is essential to ensure the success of these applications.

This digital revolution has also created a generation of technologically advanced and sophisticated millennials, a term first coined by Howe and Strauss in 1991. Millennials are typically people born between 1984 and 2004 (Howe & Strauss, 2000). They are also referred to as generation Y, echo boomers, internet generation, iGen and net generation. They are digital natives who grew up using computers, video games, internet, websites, mobile devices and iPods. So when they enter

higher education institutes and work places, they have explicit cultural expectations about use of technology in learning (Goldman and Martin, 2016).

Collectively, millennials are characterized as "special," "sheltered," "confident," "team-oriented," "conventional," "pressured," and "achieving," and these cultural traits have transformed educational learning environments (Howe & Strauss, 2007; Strauss & Howe, 1991).

So Baby Boomers and Generation X faculty in higher education and employers must adjust their traditional teaching methods to adapt to the needs of millennials and the digital shit in higher education and workplace (Rodriguez & Rodriguez, 2015). As millennials are more than likely expecting to use internet, presentation softwares, online forums, e-mail communication as a part of their learning (Goldman and Martin, 2016).

E-learning applications and processes include web-based learning, computer-based learning, virtual classrooms and digital/virtual collaboration. By modifying these applications as per the needs of the end users, educational institutions can adopt them such that the students are guided constantly even outside their classrooms (Kolekar, Pai and Pai, 2018). Thus, a research study is undertaken to understand what factors help predict millennials' preference different platforms for E-learning. This will also provide an insight on elements that are preferred and changes to be made to these applications to enhance their user experience.

1.2 Project Scope

Use of technology in classroom is an essential tool in getting information across to students. Online learning management systems have thus become an integral part of today's universities. Millennials are at home with technology and understanding their preference is essential, as lecturers compete with Facebook, Instagram, Twitter

and other online platforms for their attention. So, developing an E-learning platform that entices them and engages them at the same time is essential for the everchanging landscape of learning and evolving as human beings (Gonçalves et al., 2016; Moreira et al., 2016; Au-Yong-Oliveira et al., 2018).

This has lead to a welcomed use of E-learning platforms in higher education, like Padlet.com (a digital wall, for collaboration and knowledge sharing in classrooms), Moodle (for posting class content and material), online news forums (to challenge students and give them homework) (Fonseca et al., 2014). As these platforms develop, more sophisticated course assignments are expected off students and thus interest is heightened, and the challenges are embraced.

The quality of E-learning systems has had a substantial amount of research, many of which have attempted to identify E-learning success factors which could in turn help to enhance the effectiveness of these platforms (e.g., Fathema, Shannon, & Ross, 2015; Islam, 2013; Mohammadi, 2015; Mtebe & Raphael, 2018).

But these studies have mostly focused on the individual key factors that determine the success of an E-learning system, without giving much emphasis on the synergistic effect of these variables interacting with one another (Eom & Ashill, 2018).

Research has also been done on relationship between E-learning quality factors and user satisfaction or acceptance (e.g., Ozkan & Koseler, 2018). Through the findings of these studies, we have a clearer understanding of pivotal success factors of E-learning such as, quality of the system, of the information provided, of the service and of usefulness.

In the Malaysian context, The New Straits Times reported in 2017 that Malaysia in now leveraging ICT as a part of the Malaysian Education blueprint 2015 to 2035. 450 Massive Open Online Courses (MOOCs) are now being offered in areas of

Business, Engineering, Entrepreneurship, Finance, Healthcare, Languages, Technology. Many of these courses are also available for free and open for enrollment to all. Another special feature is MQA (Malaysia Qualifications Agency) allowing MOOC credit transfer anywhere in the world for degrees and certifications. This step will shift the national education to world class standard. According to Datuk Seri Idris Jusoh, Minister of Higher Education, Malaysia is redesigning higher education for the benefit of the students, country and the global community.

With Malaysian parents spending RM 100,000 on their children's education (8^{th} highest in the world) on all aspects of their children's education costs — including school or university tuition fees, educational books, transport and accommodation (HSBC Malaysia, 2018), use of E-learning platforms for obtaining degrees, certifications and developing skills could reduce educational costs and burden on parents.

Looking at the financial aspect, Learning Management System (LMS) Market was valued at $4,396 million in 2016, and is estimated to reach $15,391 million by 2023, growing at a CAGR of +20.0% from 2017 to 2023 (Allied market research, 2017). Hence, growth in demand for E-learning solutions amongst corporate and academic setup is set to grow exponentially.

Further research needs to be undertaken to evaluate these systems and provide continuous improvement to meet the needs of the students. But an excessive number of measurements for dependent and independent variables is the main obstacle that researchers face in trying to develop a successful E-learning model. Evidently, there is a need for a comprehensive success model for multiple levels of success (Eom & Ashill, 2018).

1.3 Significance of Study

Currently, there are many brands of web-based learning systems, for example, Blackboard, CourseNetworking, Canvas, WebCT, Moodle, OLAT, Sakai and so on. These systems can be used to integrate instructional material via different types of media (such as audio, video, and text), email, forums, live chat, quizzes and assignments, and links to webpages.

Bearing in mind that an E-learning system is an information system that integrates human entities (i.e., learners and instructors) and non-human entities (e.g., learning management systems), it is crucial to investigate multiple dimensions of success in relation to both entities. (Au-Yong-Oliveira et al., 2018).

Through this study, we aim to focus on Millennials and their preferred E-learning systems from the various options available. This is an important group to study, as literature considers them the generation who poses greater challenges (Stein, 2013).

Hence, this research could contribute significantly to understand millennial preferences and attitudes towards various E-learning platforms and hence, further aid educators and E-learning developers on what aspects will be needed to improve to ensure the success of these platforms as their usage in higher education and workplace cannot be discounted in this day and age.

Significant students' information can be extracted from an LMS and may help educators to extract and visualize real-time data on student engagement and probability of success in their courses (Oliveira, 2012).

LMS has various advantages like enhanced security, low set up costs, easy accessibility, quicker deployment, it is highly scalable, customizable, easy to maintain, automated upgrade of course material, automatic licensing done by vendors and more storage space (Au-Yong-Oliveira et al., 2018). Global players are focused on innovating and improving their LMS to strengthen their product

offering. Millennials have better understanding of media and digital technology and are considered to be tech savvy (Sweeney, 2012; Twenge, Campbell, Hoffman, & Lance, 2010). This influence must be considered heavily when determining ideal learning mechanisms of millennials (Brown & Charlier, 2013)

1.4 Research Gap

Previous studies have expressed diverse views on advantages and disadvantages, benefits and barriers of E-learning (Abdullah and Ward, 2016). Although many studies have been performed on the topic of E-learning, acceptance of technology, very few studies have attempted to determine the predictors which aid in discriminating the end user's preference for different E-learning platforms. Hence, more research needs to be done focusing on the views of E-learners to determine the actual concerns and problems they face (Babu and Sridevi, 2018).

Research has focused on millennial behaviors and acceptance of E-learning (Morris, 2016; Best, Buhay and Mcguire, 2014) and also on the behaviors commonly demonstrated by the millennials (Myers & Sadaghiani, 2010). However, learning mechanisms most relevant to the millennials has not been extensively researched. Developing this insight is critical for learning and development professionals and instructional designers. This will help practitioners in creating effective training modules and programs. This will enable millennials to be successful at the workplace.

Not much research has also not been performed about how to teach millennials, what they expect from higher education, and their preferences on various E-learning systems being offered in higher education and work place (Barron and Novak, 2017; Lourenco and Cronan, 2017; McGlynn, 2005).

Researchers can examine if millennial course designs contribute to differences in learning goals, retention, and civic engagement (Hosek and Titsworth, 2016).

Thus, this study aims to fill this void investigate the factors that discriminate preferences of millennials towards different E-learning platforms, and proposing a model that incorporates the determinants and aspects for E-learning success that are of recent concern and interest to E-learning users and developers alike.

1.5 Problem Statement

With the advent in technology and with the perpetual increase in the strength of the students and the number of departments in the educational institutions, it is laborious to exchange the study materials between the students and the faculties.

E-learning helps cutting down on expenditure for the universities as well. E-learning is an inexpensive, efficient and comfortable way for students to easily access notes and an easier alternative to study for exams.

The objective of this E-learning framework is thus to enhance current learning practices by understanding issues and challenges faced by millennials utilizing the E-learning systems, and also gauging their preference regarding which system works with least effort and the same time does not compromise on the quality of the education.

As the internet and the technology become more reliable and accessible, recent research has shifted focus towards students' and instructors' communications and attitudes towards E-learning, which is pertinent for its success (Cheng, 2011; Liaw, Huang, & Chen, 2013).

E-learning Critical Success Factors have been individually studied in previous research (Fathema, Shannon, & Ross, 2015; Mtebe & Raphael, 2018) without much emphasis on the synergistic effect of these variables interacting with one another (Eom & Ashill, 2018).

An excessive number of measurements for dependent and independent variables is the main obstacle that researchers face in trying to develop a successful E-learning model. Evidently, there is a need for a comprehensive success model for multiple levels of success (Eon & Ashill, 2018).

With millennials likely to constitute nearly 75% of the workforce by 2025 (Deloitte, 2015), a greater understanding of millennial behaviors has emerged as an area of interest.

In the VUCA (Volatile, Uncertain, Complex and Ambiguous) world, the use of technology is essential and appears to be the key to ensuring knowledge transfer (Rodriguez & Rodriguez, 2015). Millennials have better understanding of media and digital technology and are considered to be tech savvy (Sweeney, 2012; Twenge, 2016).

This influence must be considered heavily when determining ideal learning mechanisms of millennials. Increasingly leveraging technology as a learning platform is becoming popular for a wider, quicker and easier dissemination of knowledge (Brown & Charlier, 2013).

Therefore, technology-based learning, such as online and mobile learning platforms as the mode of knowledge transfer, making use of simulations, games, quizzes, MOOCs, web based interactions, videos or even research repositories, which will be available at anytime and anywhere would be preferred.

The success of the millennials in the workforce is contingent on understanding what makes them tick. This paper highlights how learning mechanisms also need to change to adapt to the millennial's preferences and styles. Based on TAM 1, we proposed a learning model for millennials which allows for predictors to discriminate amongst E-learning platforms. This research work will thus aim to create a well-defined research framework upon which further research can be built

to further our understanding of E-learning environments. The outcome of this work will also be enriched with existing E-learning frameworks and literature.

1.6 Research Objectives

This research aims to find the best predictors that can successfully discriminate amongst millennials' choices between different E-learning platforms.

RO1

Identification of Predictors (Independent variables) from existing literature for E-learning.

RO2

Identification of factors which significantly discriminate between Moodle and rest of LMSs.

RO3

Determining which predictor variables contribute the most to discriminate between Moodle versus rest of LMSs.

1.7 Research Questions

RQ1

What are the predictors from existing literature that are utilized for E-learning?

RQ2

Which factors significantly discriminate between Moodle and rest of LMSs?

RQ3

Which predictor variables influence use of Moodle instead of rest of LMSs the most?

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

An extensive literature review was done for this research project, primarily focusing on E-learning and understanding factors that influence Millennials' preference towards different platforms of E-learning. Previous areas of research have been undertaken to identify the key external factors responsible for acceptance of E-learning based on the Technology Acceptance Model (Abdullah and Ward, 2016), use of Moodle as an E-learning platform (Costa et al, 2012), on reaching the millennial generation in classrooms (Kotz, 2016), the social impact of technology on millennials and consequences for higher education (Au-Yong-Oliveiraa, 2018), evaluating the E-learning systems success (Al-Fraihat, 2019) and also case studies comparing different E-learning platforms (Reyes et al, 2010; Subramanian et al, 2014; Momani, 2010). Although these studies help understand different areas of interest of this study, there needs to be a more in-depth understanding about the critical success factors for E-learning usage from a millennial perspective.

Thus, this literature review will have key benefits for this research topic:

- Through an extensive content analysis on E-learning acceptance and its usage as well about millennials in higher education. Particularly in the last five years (2014-2019)
- Designing of a conceptual framework backed by relevant literature review
- Literature review for theoretical evidence
- Determining the theories and models used in previous studies for similar topics. Technology Acceptance Model which is based on Theory of reasoned action and theory of planned behaviour has been adopted in various past works. Also Unified theory of acceptance and technology acceptance (UTAT) was used to explain technology adoption by university students and lecturers. This study also uses Technology acceptance model (TAM) as a base for its framework.

- Providing insight into the dynamics underlying the findings of other studies which may offer more conclusive results than a single primary research study (Green et al., 2016).
- Identification of newer questions that would require future research. Achieved after a synthesized overview of current data to gain a newer perspective on the topic of interest (Baker, 2016).
- Literature review for hypothesis development and refinement to recognize and avoid future pitfalls of past studies. (Green et al., 2016).
- Demonstrate the gap (distinguishing what has been done from what needs to be done) in the literature, pointing to the significance of the problem and need for the study or building a case for the quality improvement project to be conducted (O'Mara Eves et al., 2015; Jaidka et al., 2014)

2.2 Content analysis

A content analysis was conducted with a total of 48 resources of contextually relevant information pertaining to this study as seen in Appendix 2.2.1.

2.2.1 Sources

A total of 48 papers contributed towards determining the variables used in this research study. 91.7% out of the sources were journal papers. 6.3% were from conference papers and 2.1% from books.

Qualitative and quantitative studies which utilized the Technology Acceptance Model and comparison of Moodle versus other E-learning platforms were examined.

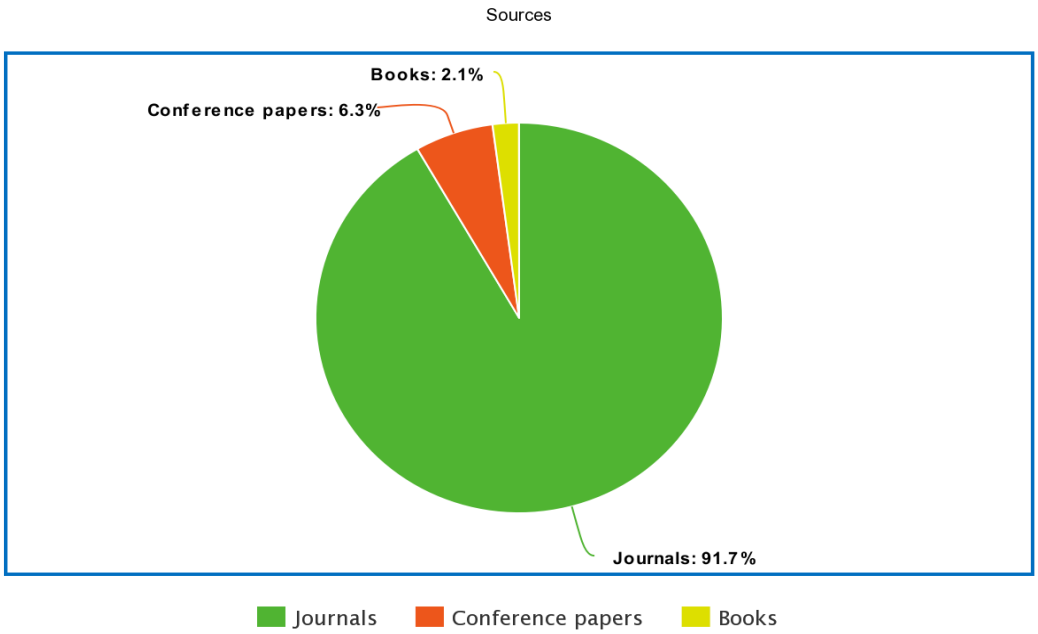


Figure 2.2.1 Literature Sources

2.2.2 Location

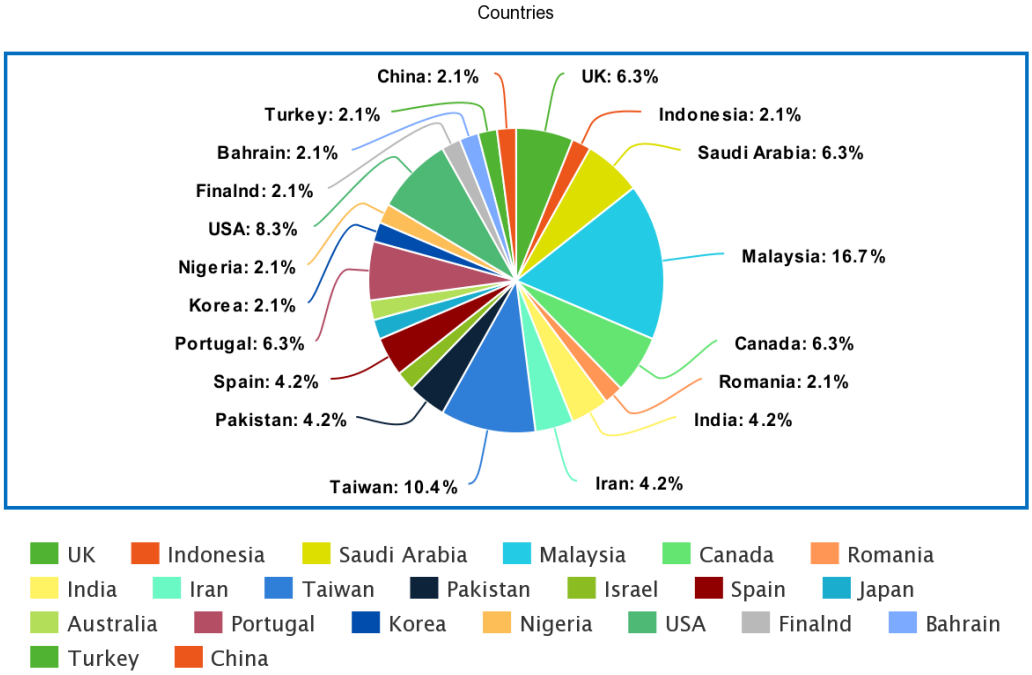


Figure 2.2.2 Locations

As seen in Figure 2.2.2, the sources gathered are from 22 countries with the majority sources are from Malaysia at 16.7% and Taiwan at 10.4%. The sources contributed to the study from around the world, including USA (8.3%), Saudi Arabia, Canada and UK (6.3%).

2.2.3 Variables

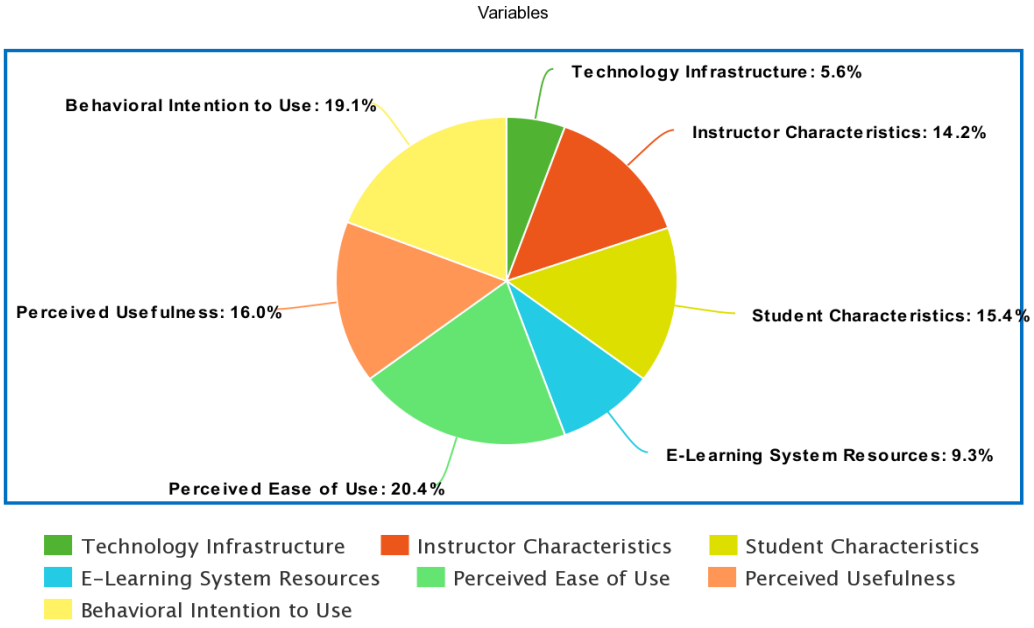


Figure 2.2.3 Variables

There were 7 variables determine from the 48 sources gathered. Out of the 7 variables, there are four independent variables which consist of Technology Infrastructure (TI) at 5.6%, Instructor Characteristics (IC) at 14.2%, Student Characteristics (SC) at 15.4%, E-learning system resources (SR) at 9.3 %; with the moderating variables being Perceived ease of use (PEU) at 20.4% and Perceived usefulness (PU) at 16% and dependent variable being Behavioural Intention to Use (BI) being at 19.1% and technology Infrastructure being the least amongst the 7 variables.

There has been very little focus on the technology infrastructure as an external factor affecting use of the E-learning systems, but majority of the variables reflect use of the Technology Acceptance Model which is also applied in this study.

2.3 Key Predictors for Topic of Interest

2.3.1 Technology Infrastructure

Technology infrastructure is broadly defined as a set of IT components that form the basis of any information technology or internet-based service and platform. It encompasses physical components liked computer and networking hardware and also various software components (Laal and Sjaak, 2017).

All components required for the existence, operation and management of an organization's IT environment are referred to as IT infrastructure (Van der Veen et al., 2017). This could be internal to an organization or deployed to a cloud computing system or a combination of both.

In the context of E-learning, a study done by Alsabawy, Steel and Soar in 2014 deemed that IT infrastructure services were a critical factor in the development of a successful E-learning system, particularly from the perspective of two stakeholders: The Academic staff and the students. Conducted in an Australian University, the main conclusion drawn was that the Academic staff could identify the role of IT infrastructure services in enhancing their job performance (perceived usefulness) but they underestimated its role in supporting the value to the students (the end users of the E-learning system). The students on the other hand found that the IT services were the foundation to achieve a successful E-learning system with its impact on usefulness, user satisfaction and enhanced customer value. Thus, it becomes imperative to pay attention to IT infrastructure services via developing and maintaining them.

A study conducted in a Saudi University by Alhomod and Shafi (2014) evaluated the success of E-learning projects from a technical perspective. The further highlighted that the future delivery of education by use of E-learning platforms will depend on providing teachers with superior and enhanced teaching tools and the results also reflected that technical support had a positive effect on the participation

and willingness to use E-learning systems with many respondents (36%) deeming it the utmost priority.

Soong, Chan, Chua, and Loh (2015) also studied the critical success factors for online courses and conclusively found that the IT infrastructure (in the case of this study, the software utilized) was an important factor in the success of online courses. Although this measure could be considered limited and insufficient because other aspects such as IT education, security, risk management, data management and application management should also be measured.

From the literature above, it can be concluded that measures in the previous studies are limited to very few aspects of what encompasses technology infrastructure. Studies have focused on computer access or computer network reliability (Selim, 2015).

The role of all IT infrastructure services will need to be evaluated to understand the role of this factor in the success of E-learning systems (Weill, Subramani and Boradbent, 2015).

2.3.2 Instructor Characteristics

The instructor's characteristics can be defined as a combination of technical/pedagogical capability, professional qualities and overall personality (Zhi, 2015). Traditional role of instructors in classrooms was to ascertain the success of the academic performance in the classroom. With the revolution of the education system through the rapid development of technology, there were questions raised about the role of teachers in this era of E-learning environment where all the information is now freely available (Yengin et al., 2014).

The literature on online education has had two clear conclusions, one being that students would like to be in control of their own learning (Merriam, Caffarella and Baumgartner, 2014) but also want their instructors to be engaged in their courses (Hoey, 2017).

A study conducted by Lee, Lee and Kim (2018) noted that a major problem with E-learning courses was low retention, but if the instructor was active and involved, it increased the learner's interest and willingness to achieve and self-improve. This thus demonstrates that instructor involvement was responsible for reducing drop-out rates and also positively related to the students' academic achievement.

Another study used instructor quality as a separate construct and confirmed a positive significant relationship between instructor quality and perceived ease of use (Lwoga, 2014). Mtebe and Raphael in 2018 also found that instructor quality had a significant effect on learner's satisfaction with E-learning. Many studies also used Subjective norm in relation to instructor quality and find that there is a significant relationship between perceived usefulness, perceived ease of use and satisfaction (Park, 2016; Roca et al., 2016).

McGill and Klobas (2018) studied the correlation between instructor norms and LMS utilization and found it positively significant. An extensive study done by Al-Fraihat, Joy and Sinclair (2017) found that aspects related to instructors, such as positive attitude, enthusiasm, recommendation to students, involvement with different levels of activities (e.g. interactive and communication and responsiveness to students) significantly influence the likelihood utilizing the E-learning system.

Various studies have also been conducted taking into account different constructs, including, Instructor's enthusiasm while teaching using E-learning tools (Selim, 2017; Puri, 2016; Ahmed, 2015; Abdel-Gawad and Woollard, 2015), Instructor's ability to motivate students to use E-learning system (Selim, 2017; Taha, 2014), Clarity of the instructor's explanation of the E-learning components (Puri, 2016; Ahmed, 2015), Instructor's ability to use the E-learning system effectively (Ahmed, 2015; Taha, 2014) and also Instructor's friendliness while teaching and engaing in online discussions (Puri, 2016; Ahmed, 2015).

2.3.3 Student Characteristics

Student characteristics can be defined as various measures of students' psychological, behavioral nature and attitudes toward everything related to learning (Chan et al., 2014).

This construct has been extensively studied in existing literature by prior E-learning researchers. Studies have examined a subset of the Student (or learner's) quality construct with self-efficacy being the most commonly used dimension. A study conducted by Ong, Lai and Wang (2014) found that the learner's self-efficacy had a significant relationship with perceived usefulness. Similar results were found in the study conducted by Park (2016). McGill and Klobas (2018) also found that learner's attitude towards LMS and LMS utilization were significant.

Students should take an active approach towards learning for them to become successful online learners (Craig et al., 2014). Birch (2014) reiterates the fact that e-learners should be self-sufficient enough to identify and prioritize their skill gaps and also manage their learning experience by setting clear goals, establishing specific plans and securing the resources they need. Quesk and Wong (2013) also state that in order to be successful in an online learning environment, students should have a clear understanding of the purpose and function of E-learning. Another study conducted by Adurachman et al. (2018) Self-efficacy has significant

positive effect of 46.8% on perceived ease of use in the adoption of E-learning system. Thus, concluding that the more students believed in their ability to use the E-learning system, the easier it became for them to use the system. A research conducted by Abdullah and Ward (2016) attempted to identify the most commonly used external factors in the TAM model in context of E-learning. Their results showed that the best predictor for the student's perceived ease of use (PEOU) for E-learning systems was self-efficacy, followed by enjoyment, experience and computer anxiety.

Other constructs studied in previous research papers also include: Student's willingness to participate in E-learning (Puri, 2016; Ahmed, 2015), Student' learning style affecting the use of E-learning system (Ahmed, 2015; Abdel-Gawad and Woollard, 2015), Student's experience and knowledge about computers (Puri, 2016; Ahmed, 2015), the level of student's enjoyment while using technology (Puri, 2016; Taha, 2014) and Student's understanding and purpose of different parts of E-learning system (Puri, 2016; Ahmed, 2015; Abdel-Gawad and Woollard, 2015).

Several dimensions of students' characteristics also include, Self-Efficacy (SE) refers to an individual's judgment of his or her own capability to perform a specific task (Abdullah and Ward, 2016). A study conducted by Compeau and Higgins (2014) suggests that the higher the individual's E-learning self-efficacy, the more likely they are to use E-learning. In a systematic review conducted by Abdullah and Ward (2016), 107 studies were analyzed, out of which 41 studies investigated the relationship between Self-efficacy and Perceived Ease of Use (PEOU) of E-learning, out of which 33 papers (80%) found a significant and positive relationship between the two constructs.

The dimensions of computer anxiety and computer experience were discarded in this study, on account of the respondents of this study being millennials who are

digital natives and hence, use of technology and experience does not invoke negative emotions in them.

2.3.4 E-learning System resources

Any digital material used for supporting student learning that is delivered in multiple delivery models (Kumi-Yeboah et al., 2016). As E-learning is widely used in educational and corporate set-ups as a means for supporting learning, concurrently, the E-learning resources become valuable to improve access to high quality educational content (Navarrete, Luján-Mora and Peñafiel, 2016).

Although various studies have postulated different dimensions of E-learning system resources, it has not been used as a single construct to examine its role in the success of E-learning systems.

The various dimensions studied include, Content quality (Al-Ammari and Hamadd, 2018, Cheng, 2016; Cheng, 2014; Lau and Woods, 2018; Motaghian et al., 2014; Park, Son and Kim, 2015; Shah et al., 2014), Teaching materials (Bhatiasevi, 2014; Chen et al., 2015; Cheung and Vogel, 2017; Lee, Hsia and Purnomo, 2014), Course design quality (Cheng, 2014; Hussein, Aditiawarman and Mohamed, 2017; Musa and Othman, 2015; Puri, 2016; Musa and Othman, 2015; FitzPatrick, 2014), Content richness and vividness (Lee and Lehto, 2014), Ease of access to course material (Musa and Othman, 2015; Ahmed, 2014; Taha, 2014), Measurement of learning progress (FitzPatrick, 2014; Ahmed, 2014), Language support (FitzPatrick, 2014; Ahmed, 2014; Puri, 2016; Abdel-Gawad and Woolland, 2015).

The increasing availability of educational resources online, particularly Open Educational Resources (OER), has provided an opportunity for students to be able to access high quality educational content released by prestigious universities and highly valued researchers around the world through their technological devices. OER as digital content utilized for the purpose of teaching and learning is released

under open intellectual property which allows for it to be used, reused and be adapted. These resources include learning materials like textbooks, lessons, lectures, assessments, full courses, syllabi and simulation software. These can also have different formats, such as web pages, documents, presentations, video streaming, images and podcasts (Atkins, Brown and Hammond, 2017).

The quality of the E-learning resources is an indispensable dimension in evaluating the success of E-learning systems due to its essential role in achieving the learning objectives and the issues that occur with poor quality information (Al-Sabawy, 2013). This relationship between information quality and its use was found to be significant in a study conducted by Rai et al. (2013).

Klobas and McGill (2018) and Eom et al. (2017) also found a significant relationship between information quality and user satisfaction with the LMS. The relationship between information quality and perceived usefulness was also found significant in the study of Chen (2016) for E-learning platforms in the context of an organization.

The integration of OER in E-learning environments can support the learning process by taking advantage of the inherent quality of these resources and the reduction of the costs associated with this process (Navarrete, Luján-Mora and Peñafiel, 2016).

As more universities and academic institutes integrate E-learning as a part of their curricula, E-learning platforms should be able to offer courses and materials freely and openly on the internet for non-commercial educational purposes, this could potentially mean that there will not be any restrictions on how a user could modify these materials according to his requirements for grants, translation and combining them with other materials or change their format (MIT, 2018).

2.3.5 Perceived Ease of Use

Perceived ease of use is defined as “the degree to which an individual believes that using a particular system would be free of physical and mental effort” (Davis, 1989).

This is one of the major constructs in the Technology Acceptance Model. Perceived ease of use is a behavioural belief that influences user’s intention to adopt information technology. Hence, if an application is easy to use, it will more likely be accepted by individuals. Cheng et al. (2016) in their study concluded that a positive relationship existed between perceived ease of use and behavioral intention through two ways, firstly, by direct effect and also indirectly through perceived usefulness.

In the study conducted by Abdurachman et al. (2018) perceived ease of use had a significant positive effect of 79.9% on perceived usefulness in the adoption of E-learning system, hence demonstrating that the more students find it easy to use E-learning system, the greater will be the benefits of using the system for the students. Other studies also came to this conclusion (Abdullah and Ward, 2016; Lee, Hsiao and Purnomo, 2014; Lee, Hsieh and Chen, 2015; Mohammadi, 2015; Irawati and Putra, 2014; Abbasi et al., 2015; Punormo and Lee, 2013; Agudo-Peregrina, Hernández-García, and Pascual-Miguel, 2014; Alharbi and Dre, 2014).

The study by Abbasi et al. (2015) explained that although perceived ease of use had no direct impact on the intention to use E-learning system, it had direct influence on perceived usefulness, which in turn led to a greater acceptance of E-learning systems.

Hence it becomes important for the universities to provide training for instructors and students to be able to use the system easily and for the E-learning designers to improve the ease of use, through user-friendly interface design, easy access to the platform and clear instructions to use.

Lee, Hsieh and Chen (2015) found that Perceived ease of use has significant positive effect on perceived usefulness. The easier it is to use the system, the greater the benefits of using the system that the person perceives. The relationship between these two variables is supported by the findings of study (Alharbi and Drew, 2014). Their study also concluded that Perceived ease of use has significant positive effect on behavioral intention to use. The more a person believes that a system is easy to use, the higher the person's intention to use the system. The relationship between these two variables is supported by the findings of various other studies (Tarhini et al., 2017; Chin-Ter, Hajiyev and Su, 2017; Tarhini, Hone and Liu, 2014).

This construct has been shown in a variety of studies to positively influence behavioral intention to adopt a system (Fagan et al., 2018; Norazah & Norbayah, 2017; Norazah et al., 2016). However, in some studies, perceived ease of use has no influence over the behavioral intention to adopt a system (Ruiz-Mafe et al., 2015). The variable findings noted in the various studies may be attributed to the different situation and technology studied (Chen et al., 2016).

2.3.6 Learning Management System (LMS)

A learning management system is a web-based delivery software application that is utilized for the administration, documentation, tracking, reporting and delivery of educational courses, training programs, or learning and development programs (Ellis and Ryann, 2012). The concept of LMS has directly emerged from E-learning.

Learning Management Systems (LMSs) adopted by universities and other higher education institutions help to deliver courses' contents, provide distance learning and manage the education process (Fischer et al., 2012). LMS provides delivery of instructions and resources in a variety of ways, like use of web pages for delivery of texts, multimedia (educational videos) and interactive hypermedia (Masa'deh et al., 2016; Tarhini et al., 2016).

Modern LMSs are now web-based systems. Initially designed to be hosted by the organization itself on-premise, through the purchase of the software license, now SaaS (Software as a service) is popular where hosting is provided by the vendors of the platform itself (Lin, 2015). Although Massive Open Online Courses (MOOC) with home grown and open learning solutions like Moodle have gained traction now.

Through the use of LMS, instructors have the ability to create course materials and integrate them with learning goals, assessments, track student progress and also provide them with customized tests and quizzes. The leverage of LMS is that learning content and tools are delivered straight to the learners while also creating a channel of communication between the instructor and the learner (Phillip, 2014; Wang et al., 2018).

The Asia-Pacific market is poised to register a high CAGR (+20%) in countries like China, India and Japan. This rise is also attributed to increase in demand of low-cost cloud deployment and rise of bring your own device (BOYD). In the US higher education market, Top 3 LMSs were Blackboard (31%), Canvas (30%) and Moodle (18%). Although worldwide, Moodle had over 50 % of market share in Europe and Latin American nations (Allied market research, 2018).

E-learning systems used in higher education most often to facilitate learning in an internet learning setting : include Moodle, WebCT, Canvas, Iilias, LAMS and SAKAI, Blackboard.

2.3.6 a) Moodle

Moodle (*modular object-oriented dynamic learning environment*) is free and open-source LMS written in PHP and distributed under General Public License (Moodle.org, 2019). It was developed by Martin Dougiamas to help educators create online courses also including interaction and collaborative content features. The first version became public in 2002. It is a course management system (CMS) based on sound pedagogical principles to help aid in blended learning, distance education and E-learning programs in schools, academic set ups and workplaces (Horvat et al., 2015).

Moodle core provides the entire infrastructure necessary to build an LMS. It implements the key concepts that all the different plugins will need to work with (Subramanian, Zainuddin & Alatawi, 2014).

As a free web application, instructors can effectively create online learning courses. Moodle has features that allow it to scale very large deployments as well as for small classroom settings. It is used by various academic institutes to conduct distance learning (fully online courses) as well as to supplement traditional classroom setting (blended learning). Moodle also provides forums and databases and collaborative communities centered around course modules.

Moodle is developed on pedagogical and technological principles in mind, with its strong grounding in social constructionist pedagogy and availability of educational tools (Cheng-Chao Su, 2015).

Moodle is perceived as high value in the education community, particularly higher education (Momani, 2014).

Moodle is one of the most user-friendly and flexible open source courseware products available. Thus, this program receives a high recommendation and is used all over the world by universities, schools, companies and independent teachers (Catalyst IT Limited, 2013).

Currently, there are 3324 web sites from 175 countries that have registered with Moodle; also, Moodle has 75 languages (Moodle.org, 2019).

2.3.6 b) Other LMS: Blackboard, Atutor, Iilias

Blackboard Learn (previously the Blackboard Learning Management System) is a VLE and LMS (virtual learning environment and learning management system) developed by Blackboard Inc. A web-based server software which has features of course customization and scalable design options that allows integration with student information. It can be installed in-premise for universities or hosted by Blackboard itself (Blackboard Learn, 2019). In October 2017, Blackboard partnered with OpenEd to integrate OER with Learning Management Systems (Bolkan, 2017).

Blackboard Learn provides users with a platform for communication and sharing content. As a Course Management System (CMS) it allows instructors to create and upload teaching material online for students to access them. Students can follow the lessons on-line, interact with the teachers, and with each other in different ways and access repositories of documents (Momani, 2014).

It is one of the most popular platforms for E-learning in higher education institutes (Iskander, 2013).

It integrates communication tools, including a bulletin board, chat room and private e-mail. In addition, graphics, video, and audio files can be included into a Blackboard site. Blackboard also provides instructional tools to support course content such as a glossary, references, self-test, and quiz module. Students can place assignments and other materials in Blackboard for courses in which they are enrolled. Furthermore, Blackboard also gives academic staff course management tools for grading, tracking student interaction, and monitoring class progress (Tarhini et al., 2016).

Atutor

Atutor is an open source web-based learning content management system (LCSM) that was launched in 2002. Its USP is the accessibility features for visually impaired and disabled learners. Its conformity with XHTML 1.0 is intended to ensure that ATutor is presented and displayed consistently in any compatible technology (Atutor, 2019)

ATutor is designed for adaptability to any of several teaching and learning scenarios. There are four main areas that reflect this design principle: themes, privileges, tool modules and groups.

The ATutor theme system allows administrators to easily customize the look and layout of the system to their particular needs. Themes are used to give ATutor a new look, to give categories of courses their own look, or to provide multiple versions of ATutor on a single system, from which users could choose one as a preference setting (Ruiz Reyes et al., 2015).

Ilias

ILIAS is an open source web-based learning management system (LMS). It supports learning content management (including SCORM 2004 compliance) and tools for collaboration, communication, evaluation and assessment. The software is published under the GNU General Public License and can be run on every server that supports PHP and MySQL (Ilias.de, 2019). In 2004, ILIAS became the first open source LMS that reached full SCORM 1.2 compliance.

2.4 Conceptualized Research Framework

A conceptual framework is developed for this research to study the influence of Technology Infrastructure, Instructor Characteristics, Student Characteristics and E-learning System Resources on Type of E-learning platform preferred by millennials. The framework is constructed based on application of constructs from Technology Acceptance Model (TAM) version 1 (Davis, Bagozzi & Warshaw 1989).

The framework is constructed based on application of constructs from Technology Acceptance Model (TAM 1) namely, namely *External Variables* (represented by Technology Infrastructure, Instructor Characteristics, Student Characteristics and E-learning System Resources), Perceived Ease of Use (PEU) *Actual System Use* (Type of E-learning Platform preferred). The dependent variable is categorical in this study.

As illustrated from Figure 2.4.1, the framework presents all of the proposed hypotheses by demonstrating the direct relationship between independent predictors, i.e. Technology Infrastructure (TI), Instructor Characteristics (IC), Student Characteristics (SC) and E-learning System Resources (SR) and dependent variable, i.e. Type of E-learning platform preferred (Moodle versus rest of LMSs)

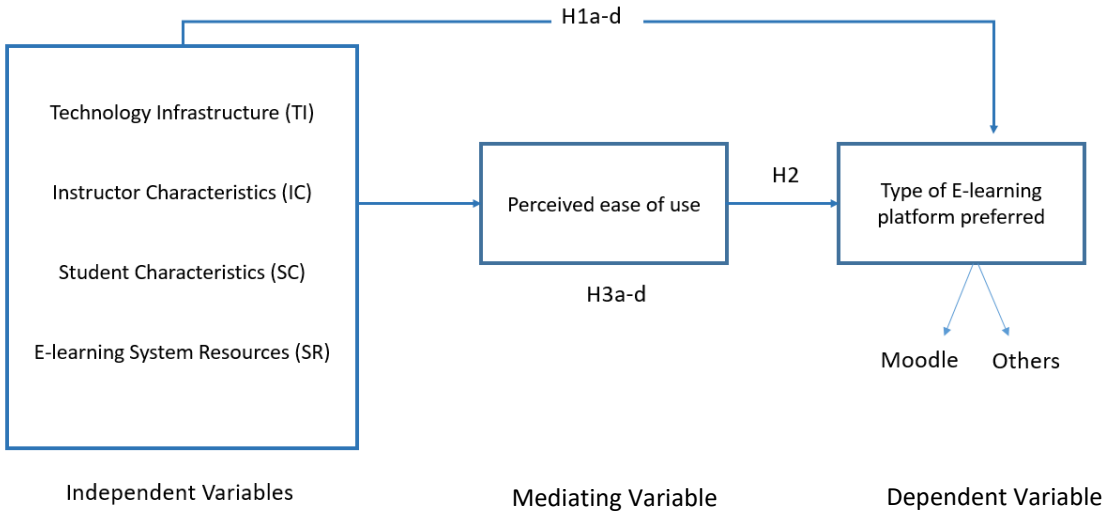


Figure 2.4.1: Proposed Conceptual Framework.

2.5 Management Theory Supporting Framework

Technology Acceptance Model (Version 1) is adopted in this study to examine what factors influence the millennial respondents' preference for E-learning Systems.

TAM, shown in Fig. 2.5.1, was adapted from the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) by Davis in 1986, its purpose is to explain technology adoption behaviour. In TAM, external variables are proposed to trace the impact of outside factors on users' two main perceptions, perceived ease of use (PEOU) and perceived usefulness (PU). PEOU directly influences PU. These perceptions affect users' positive or negative attitudes towards using the technology. Attitude towards using the technology influences behavioural intention to use the technology. PU also directly influences behavioural intention to use. Behavioural intention to use technology then determines actual use.

In the context of E-learning, TAM is the most used ground theory in E-learning acceptance literature, a systematic review of 42 E-learning acceptance studies showed 86% use TAM (Sumak, Hericko and Pusnik, 2011).

TAM has been widely used to study E-learning acceptance or use (Al-Gahtani, 2014; Hidayanto et al., 2014; Hsia, Chang, & Tseng, 2014; Lee, Hsiao, & Purnomo, 2014; Padilla-Melendez, Tarhini et al., 2014; Wu & Zhang, 2014). Many researchers have extended TAM by adding different external factors to study E-learning acceptance or use (including: Cheung & Vogel, 2013; Hidayanto et al., 2014; Lee & Lehto, 2013). In a review of 107 studies that added external variables to the basic TAM and proposed new models, Abdullah and Ward (2016) found five excessively and commonly used variables for the extension – self-efficacy, subjective norm, perceived enjoyment, computer anxiety, and computer use experience.

TAM is believed to be more parsimonious, predictive, and robust (Venkatesh & Davis, 2000). Technology Acceptance Model (TAM) has appeared to be one of the most widely used models due to its understandability and simplicity (Legris, Ingham and Collerette, 2003).

TAM is therefore adopted for this study as a ground theory with different external factors to underpin the use of different E-learning platforms (Moodle versus Other LMSs).

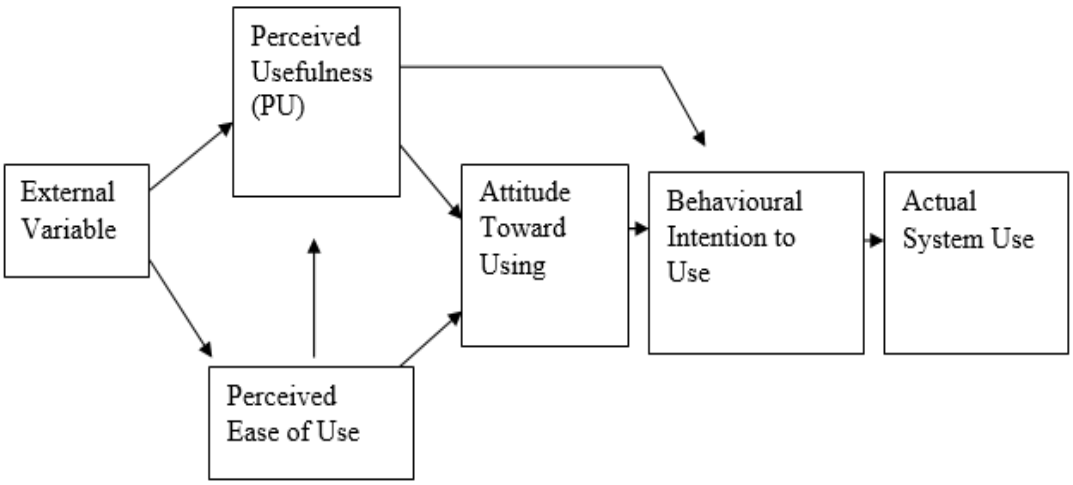


Figure 2.5.1: Framework of Technology Acceptance Model (TAM) version 1

Source: Davis et al., 1989.

2.6 Literature Review and Hypotheses Development

2.6.1 Relationship between TI and Type of E-learning platform preferred

Technology infrastructure can be broadly defined as the foundation and framework consisting of hardware, software, storage and networking facilities geared towards keeping an organization's IT environment running (Laal and Sjaak, 2014). For running and successfully operating E-learning platform, a robust technology infrastructure is required.

DeLone and Mclean (1992) based the success of E-learning on an information systems success model. This model contained six variables: system quality, information quality, use, user satisfaction, individual impact and organizational impact. The model was then updated 10 years later, and the 'use' construct was then split into 'intention to use' and 'use' to measure success in areas where use is voluntary and mandatory, and the individual and organizational impacts were

merged into benefits. Thus, the technical system quality (in the case of this study, technology infrastructure) in the DeLone and McLean (2003) model was assumed to directly affect use and user satisfaction. This model has since been used in the information technology context and found a positive association between IT system quality and use (Halawi, McCarthy and Aronson, 2014; Hsieh and Wang, 2016; Livari, 2015). In the context of E-learning, system quality has also proved to be strongly related to use (Balaban, Mu and Divjak, 2013; Garcia-Smith and Effken, 2014; Marjanovic et al., 2016).

Other studies have also found a positive relationship between IT system quality and user satisfaction (Halawi, McCarthy and Arson, 2014; Leclercq, 2017). Hassanzadeh et al. (2012) in their study postulated that if the technical quality of the E-learning system is more, user satisfaction is higher.

Based on these findings, we assume that a better technology infrastructure (compatible with the respondents' requirements) will lead to higher satisfaction amongst users and hence, a higher probability of them using that system. Thus, the following hypothesis was proposed.

H1a: Technology Infrastructure is a good predictor of the type of E-learning platform preferred

2.6.2 Relationship between IC and Type of E-learning platform preferred

A teacher (Instructor/lecturer) has a strong influence on the students. Thus, the ability of the teacher to be liked, to motivate students, to help them understand and assimilate information becomes of paramount importance. Effective learning requires good teaching and good teaching requires value judgments that build professionals to educate their students (Lupascu, Panisoara and Panisoara, 2014).

The study by Darling-Hammond (2015) showed that there is a positive relationship between teacher quality as “enthusiasm, creativity, flexibility and adaptability and school success of its students”.

Instructor characteristics encompasses pedagogical capability, professional qualities and personal characteristics. Therefore, instructor's role in the success of E-learning has received attention from researchers in the E-learning arena.

In a study by Sun et al. (2015) found a positively significant relationship between instructor response timeliness, instructor attitude towards E-learning and satisfaction. Study by Cidral et al. (2018) also found a positive relationship between instructor attitude toward E-learning and user's satisfaction. Lwoga (2014) in his study also confirmed a positively significant relationship between instructor quality and perceived ease of use and user satisfaction.

Also, instructor quality has been found to have a significant effect on learners' satisfaction with an E-learning system in the study conducted by Mtebe and Raphael (2018). In our research, we assume that aspects related to instructors, are likely to influence the E-learning system they prefer to use. Based on that, we propose the following hypothesis:

H1b: Instructor Charateristics is a good predictor of the type of E-learning platform preferred

2.6.3 Relationship between SC and Type of E-learning platform preferred

Learner characteristics can be personal, academic, social/emotional and/or cognitive in nature. These characteristics may influence how and what they learn. Thus, the Student Characteristics are important for creation of effective instructional design. As by considering characteristics of the students, more

efficient and well-tailored instructional mode, method and materials can be developed to be delivered to the learners (Drachsler and Kirschner, 2012).

In the current era of Technology enhanced learning, focus on student characteristics has increased, as personalization of massive amounts of information and knowledge for students in higher education and employees in work place has the potential to reduce delivery costs, create effective learning experiences, reduce study time and increase competence and skill development (Manouselis et al., 2015).

Studies by Ong, Lai and Wang (2014), Chen and Tseng (2015) and Park (2014) showed a significant relationship between learner's self-efficacy and perceived usefulness.

McGill and Klobas (2018) found a significant relationship between learner's attitude towards LMS use and LMS utilization. The relationship between learner and perceived satisfaction was found to be significant by Sun et al. (2015) and Ozkan and Koseler (2018). Hence, given the positive relationship between various dimensions of learner's characteristics and use of the system, it is more likely that the characteristics of the student will influence their preference and use of an E-learning platform. Thus, we propose the following hypotheses:

H1c: Student Characteristics is a good predictor of the type of E-learning platform preferred

2.6.4 Relationship between SR and Type of E-learning platform preferred

All resources available on an E-learning platform that is used for non-commercial educational purposes can be deemed as E-learning system resources. This includes, course or chapter objectives, lecture notes, PowerPoint slides, presentations,

assignments, quizzes, tests, videos, documents providing links to other websites and e-books.

The availability and quality of these resources are indispensable dimensions in evaluating the success of E-learning systems. As information and resources play a key role in achieving the learning aims and goals of the learners (Al-Sabawy, 2013).

The above mentioned DeLone and McLean model of 2003 also incorporated information quality in their information success model for E-learning.

Based on the information systems literature, Rai et al. (2014) showed that there is a significant relationship between information quality and use. Similar results were also obtained by Halawi et al. (2018), Kositanurit, Ngwenyama, and Osei-Bryson (2016) and Seddon and Kiew (2012) and

Klobas and McGill (2018) and Eom et al. (2015) found a significant relationship between information quality and both use and satisfaction with the LMS.

Therefore, we may assume that improved quality of information in the E-learning system will positively lead to an increase system usage. Thus, we hypothesize that:

H1d: E-learning System Resources is a good predictor of the type of E-learning platform preferred

2.6.5 Relationship between PEU and Type of E-learning platform preferred

Perceived ease-of-use (PEU) was defined in the original TAM model by Davis as "the degree to which a person believes that using a particular system would be free from effort" (Kurahashi et al., 2018).

Many studies have through empirical evidence, established a significantly positive relationship between PEU with perceived usefulness. This means that the easier a system is to use, the higher the benefits the user will perceive, thus a higher

probability of the learner using that system (Lee and Hsiao, 2014; Mohammadi, 2015; Alharbi and Drew, 2014; Irawati and Putra, 2015).

Perceived ease of use also has a significant and positive effect on behavioural intention to use. This means that the more a person believes a system is easy to use, the higher the person's intention to use the system (Tarhini et al., 2017; Ching-Ter, Hajiyev and Su, 2017; Lee and Hsiao, 2014; Abdullah and Ward, 2016; Motaghian, Hassanzadeh, and Moghadam, 2013).

In a study conducted by Adburachman et al. (2018) PEU had 79.9% significantly positive effect on perceived usefulness in adoption of E-learning system. So, if students feel that E-learning system is easy to use, then the system will be deemed useful by students and they will be ready to adopt E-learning system.

Therefore, the following hypothesis is proposed:

H2: Perceived Ease of Use has a positive influence on the type of E-learning platform preferred

The original TAM model used attitude as a mediator between user perceptions (i.e. perceived ease of use and perceived usefulness) and behavioral intention to use, but some studies have taken attitude toward using out from their model because of its weak role in construct relationships (Tarhini et al., 2017; Ching-Ter, Hajiyev and Su, 2017; Chen et al., 2013; Lee and Lehto, 2014; Abdullah and Ward, 2016).

This is also supported by research results which suggest that there is a weak relationship between perceived usefulness and attitude as well as no direct effect of attitude on intention to use (Venkatesh et al., 2003) hence, attitude is excluded from the TAM model in this research.

The construct of Perceived ease of use is appointed as the mediator in this research. According to TAM, perceived ease of use can be a predictor of perceived usefulness

of a system (Davis, 1989; Park et al., 2014; Tarhini et al., 2015; Venkatesh & Davis, 2000). Since perceived ease of use is considered a key determinant of perceived usefulness, it can also indirectly affect the intention to continue using a system through perceived usefulness.

Thus, based on the above mentioned external predictors, the system first needs to be handled easily in order to be perceived as useful and actually be implemented (Park et al., 2014). Therefore, this study forms the following hypothesis.

H3a: Perceived Ease of Use positively influences the predictive power of Technology Infrastructure in the type of E-learning platform preferred

H3b: Perceived Ease of Use positively influences the predictive power of Instructor Characteristics in the type of E-learning platform preferred

H3c: Perceived Ease of Use positively influences the predictive power of Student Characteristics in the type of E-learning platform preferred

H3d: Perceived Ease of Use positively influences the predictive power of E-learning System Resources in the type of E-learning platform preferred

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The research investigation was carried out in October 2019, questionnaires were distributed among 300 respondents. This chapter discusses the search methodology used to collect the data required.

3.2 Research Design

The method adopted for this research was Quantitative research (Deductive) method. The Questionnaire survey was created using Google form and the link was then distributed via WhatsApp for the respondents to fill up. This was a Primary Data Collection method. The aim was to understand what factors influence millennial's preference of different E-learning platforms. The questionnaire was developed based on the literature review and some questions were modified for the purpose of being clear, simple and concise for the respondents, and also for contextual relevance to the study.

3.3 Population and Sample

The target population for this research were millennials, born in or after 1982 (Jordan, 2016) who are currently using or have used different E-learning platforms. This study planned to collect data from 300 respondents.

It has been emphasized that researchers face various difficulties while collecting data due to many factors (Rimando et al, 2015). The duration of data collection was from 12th October to 24th October 2019. The short duration could have also negatively affected the success of data gathering process, which, according to a study conducted by Rimando et al in 2015, is one of the challenges faced by early

career researches. The process utilized was through an online survey distributed through WhatsApp.

The survey took about 10-15 minutes to complete, could have lead to a decline in survey response. Survey abandonment as it is time consuming or providing information in a hasty manner has also posed a challenge for scholars (Schmeets, 2010). A convenience sampling method was also used for ease of collecting data and time constrain.

Apathy of respondents when responding to questionnaires could also compromise the objectivity and independence of the reality of the positivist paradigm in which survey research is established in (Terrell, 2012). Non-response of participants in a sample size is a daunting challenge in data collection. Survey researchers anticipate getting the smallest sample size to generate outcomes that are statistically consistent and generalizable (Barlett, Kotrlik, & Higgins, 2001). Hence, accuracy of quantitative research results hinges on the sample size of the population. Sample sizes larger than 30 and less than 500 are appropriate for most of the research and for multivariate study such as multiple regression analysis (Roscoe, 1975).

The sample size for this study is 77 participants. 75.3% of those were Malaysians. It consisted of 35 males and 42 females. 53.2% of the participants were bachelor's degree holders. 28.6% of the respondents have used Moodle and the rest having used other LMS platforms. Socio-demographic information of the respondents is given in Table 3.2.1.

Table 3.2.1: Socio-Demographic information of respondents.

Variable	Particulars	No. of Respondents	Percentages (%)
Gender	Male	35	45.5%
	Female	42	54.5%

Age	16-20 Years Old	3	3.9%
	21-26 Years Old	52	67.5%
	27-32 Years Old	18	23.4%
	33-38 Years Old	4	5.2%
Nationality	Malaysian	58	75.3%
	Non-Malaysian	19	24.7%
Student Type	Full Time Student	56	72.7%
	Part Time Student	21	27.3%
Academic Level	Pre-University	1	1.3%
	Diploma	1	1.3%
	Degree	41	53.2%
	Master	23	29.9%
	Post Graduate Diploma	7	9.1%
	Doctorate / Phd	4	5.2%
E-learning System Used	Moodle	22	28.6%
	Others	55	71.4%

3.4 Survey Method

Primary data collection method was used. An online questionnaire was designed, and the questions were substantially modified to remove any ambiguity and make the process smooth and less time consuming. The online survey was created as a google form and the survey link was then distributed to 300 people. A total of 98 complete reponses were collected and based on the filtering questions, 77 respondents were included in the final data analysis. The rest did not qualify on the basis of their age and their non usage of any E-learning platform prior to this study, thus causing their exclusion.

The constructs of Technology Characteristics, Instructor Characteristics, E-learning System Resources, Student Characteristics and Perceived Ease of use were measured using questionnaire items that had to be rated using a 5-point Likert scale.

The Likert scale helps to quantify results and hence obtain shades of perceptions. The Choices (Or categories of responses) range from "Strongly Disagree" =1 to "Strongly Agree" = 5, as the categories move from one unit to the next, the value will increase by one unit. This scale has equal units as categories move from most negative to most positive, thus allowing measurement of attitudes, beliefs and perceptions aiding in quantifying data. (Simon et al, 2013; Rensis, 1932)

3.5 Questionnaire Development

A self-administrated questionnaire was developed to verify all the hypotheses and research framework. The questionnaire was prepared based on the literature review. Primarily two studies were used to adopt or adapt the question items (Alhabeeb and Rowley, 2018 and Sylvia and Abdurchman, 2018).

Some questions were modified to simplify and remove any ambiguity. The original and revised questionnaires are available in Appendix 2.

	Strongly Disagree	**Disagree**	**Somewhat Agree**	**Agree**	**Strongly Agree**
Technology Infrastructure					
TI 1: I have easy access to the internet on a daily basis	**1**	**2**	**3**	**4**	**5**

TI 2: I can easily browse through the E-learning website	**1**	**2**	**3**	**4**	**5**
TI 3: There are sufficient computer labs in the university for me to utilize when I need it	**1**	**2**	**3**	**4**	**5**
TI 4: Online help desk is easily available and helpful when I need it	**1**	**2**	**3**	**4**	**5**
TI 5: I find it easy to register for E-learning courses	**1**	**2**	**3**	**4**	**5**
Instructor Characteristics					
IC 1: Instructor's ability to motivate me to use E-learning system is important	**1**	**2**	**3**	**4**	**5**
IC 2: I tend to learn more via E-learning System if the instructor is skilled	**1**	**2**	**3**	**4**	**5**

IC 3: Instructor's ability to provide me with adequate resources will enhance my learning journey.	**1**	**2**	**3**	**4**	**5**
IC 4: Understanding the instructor's explanation is important to me	**1**	**2**	**3**	**4**	**5**
E-learning System Resources					
SR 1: Online tests/quizzes are available for my utilization	**1**	**2**	**3**	**4**	**5**
SR 2: Resources required for the courses are available on the website	**1**	**2**	**3**	**4**	**5**
SR 3: I am easily able to contact the instructor through the E-learning system (eg. E-mail and online message)	**1**	**2**	**3**	**4**	**5**
SR 4: Offline support is easily available if I encounter any issues with the E-learning system	**1**	**2**	**3**	**4**	**5**

SR 5: I can easily access the E-learning resources on and off campus	**1**	**2**	**3**	**4**	**5**
Student Characteristics					
SC 1: I have confidence in my knowledge and experience about computers	**1**	**2**	**3**	**4**	**5**
SC 2: I am confident in my ability to find things in the E-learning system	**1**	**2**	**3**	**4**	**5**
SC 3: I am willing and motivated to participate in the E-learning	**1**	**2**	**3**	**4**	**5**
SC 4: I enjoy using E-learning system for my course	**1**	**2**	**3**	**4**	**5**
SC 5: I have confidence in my ability to do what lecturers expect me to do while using the E-learning system	**1**	**2**	**3**	**4**	**5**
Perceived Ease of Use					

PEU 1: Ease of Signing in the System	**1**	**2**	**3**	**4**	**5**
PEU 2: Ease of navigating the system	**1**	**2**	**3**	**4**	**5**
PEU 3: Ease of Accessing the course material	**1**	**2**	**3**	**4**	**5**
PEU 4: Ease of submitting and receiving emails	**1**	**2**	**3**	**4**	**5**
PEU 5: Ease of submitting assignments	**1**	**2**	**3**	**4**	**5**
PEU 6: Ease of using the chat function	**1**	**2**	**3**	**4**	**5**
PEU 7: Ease of use of Turnitin	**1**	**2**	**3**	**4**	**5**

PEU 8: I easily get the information I need from the E-learning system.	**1**	**2**	**3**	**4**	**5**
PEU 9: The instructions in the E-learning system is clear and easy to understand.	**1**	**2**	**3**	**4**	**5**
PEU 10: The use of E-learning system increases my learning effectiveness.	**1**	**2**	**3**	**4**	**5**
Open Ended Question					
How can teachers encourage and support online learning?					
Does E-learning improve your learning performance? Which part was most useful and/or interesting?					
What were the challenges you faced while using the E-learning system?					
Would you prefer to take up a subject online or in a classroom? Why?					
How could the institution improve the course and the online services it provides to students? For example, should the institution provide blog, e-portfolio, or wiki capabilities?					

3.6 Data Collection and Data Cleaning

With the Google form created online, the URL was to contacts via WhatsApp, a social media and communication application. The targeted respondents were primarily university students as this study's primary focus are millennials who have prior experience of E-learning platforms.

As students and young adults who have used different E-learning platforms have contextual relevance towards understanding which platforms are preferred more and what factors influence these preferences. The data was then extracted from the google form excel file and then converted to numerical data for analysis in SPSS as seen in Appendix.

3.7 Statistical Analysis

Tests of different statistical analysis and tools were used in this research study in order to analyze the collected data. These tools included: Descriptive analysis, Reliability test and Linear Discriminant Analysis.

Reliability tests were conducted by using the Cronbach's alpha to validate the reliability of the research instrument. Moreover, the Descriptive analysis and linear discriminant analysis were used to explain the predictive discriminatory power of the independent variables.

3.8 Ethical Considerations

This study was conducted to understand the preferences of millennials for different E-learning platforms. Ethical issues were taken into consideration when the data was collected. The respondents were informed of the purpose of the study and their participation was voluntary. Their consent was taken in the beginning of the study and the anonymity and confidentiality of all the information provided was ensured. Mailed or web-based surveys, however, have implied consent or "passive" consent when respondents complete them (Buchanan & Hvizdak, 2009). Surveys are widely used instruments to collect research data.

Moreno et al. (2013) suggested that researchers should provide complete details of the study to the respondents (the aim of the study, data collection, advantages of the study, how confidentiality is maintained). The contact information provided can

help ensure that respondents can contact any time to clarify any doubts or worries they could have regarding the research.

Hence, all these steps were taken to ensure that this study was conducted in an ethical manner, and the data provided by each respondent online was protected and only used for the purpose of this research.

CHAPTER 4: DATA ANALYSIS

4.1 Introduction

This chapter discusses the findings and data analysis collected from the survey distributed to respondents who have previous experience in using E-learning platforms. The findings of the data have been generated through the use of SPSS software. This chapter has been divided into 4 parts.

Part one discusses the response rate information and the socio-demographic characteristics of the respondents.

Part two discusses the descriptive analysis of single variable questions.

Third part includes common method bias before reliability analysis was done to further test the internal consistency

Fourth and last part is to test the hypothesis for independent and mediating variable using Linear Discriminant Analysis as the dependent variable in this study is categorical (Type of E-learning platform preferred: Moodle versus Others) and the predictor (independent) variables are interval in nature. This will attempt to divide the respondents into the two groups based on a categorical dependent variable.

4.2 Response Rate of Survey

The survey for this study was conducted on a 100% online basis. The URL link was created through google forms and distributed using the social media and communication platform WhatsApp to 300 respondents. This was done from 12th October to 24th October 2019 (10 days).

There were total 98 completed questionnaires returned, which contributed to the total response rate of 25.6%. From the 98 responses, 21 responses were discarded

as responses did not satisfy the condition of having used an E-learning platform before and being under 40 years of age (to qualify as millennials). Rule of thumb for sample size selection suggested by Roscoe (1975) was considered best suited for this research. Roscoe (1975) proposed the rule of thumb as below for selecting sample size:

1. Sample sizes larger than 30 and less than 500 are appropriate for most research.

2. In multivariate research (including multiple regression analyses), the sample size should be several times (preferable 10 times or more) larger than the number of variables in the study.

Hence, the above proposed assumptions for Rule of thumb matches this research study as in this research, there are a total of 5 variables, thus, a minimum of 50 respondents (5 variable* 10) are required to perform the Partial Least Squares Structural Equation Modelling (Hair et al., 2014). This study has sufficient 77 samples.

Table 4.2.1: Response rate

	Online
No. Of Questionnaires distributed	300
No. Of Completed Questionnaires returned	98
No. Of Unusable Questionnaires	21
No. Of Usable Questionnaires	77
Response Rate (%)	25.6%

4.3 Common Method Bias (CMB)

For the first part, Common Method Bias (CMB) was utilized to evaluate variation in responses. Common method variance, defined by Podsakoff et al. (2003) as

"variance that is attributable to the measurement method rather than to the constructs the measures represent," is a potentially important problem. These could range from tendencies to give similar responses across all the measures, due to similarity in the response scale construct and similar items, respondents could be induced into giving similar responses and also due to the proximity of the measuring items (Edward, 2008).

This Common method variance needs to be accounted for as it could potentially inflate, deflate or attenuate the observed relationships. This systematic variance could enhance convergent validity and reliability estimates. Hence, this could lead to biased parameter estimates between the causal predictors and the dependent variables. This could affect the construct validity, obscure the relationship between constructs, which in turn could affect the outcome of the hypothesis testing and ultimately undermine the quality of research (Messick, 1991).

One of the most employed methods is a detective technique called "Harman's Single-Factor Test", also used in this study. Harman's Single-Factor Test is conducted by examining the results of an exploratory factor analysis and checking whether the first extracted factor explains more than 50 percent of the variance.

The rule of thumb to be followed here is, for the first extracted factor, the variance must be less than 50% and for the last extracted factor, the cumulative variance has to be more than 50% (Podsakoff et al., 2003).

Table 4.3.1 shows the percentage of variance for first principal component is 16.53%. This indicates there is no common method bias as this is satisfying the first thumb rule of common method bias. The cumulative percentage of variance for last principal component is at 73.88%, which is more than 50%. Hence the total variances explained by the data set also satisfy the second rule of thumb.

Hence, this concludes that no respondent bias occurred in this research survey.

Table 4.3.1: Total Variance Explained.

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.417	29.024	29.024	8.417	29.024	29.024	4.793	16.527	16.527
2	4.723	16.288	45.312	4.723	16.288	45.312	3.702	12.767	29.294
3	2.239	7.719	53.031	2.239	7.719	53.031	3.279	11.306	40.599
4	1.469	5.067	58.098	1.469	5.067	58.098	3.120	10.758	51.357
5	1.364	4.702	62.800	1.364	4.702	62.800	2.106	7.261	58.618
6	1.166	4.020	66.820	1.166	4.020	66.820	1.700	5.861	64.479
7	1.049	3.619	70.439	1.049	3.619	70.439	1.415	4.878	69.357
8	1.000	3.449	73.888	1.000	3.449	73.888	1.314	4.530	73.888

Source: Author's calculation.

4.4 Descriptive Statistics for Question Items

Descriptive statistics provide a brief summary of the samples and the measures done in a particular study. Together with a number of graphics analysis, descriptive statistics form a basis of quantitative data analysis (King and Eckersley, 2019). In Table 4.4.1, there are two important indicators: Mean & Std.Deviation. "Mean" is the measurement of central tendency of data, while "Std.Deviation" is the measurement of data dispersion. "Mean" is used to describe the average of all data points. A high standard deviation indicates that data is spread widely from the mean and a lower value indicates that data is close to the mean value (Logan and Murray, 2010).

Table 4.4.1: Descriptive Statistics of the Model Variables (n=77)

Variable Name		Minimum	Maximum	Mean	Std. Deviation
Technology Infrastructure	TI1	2	5	4.60	.674
	TI2	2	5	4.32	.751
	TI3	1	5	3.71	1.157
	TI4	1	5	3.42	1.229
Instructor Characteristics	TI5	1	5	4.01	.925
	IC1	1	5	3.88	1.124
	IC2	1	5	3.90	.926
	IC3	2	5	4.22	.788
E-Learning System Resources	IC4	2	5	4.29	.792
	SR1	1	5	4.05	.944
	SR2	1	5	4.12	.873
	SR3	1	5	3.74	1.081
	SR4	1	5	3.08	1.189
Student Characteristics	SR5	1	5	4.16	.889
	SC1	2	5	4.14	.838
	SC2	2	5	4.12	.778
	SC3	2	5	3.96	.850
	SC4	2	5	3.97	.903
	SC5	2	5	4.01	.803
Percieved Ease Of Use	PEU1	1	5	2.51	1.438
	PEU2	1	5	2.65	1.222
	PEU3	1	5	2.68	1.208
	PEU4	1	5	2.68	1.229
	PEU5	1	5	2.90	1.456
	PEU6	1	5	3.32	1.302
	PEU7	1	5	3.04	1.390
	PEU8	1	5	3.82	1.243
	PEU9	1	5	4.04	1.106
	PEU10	1	5	4.04	1.094

4.4.1 Technology Infrastructure

Question TI1 has the highest mean value (4.60) with lowest standard deviation (0.674), it indicates that participants favour question TI1. This means that respondents believe that they have easy access to the internet on a daily basis. The mean score for TI4 is the lowest at 3.42. This is below 3.5 out of 5-point Likert Scale. This indicates that all respondents may not find the online help desk to be easily available and helpful when they need it. Hence it is important for higher education institutes to work on this factor by providing user training and convincing the students that they will get support from the university (Abdurachman et al., 2018).

On the other hand, E-learning system designers should improve the ease of use through user-friendly interface design, easy access to the system, and by giving clear instructions to users, which could positively enhance the student experience.

In previous studies, for students, the most important three CSF's (in order of importance) are: technology infrastructure, instructor characteristics, and student characteristics (Alhaleeb and Rowley, 2018). In prioritizing the technology infrastructure, students reflect on their own experience with the technology – and prioritize factors such as easy browsing, easy access to the internet, availability of sufficient computer labs, and reliability.

4.4.2 Instructor Characteristics

Question item IC4 (Understanding the instructor's explanation is important to me) has the highest mean score of 4.29 and a lower Std. Deviation of 0.792. This indicates that respondents value this question more. Question item IC1 (Instructor's ability to motivate me to use E-learning system is important) has the lowest mean score of 3.88 and highest Std. Deviation of 1.124. This indicates that respondents may have differing opinions on this question. Some consider the instructor's ability to motivate them as important, while others may not.

Instructor characteristics were found to be one of the most important categories in the critical success factors of eLearning in various studies (Adbdel-Gawad and Woollard, 2015; Ahmed, 2013; Puri, 2012).

Given the importance of both student and instructor' role in the success of E-learning, instructor's knowledge of technology, their enthusiasm and ability to motivate students to use E-learning should be an essential part of the E-learning system development and operational planning (Al-Asmari and Khan, 2014).

Many studies also regard instructor characteristics, including instructors' enthusiasm, and competence regarding the E-learning system to be an important supporting factor (FitzPatrick, 2012; Puri, 2012; Alhomod and Shafi, 2013; Musa and Othman, 2012).

4.4.3 E-learning System Resources

Question item SR5 has the highest mean score of 4.16 with a lower Std. Deviation of 0.889. This indicates that most respondents have easy access the E-learning resources on and off campus. Question item SR4 has the lowest mean value of 3.08 and highest Std. Deviation of 1.189.

This indicates that offline support is not easily available when the respondents encounter any issues with the E-learning system. Characteristics, conditions or variables that, when properly sustained, maintained, or managed, can have a significant impact on the success of a firm, although most studies have focused on the user perspective, student perspectives (e.g. Musa & Othman, 2012; Puri, 2012) and academic staff perspectives (e.g. Ahmed, 2013; Naveed et al., 2017). Hence it is imperative that further research be done in understanding how the E-learning system resources affect the positive or negative experience of E-learning users, the teachers and the students.

4.4.4 Student Characteristics

Question item SC1 (I have confidence in my knowledge and experience about computers) had the highest mean score of 4.14 and a lower Std. Deviation of 0.838, which means that most respondents felt confident in their knowledge and experience to use computers.

Question item SC3 (I am willing and motivated to participate in the E-learning) had the lowest mean value of 3.96 and a higher Std. Deviation of 0.850. This indicates that not all respondents may not feel very motivated to participate in E-learning activities.

Question item SC4 (I enjoy using E-learning system for my course) also had a lower mean value of 3.97 and the highest Std. Deviation at 0.903, this also means students had differing opinions about their levels of enjoyment when they use the E-learning system. Some favored its use, and some did not enjoy using it.

Menu, content, and information presented can be added with images, videos, or sounds to make it easier for students to understand. The design of E-learning system must meet the aesthetic, attractive, user-friendly, readable, organized, flexible, reliable, and secure aspects to match user's needs (Abdurachman et al., 2018). This could improve the enjoyment levels of the students and increase their willingness to participate in E-learning.

4.4.5 Perceived Ease of Use

Question item PEU 9 and PEU10 have the highest mean score of 4.09, with PEU 10 with the lowest Std. Deviation of 1.094 and PEU 9 with a lower Std. Deviation of 1.106. PEU10 (The use of E-learning system increases my learning effectiveness) indicates that respondents feel that using an E-learning system positively influences their learning ability. PEU9 (The instructions in the E-learning system are clear and easy to understand) Question item PEU1 (Ease of Signing in the System) had the lowest mean value of 2.51 and a higher Std. Deviation of 1.438 which indicated that respondents have differing opinions on the relative ease they feel when signing into the system.

This could be attributed to the user interface of the E-learning system and high use traffic encountered in these systems, which could lead to difficulty in signing into the system.

The more students find it easy to use E-learning system, the greater the benefits of using the system that the students perceive. The results of this study are supported by various studies such as study (Purnomo et al., 2014; Abdullah et al., 2016; Lee at al., 2013; Mohammadi, 2015; Irawati and Putra, 2014; Abbasi et al., 2015;Agudo-Peregrina et al., 2014; Alharbi and Drew, 2014) .

If students feel that E-learning system is easy to use, then the system will be deemed useful by students which in turn will increase its effectiveness of their learning through using the platform. Hence, it would be wise to pay more attention to E-learning system functionality while improving its ease of use. As a complicated or confusing system could cause students to feel less comfortable and often come across problems while using the system (Abdurachman, 2018)

4.5 Open Ended Questions

In the survey, respondents were also asked 5 open ended questions to gain an insight into their opinion about E-learning platforms that were not covered through the likert scale questions.

Table 4.5.a: Open Ended Questions

Questions	Frequency	Percentage
How can teachers encourage and support online learning?	29	37.7%
What were the challenges you faced while using the E-learning system?	32	41.6%
Does E-learning improve your learning performance? Which part was most useful and/or interesting?	31	40.3%
Would you prefer to take up a subject online or in a classroom? Why?	27	35.1%
How could the institution improve the course and the online services it provides to students? For example, should the institution provide blog, e-portfolio, or wiki capabilities?	37	48.1%

Based on the answers given by respondents, their suggestions were grouped into 5 categories as stated below in the Table 4.5.b

Table 4.5.b: Based on comments and suggestions

1.	Teachers should assume a more proactive role: Motivate, encourage and keep resources updated, respond promptly to student doubts
2.	Easy accessibility, efficient and saves time: More focus on improving video quality of lectures
3.	User interface issues: Slow system, server crash, unattractive display and obsolete resources with unclear instructions
4.	Blended mode of learning preferred: Teacher's invaluable input supplemented by online resources for effective learning
5.	More resources: Provision of wiki capabilities, blogs, access to digital libraries, video tutorials, free e-books, use of apps within website like kahoot, quizlets for testing knowledge

4.6 Reliability Analyses Result

Reliability Test is performed and analyzed through Cronbach's Alpha value that are calculated using SPSS. It tests the consistency of Likert Scale when measuring constructs. Table 4.6 presents good Cronbach's Alpha value ranging between 0.5 to 0.9 for each component (Hair, Black, Babin, & Anderson, 2009) i.e. 0.790, 0.543, 0.876, 0.833, 0.837 for Component 1, 2, 3, 4, 5 and 6 respectively. It indicates that question items have high internal reliability as they can reflect consistency among respondent's opinion.

Table 4.6: Reliability Analysis and Cronbach's Alpha for each construct

Constructs	Cronbach's Alpha
Technology Characteristics	0.790
Instructor Characteristics	0.543
Student Characteristics	0.876
E-learning System Resources	0.833
Perceived Ease of Use	0.837

Therefore, these question items are deemed to be reliable for construct measurement.

4.7 Descriptive Statistic for Model Variables

As seen in the Table 4.7 below, Instructor Characteristic (IC) has the highest mean value (4.0714) and the lowest Std. Dev.(0.56466) which is aligned with a study conducted by Alhabeeb and Rowley (2018) where for the students, the most important three critical success factors (in order of importance) were: instructor characteristics, technology infrastructure and student characteristics.

Perceived Ease of Use (PEU) has the lowest mean value (3.1662) and the highest Std. Dev. (0.81104) this concurs with a study conducted by Abdurachman et al. (2018) where PEU had no significant effect on behavioral intention to use in the adoption of E-learning system. This meant that even if students did not find the platform easy to use, if it was perceived to be beneficial to use, they used it regardless.

Skewness and kurtosis that can be used to test the normality of a given data set. Normality tests are used to determine whether a data set is modeled for normal

distribution. Many statistical functions require that a distribution be normal or nearly normal (Joanes and Gill, 2012).

From the table below the skewness of the model variables is between -0.5 and 0.5, and the kurtosis is close to 0 (mesokurtic distribution) hence the data is considered fairly symmetrical and normal distribution is assumed (Westfall, 2014).

Table 4.7 Descriptive Statistics of model variables

	Minimum	**Maximum**	**Mean**	**Std. Deviation**	**Skewness**	**Std. Error**	**Kurtosis**	**Std. Error**
AVGTI	1.80	5.00	4.0130	.71623	-.570	.274	.291	.541
AVGIC	2.75	5.00	4.0714	.56466	.077	.274	-.787	.541
AVGSR	1.40	5.00	3.8286	.77644	-.431	.274	.138	.541
AVGSC	2.40	5.00	4.0416	.68313	-.207	.274	-.771	.541
AVGPEU	1.50	5.00	3.1662	.81104	.550	.274	-.204	.541

4.8 Findings for Discriminant Analysis

Linear Discriminant Analysis (LDA) is adopted to perform a multivariate test of differences between the 2 groups of dependent variables (Moodle and rest of LMSs).

It will also be used to determine the dimensions (predictors) that will be needed to describe these differences.

The 4 Independent variables (TI, IC, SC and SR) and one mediating variable (PEU) will be tested to see their likelihood to be able to predict respondents' preference between Moodle and the rest of LMSs.

The relationship between group membership and if these predictors correctly classify the observations into the two groups is also examined, which variable can predict this relationship best will also be determined using this method.

For this analysis 7 main assumptions are considered in testing if the discriminant analysis can be performed. Based on the LD analysis method by Oda et al. (2019)

1. Sample Size: Group size of the dependent variable should be at least five times the number of independent variables. If the group sizes of the dependent variable are grossly different (80:20) logistic regression may be preferred
2. Normal Distribution: Each of the independent variable should be normally distributed
3. Non-multicollinearity: There should not be a high correlation among the independent variables
4. Mutually Exclusive: The groups should be mutually exclusive with every subject belonging to only one group
5. Homogeneity of variances/covariances: All variables have a linear, homoscedastic relationship.
6. Outliers: Should not be present as DA is very sensitive to inclusion of outliers
7. Classification: Each of the allocations for the dependent categories in the initial classification are correctly classified

4.8.1 Sample size

Group size should be at least five times the number of independent variables (Oda et al., 2019)

Group 1 (Moodle):22 users

Group 2 (Other LMS):55 users

No. Of independent variables: 4

4.8.2 Normality

Skewness and Kurtosis is used to check the normality of the data for the Independent variables only as the dependent variable for this study is categorical.

From the table below the skewness of the model variables is between -0.5 and 0.5, and the kurtosis is close to 0 (mesokurtic distribution) hence the data is considered fairly symmetrical and normal distribution is assumed (Westfall, 2014).

Table 4.8.2 Descriptive statistics of model variables

	Minimum	Maximum	Mean	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
AVGTI	1.80	5.00	4.0130	.71623	-.570	.274	.291	.541
AVGIC	2.75	5.00	4.0714	.56466	.077	.274	-.787	.541
AVGSR	1.40	5.00	3.8286	.77644	-.431	.274	.138	.541
AVGSC	2.40	5.00	4.0416	.68313	-.207	.274	-.771	.541
AVGPEU	1.50	5.00	3.1662	.81104	.550	.274	-.204	.541

4.8.3 Non-multicollinearity: Pooled Within-group Correlation matrix for Model Variables

The Pooled Within-group Correlation matrix provides bivariate correlations between all variables. It can be used to detect potential problems with multicollinearity.

This is equivalent to the Pearson's correlation in multiple regression. Multicollinearity occurs when there is a high intercorrelation between independent variables, which could lead to skewed or misleading results when trying to identify

each independent variable's effectiveness to predict the dependent variable (Kock and Lynn, 2012). Thus, in a statistical inference from a model, multicollinearity may not be dependable and hence is not desirable.

From the table 4.8.3 below, since all values are below 0.8 there are no problems with multicollinearity reported. As variables correlated at less than 0.8, they do not pose a problem of multicollinearity (Rencher and Christensen, 2012).

Table 4.8.3 Pooled within-group matrices

Pooled Within-Groups Matrices[a]						
		AVGTI	AVGIC	AVGSR	AVGSC	AVGPEU
Covariance	AVGTI	.479	.194	.335	.202	.091
	AVGIC	.194	.302	.198	.178	.058
	AVGSR	.335	.198	.557	.317	.031
	AVGSC	.202	.178	.317	.423	.031
	AVGPEU	.091	.058	.031	.031	.637
Correlation	AVGTI	1.000	.510	.649	.448	.164
	AVGIC	.510	1.000	.482	.498	.132
	AVGSR	.649	.482	1.000	.653	.052
	AVGSC	.448	.498	.653	1.000	.060
	AVGPEU	.164	.132	.052	.060	1.000
a. For split file $bootstrap_split=0, the covariance matrix has 75 degrees of freedom.						

Concluding results from above results, LDA is considered a good model for data analysis after fulfilling all the assumptions.

4.9 Findings for Linear Discriminant Analysis

Discriminant Analysis Model: Creates an equation which will minimize the possibility of misclassifying cases into their respective categories.

Discriminant function (canonical root): A latent variable which is constructed as a linear combination of independent variables. It involves linear combinations of the following form:

$$\mathbf{D = b_0 \text{ (constant)} + b_1X_1 + b_2X_2 + b_3X_3 + ...+ b_kX_k}$$

Where D = discriminant score

b = discriminant coefficient or weight (estimated so that the groups differ as much as possible on the values of the discriminant function)

X = Predictor or independent variable proposed by Fisher (1936) for classifying an observation into two possible groups based on the measurements extracted from Table 4.9b.

Table 4.9a. Predictor variables

X_1	Instructor Characteristics
X_2	Student Characteristics
X_3	E-learning System Resources
X_4	Technology Infrastructure

Table 4.9b. Function Coefficients

Canonical Discriminant Function Coefficients		
	Function	Coefficient
AVGIC	1	.285
AVGSC	1	.893
AVGSR	1	.200
AVGTI	1	.469
(Constant)	1	-7.419
Unstandardized coefficients		

Extracting the Coefficient value from Table 4.9.2, a linear equation for the study is formed as below: -

$$\mathbf{D= -7.419 + 0.285 \times \mathcal{X}_1 + 0.893 \times \mathcal{X}_2 + 0.200 \times \mathcal{X}_3 + 0.469 \times \mathcal{X}_4}$$

4.9a. Log determinants

The larger the log determinant in the table, the more that group's covariance matrix differs. The "Rank" column indicates the number of independent variables in this case. Since discriminant analysis assumes homogeneity of covariance matrices between groups, we would like to see the determinants be relatively equal (Bian, 2014).

From the table below, the rank column indicates that there are 4 independent variables in this case and the log determinant values do not vary too much from each other.

Table 4.9c. Log Determinants

Log Determinants		
Systemname	Rank	Log Determinant
Moodle	4	-5.026
Others	4	-4.898
Pooled within-groups	4	-4.917
The ranks and natural logarithms of determinants printed are those of the group covariance matrices.		

4.9.1 Box's M Test

a) Pre-mediator

From the table 4.9.1 it can be seen that the significance value of 1.000 indicates that the covariance matrices do not differ between groups formed by the dependent variable. This means we can proceed with the analysis.

Table 4.9.1 Pre-mediator test results

Test Results		
Box's M		1.224
F	Approx.	.113
	df1	10
	df2	7644.220
	Sig.	1.000
Tests null hypothesis of equal population covariance matrices.		

b) Post mediator

After mediator PEU was introduced into the equation, from Table 4.9.2 we can see that the significance value of 0.995 indicates that the covariance matrices do not differ between groups formed by the dependent variable. This means one can proceed with the analysis.

Table 4.9.2 Post-mediator test results

Test Results		
Box's M		5.154
F	Approx.	.311
	df1	15
	df2	6691.905
	Sig.	.995
Tests null hypothesis of equal population covariance matrices.		

Thus in both cases using Box's M test, we tested a null hypothesis that the covariance matrices do not differ between groups formed by the dependent variable. In both cases, the test was insignificant. Indicating that we reject the null hypothesis and the assumption required for LDA holds true (Ramyah et al., 2014).

4.9.2 Group Statistics

a) Pre-mediator

From Table 4.9.2.a, before the introduction of the mediator (PEU) the mean values of the independent variables, Technology Infrastructure (AVGTI), Instructor Characteristics (AVGIC), E-learning System Resources (AVGSR) and Student Characteristics (AVGSC) is higher for the E-learning platform Moodle as compared to the rest of LMSs.

This aligns with a study conducted by Cheng-Chao Su (2014) where Moodle was considered to be a top open source learning platform which was attributed to its many features, including, its useful to potential students such as easy installation, customization of options and settings, good support/help, and good educational tools. Moreover, it has excellent documentation, and strong support for security and administration.

Table 4.9.2.a. Pre-mediator Group Statistics

Group Statistics					
				Valid N (listwise)	
Systemname		Mean	Std. Deviation	Unweighted	Weighted
Moodle	AVGTI	4.3273	.62196	22	22.000
	AVGIC	4.2955	.53249	22	22.000
	AVGSR	4.1909	.73414	22	22.000
	AVGSC	4.3909	.63987	22	22.000
Others	AVGTI	3.8873	.71778	55	55.000
	AVGIC	3.9818	.55664	55	55.000
	AVGSR	3.6836	.75099	55	55.000
	AVGSC	3.9018	.65419	55	55.000
Total	AVGTI	4.0130	.71623	77	77.000
	AVGIC	4.0714	.56466	77	77.000
	AVGSR	3.8286	.77644	77	77.000
	AVGSC	4.0416	.68313	77	77.000

b) Post-mediator

From Table 4.9.2.b, after the introduction of the mediator (PEU) the mean values of the independent variables, Technology Infrastructure (AVGTI), Instructor Characteristics (AVGIC), E-learning System Resources (AVGSR) and Student Characteristics (AVGSC) is higher for the E-learning platform Moodle as compared to the rest of LMSs. But the Value for PEU for Moodle is 2.9000 and for rest of LMSs is at 3.2727.

This shows that respondents who use other LMSs, have slightly higher perceived ease of use of the platforms as compared to those who use Moodle.

This is in contrast to the results from the study done by Subramaniam, Zainuddin and Alatawi (2014) where a comparison was done between Moodle 2.0 and other E-learning systems on the basis of Communication Tools, Productivity Tools and Student Involvement Tools, Moodle was chosen to be a better platform.

Another case study done by Kumar, Kumar and Dutta (2014) where Moodle was compared to other E-learning platforms and the authors choose Moodle as the optimal learning platform based on architecture and technical aspects as compared to others.

Table 4.9.2.b. Post-mediator Group Statistics

Group Statistics					
Systemname		Mean	Std. Deviation	Valid N (listwise) Unweighted	Valid N (listwise) Weighted
Moodle	AVGTI	4.3273	.62196	22	22.000
	AVGIC	4.2955	.53249	22	22.000
	AVGSR	4.1909	.73414	22	22.000
	AVGSC	4.3909	.63987	22	22.000
	AVGPEU	2.9000	.90764	22	22.000
Others	AVGTI	3.8873	.71778	55	55.000
	AVGIC	3.9818	.55664	55	55.000
	AVGSR	3.6836	.75099	55	55.000
	AVGSC	3.9018	.65419	55	55.000
	AVGPEU	3.2727	.75165	55	55.000
Total	AVGTI	4.0130	.71623	77	77.000
	AVGIC	4.0714	.56466	77	77.000
	AVGSR	3.8286	.77644	77	77.000
	AVGSC	4.0416	.68313	77	77.000
	AVGPEU	3.1662	.81104	77	77.000

4.9.3 Test of Significance : Wilk's Lambda

a) Pre-mediator

Wilks' lambda is a measure of how well each function separates cases into groups. It is equal to the proportion of the total variance in the discriminant scores not explained by differences among the groups. Smaller values of Wilks' lambda indicate greater discriminatory ability of the function (IBM SPSS, 2019).

Wilks' lambda in discriminant analysis is used to test whether there are differences between the means of identified groups of subjects on a combination of dependent variables (Ramayah et al., 2015).

In this study, the authors test whether the mean score of two groups, users of Moodle and users of the rest of LMSs, is the same across 4 constructs simultaneously. Thus, they are considering 4 independent variable and comparing the mean of this combination for two groups.

The associated chi-square statistic tests the hypothesis that the means of the functions listed are equal across groups. The small significance value indicates that the discriminant function does better than chance at separating the groups, if the p-value if less than 0.05 (Ramayah et al., 2015).

From the Table 4.9.3.a below, we can see that the Wilk's lambda value at 0.873 is significant at 0.042. Thus, we can conclude that the corresponding function explains the group membership well.

Table 4.9.3.a. Pre-mediator Wilk's Lambda

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.873	9.933	4	.042

b) Post-mediator

From the table below, it can be seen that the Wilk's lambda value at 0.823 is significant at 0.015 significance. Since the p-value is less than 0.05, we can conclude that the corresponding function explains the group membership well. This means that the groups are mutually exclusive with every subject belonging to only one group. So, the respondents are either Moodle users or Rest of the LMS users, and they do not overlap.

Wilks' Lambda is the ratio of within-groups sums of squares to the total sums of squares. This is the proportion of the total variance in the discriminant scores not explained by differences among groups. A lambda of 1.00 occurs when observed group means are equal (all the variance is explained by factors other than difference between those means), while a small lambda occurs when within-groups variability is small compared to the total variability. A small lambda indicates that group means appear to differ. The associated significance value indicates whether the difference is significant. Here, the Lambda of 0.823 has a significant value (Sig. = 0.015); thus, the group means appear to differ.

Table 4.9.3.b. Post-mediator Wilk's Lambda

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.823	14.123	5	.015

4.9.4 Eigenvalues

a) Pre-mediator

An eigenvalue indicates the proportion of variance explained. (Between-groups sums of squares divided by within-groups sums of squares). A large eigenvalue is associated with a strong function. The canonical relation is a correlation between the discriminant scores and the levels of the dependent variable. A high correlation indicates a function that discriminates well (Çokluck and Buyukozturk, 2018).

Hence, the larger the eigenvalue, the more of the variance in the dependent variable is explained by that function. As the dependent variable has 2 categories, there is only one discriminant function.

The canonical correlation is the measure of association between the discriminant function and the dependent variable. When there are two groups, the canonical correlation is the most useful measure in the table, and it is equivalent to Pearson's correlation between the discriminant scores and the groups (Bian, 2012).

The present correlation of 0.357 which is not extremely high (1.00 is perfect). Based on the square of the canonical correlation, 12.74% of the variance in the dependent variable is explained by the discriminant function.

Table 4.9.4.a Pre-mediator Eigenvalues

Eigenvalues				
Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.146[a]	100.0	100.0	.357

a. For split file $bootstrap_split=0, first 1 canonical discriminant functions were used in the analysis.

b) Post-mediator

After introducing the mediator (PEU), the eigenvalue value increased to 0.215 and the cannonical correlation was 0.421.

The larger the eigenvalue, the more of the variance in the dependent variable is explained by that function. Hence from the table below we can see that after the mediator was introduced, the function is able to explain the variance more in the DV.

The canonical correlation is the measure of association between the discriminant function and the dependent variable. The square of canonical correlation coefficient is the percentage of variance explained in the dependent variable (Chen et al., 2016), which is 17.64% of variance is explained.

Table 4.9.4.b Post-mediator Eigenvalues

Eigenvalues				
Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.215[a]	100.0	100.0	.421

a. For split file $bootstrap_split=0, first 1 canonical discriminant functions were used in the analysis.

4.9.5 Test for Equality for Means

In this ANOVA table, the smaller the Wilks's lambda, the more important the independent variable to the discriminant function. Wilks's lambda is significant by the F test for all independent variables (Bian, 2012).

a) Pre-mediator

Smaller values of Wilks' lambda indicate greater discriminatory ability of the function. From the table 4.9.4.a, we can see that all 4 Ivs (TI, IC, SR and SC) have the ability to discriminate the respondents between the two groups (Moodle versus the rest of LMSs) as the F value is significant (p value is < 0.05) for all the 4 variables. According to Nath and Pavur (2014), the smaller the Wilk's lambda, the more important the independent variable to the discriminant function. Wilks' lambda is a measure of how well each function separates cases into groups.

According to the table below, Student Characteristics has the highest discriminatory ability with the lowest Wilk's lambda value of 0.894 significant at 0.004.

This means that Student Characteristics had the highest ability to determine which LMS platform the millennial respondents would prefer.

Table 4.9.5.a Pre-mediator Test for Equality for means

Tests of Equality of Group Means					
	Wilks' Lambda	F	df1	df2	Sig.
AVGTI	.922	6.348	1	75	.014
AVGIC	.936	5.110	1	75	.027
AVGSR	.912	7.260	1	75	.009
AVGSC	.894	8.891	1	75	.004

b) Post-mediator

After addition of the mediator (PEU), the results remain same as before. So Student Characteristics still has the highest discriminatory ability post mediator as well. The 4 IVs Wilks' lambda were significant and hence were able to separate the respondents between the two groups. It is to be noted that the mediator, PEU was not significant ($p>0.05$) which meant that Perceived Ease of Use did not factor in for the respondents when choosing between the two E-learning platforms (Moodle versus rest of LMSs). This is aligned with studies conducted by Mohammadi (2015) and Abdurachman et al. (2018), where Perceived ease of use has significant positive effect on the adoption of E-learning system.

This means that although E-learning system is difficult to use, but there are students who still want to use E-learning system because of its benefits. The lack of significant effect may be due to the complicated and confusing screen display of E-learning system so that students feel less comfortable and often come across problems while using the system. Then again, this perceived ease of use may become less influential because students have considerable experience in using the system as they are digital natives and have grown up with technology.

Table 4.9.5.b Post-mediator Test for Equality for means

Tests of Equality of Group Means					
	Wilks' Lambda	F	df1	df2	Sig.
AVGTI	.922	6.348	1	75	.014
AVGIC	.936	5.110	1	75	.027
AVGSR	.912	7.260	1	75	.009
AVGSC	.894	8.891	1	75	.004
AVGPEU	.956	3.425	1	75	.068

4.9.6 Classification Results

This table is used to assess how well the discriminant function works, and if it works equally well for each group of the dependent variable (Bian, 2012)

a)) Pre-mediator

From the table below, it can be seen that the discriminant function correctly classifies more than 81.8% of the cases for Moodle and 61.8% of the cases for Other LMS. Overall, 67.5% of the cases are correctly classified

Table 4.9.6.a Pre-mediator Classification results

Classification Results[a,c]					
		Systemname	Predicted Group Membership		
			Moodle	Others	Total
Original	Count	Moodle	18	4	22
		Others	21	34	55
	%	Moodle	81.8	18.2	100.0
		Others	38.2	61.8	100.0
Cross-validated[b]	Count	Moodle	16	6	22
		Others	23	32	55
	%	Moodle	72.7	27.3	100.0
		Others	41.8	58.2	100.0

a. For split file $bootstrap_split=0, 67.5% of original grouped cases correctly classified.

b) Post-mediator

After the mediator was introduced, it was correctly able to classify more than 72.7% of the cases for Moodle and 69.1% of the cases for Other LMS. Overall, 70.1% of the cases were correctly classified. Hence, introducing the mediator (PEU), the discriminant function was able to classify a marginally higher percentage of cases correctly (from 67.5% to 70.1%).

Thus, the Linear Discriminant Analysis was deemed a good fit for this testing this framework and the independent variables were able to successfully discriminate between the two E-learning platforms.

Table 4.9.6.b Post-mediator Classification results

Classification Results[a]					
			Predicted Group Membership		
		Systemname	Moodle	Others	Total
Original	Count	Moodle	16	6	22
		Others	17	38	55
	%	Moodle	72.7	27.3	100.0
		Others	30.9	69.1	100.0
a. For split file $bootstrap_split=0, 70.1% of original grouped cases correctly classified.					

4.10 Findings for Linear Discriminant Analysis (LDA)

The major findings from above tests were:

a) The 4 predictors (Technology Infrastructure, Instructor Characteristics, Student Characteristics and E-learning Resources) were successfully able discriminate between millennials' preference for Moodle versus rest of LMSs
b) Moodle was preferred by the respondents as compared to rest of LMSs
c) The Perceived ease of use did not significantly influence the choices between the two groups for the respondents based on the predictors
d) Student Characteristics was found to have the highest discriminatory ability amongst all the predictors

e) Overall Post mediator, 70.1% of the cases were correctly classified by this framework

H1a: Technology Infrastructure is a good predictor of the type of E-learning platform preferred

The Wilk's lambda value for Technology Infrastructure (AVGTI) is 0.922 and is significant at 0.014. (p value <0.05). So, the H1a is accepted as Technology Infrastructure has a good discriminatory power and hence is a good predictor of the type of E-learning platform preferred.

H1b: Instructor Characteristics is a good predictor of the type of E-learning platform preferred

The Wilk's lambda value for Instructor Characteristics (AVGIC) is 0.936 and is significant at 0.027. (p value <0.05). So, the H1b is accepted as Instructor Characteristics has a good discriminatory power and hence is a good predictor of the type of E-learning platform preferred.

H1c: Student Characteristics is a good predictor of the type of E-learning platform preferred

The Wilk's lambda value for Student Characteristics (AVGSC) is 0.894 and is significant at 0.004. (p value <0.05). So, the H1c is accepted as Student Characteristics has a good discriminatory power and hence is a good predictor of the type of E-learning platform preferred. The Wilk's lambda value for SC is also the lowest, which means that it has the highest discriminatory ability amongst all the IVs.

H1d: E-learning System Resources is a good predictor of the type of E-learning platform preferred

The Wilk's lambda value for E-learning System Resources (AVGSR) is 0.912 and is significant at 0.009. (p value <0.05). So, the H1d is accepted as E-learning System Resources has a good discriminatory power and hence is a good predictor of the type of E-learning platform preferred.

H2: Perceived Ease of Use has a positive influence on the type of E-learning platform preferred

The wilk's lambda at 0.956 was not significant at 0.068 (p>0.05). Hence, we reject H2, which means that PEU does not have a positive influence on the type of E-learning platform preferred.

H3a: Perceived Ease of Use positively influences the predictive power of Technology Infrastructure in the type of E-learning platform preferred

H3b: Perceived Ease of Use positively influences the predictive power of Instructor Characteristics in the type of E-learning platform preferred

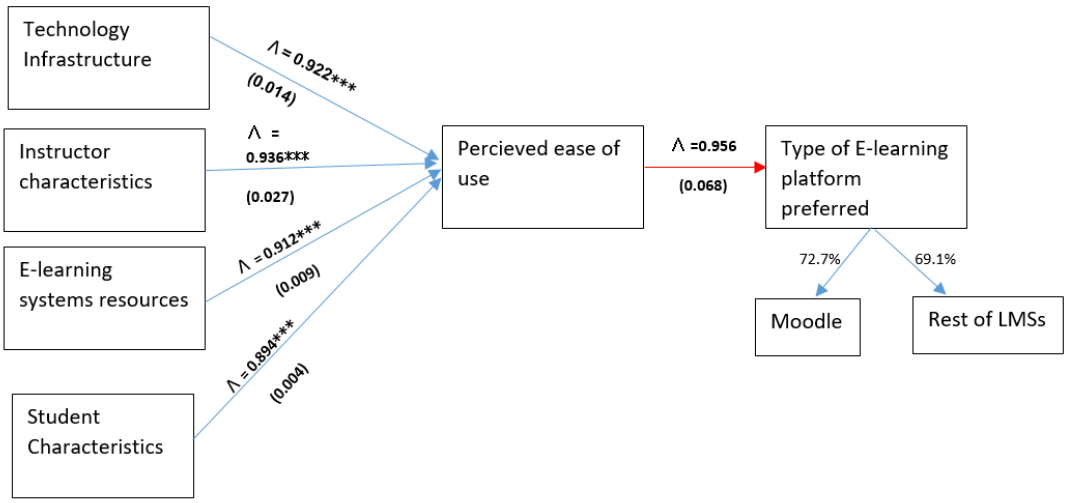
H3c: Perceived Ease of Use positively influences the predictive power of Student Characteristics in the type of E-learning platform preferred

H3d: Perceived Ease of Use positively influences the predictive power of E-learning System Resources in the type of E-learning platform preferred

Based on the classification results, before the mediator was introduced, the discriminant function was able to classify 81.8% cases correctly for Moodle and 67.5% cases for rest of LMSs. Hence overall, 67.5% cases were correctly classified.

After the mediator was introduced, the discriminant function was able to classify 72.7% cases correctly for Moodle and 69.1% cases for rest of LMSs. Hence, overall 70.1% cases were correctly classified.

Thus, the mediator (PEU) positively influenced the predictive power of all the 4 independent variables, as the overall cases correctly identified increased from 67.5% to 70.1%. So, we accept H3a-d, as PEU positively influenced the predictive power of Technology Infrastructure, Instructor Characteristics, Student Characteristics and E-learning System Resources in the type of E-learning platform preferred.



Source: Constructed by author

Information:
→ Accepted
→ Rejected
Estimate
***** = p < 0,05**

Λ = Wilk's lambda

(Sig)=p-value

CHAPTER 5: CONCLUSION, RECOMMENDATIONS AND CONTRIBUTIONS

5.1 Response to Hypotheses

H1a: Technology Infrastructure is a good predictor of the type of E-learning platform preferred

LDA result shows that Technology Infrastructure is a good predictor of the type of E-learning platform preferred.

From a previous study done by Alhabeeb and Rowley (2018) which focused on the critical success factors (CSF) for E-learning platforms, the students, chose the most important three CSF's (in order of importance) as: technology infrastructure, instructor characteristics and student characteristics. Thus, the respondents in this study also believe that Technology Infrastructure plays an important role when making a decision regarding which E-learning platform they prefer. The easy to use features for students include easy installation, customization of options and settings, good support/help, and good educational tools. Moreover, it has excellent documentation, and strong support for security and administration (Cheng-Chao Su, 2014).

The Moodle software is easy to use and runs without any modification on any system that supports PHP. It has high credibility currently and is used worldwide by independent teachers, schools, universities and companies (Cole and Foster, 2017; Moodle.org, 2019)

H1b: Instructor Characteristics is a good predictor of the type of E-learning platform preferred

LDA result shows that Instructor Characteristics is a good predictor of the type of E-learning platform preferred.

Abdel-Gawad and Woollard (2015) focused on the categories of critical success factors for classless E-learning systems and the most influential categories were found to be tutors' characteristics, learners' characteristics, and technology, and curriculum nature.

The respondents in this survey also gave importance to Instructor Characteristics. They agree that a teacher should be able to motivate them to use the E-learning system, be encouraging, competent in using the system and also keep the resources up to date which would in-turn keep their interest vested in using the platform to further improve their skills and knowledge.

H1c: Student Characteristics is a good predictor of the type of E-learning platform preferred

LDA result shows that Student Characteristics is a good predictor of the type of E-learning platform preferred. It also had the highest predictability amongst all the variables to discriminate between Moodle versus rest of LMSs.

Respondents showed that they were well aware that their self-efficacy, motivation and enjoyment were of prime importance for them to be able to use the E-learning platforms. The students and their interaction with that system reflect in their intrinsic beliefs and motivation to use the E-learning system and perceive its usefulness.

Motivation to learn reveals that a student desires to take part in, and learn from, a training activity (Harandi, 2015). A study by Kim and Frick (2016) highlighted the significant relationship between E-learning and students' motivation so students are more likely to be more motivated when applying E-learning.

If students are more motivated to learn, then they are more likely to be engaged; and if they are engaged and engaged successfully, they are more likely to achieve the learning objectives.

Rovai, Ponton, Wighting, & Baker, (2017) studied student Motivation in Traditional Classroom and E-learning Courses. Results indicated that students who were taught by E-learning were more intrinsically motivated than students who study face to face in Traditional Classrooms. The results also showed that graduate students were more intrinsically motivated than undergraduate students in E-learning and traditional education.

H1d: E-learning System Resources is a good predictor of the type of E-learning platform preferred

LDA result shows that E-learning System Resources is a good predictor of the type of E-learning platform preferred. The respondents believe that E-learning system resources, including presentations slides, course materials, videos and access to digital libraries are important for the E-learning platform that they choose to use.

As Moodle outperformed the rest of LMSs as a choice of E-learning platform by millennials, thus this shows that respondents believe that resources available in Moodle are adequate for their usage. A study conducted by Al-Ajlan and Zedan (2018) on comparison of Moodle with other E-learning platforms. The comparison was based on various categories. This study proved that Moodle outperformed all other systems and scored 4.467 out of 5. Moodle has nearly the maximum score because it has many of the features expected from an E-learning platform, including forums, resources, quizzes with different kinds of questions, and a number of activities modules.

Furthermore, Moodle is very beneficial for language teaching and learning because the interactive tools, such as wiki, discussion forums, and quizzes, can be selectively employed to meet the objectives of the course and to motivate students.

H2: Perceived Ease of Use has a positive influence on the type of E-learning platform preferred

LDA result shows that Perceived Ease of Use did not have any influence on the type of E-learning platform preferred.

The LDA shows that the mediator, Perceived ease of use did not have a good discriminatory ability on the type of E-learning platform preferred. This shows that even though the E-learning system may not be very easy to use or require more effort, the students are inclined to use the system because of the benefits it provides them.

Although to attract more users, designers should pay more attention to E-learning system functionality and improve its ease of use. The perceived ease of use could be less influential because students have considerable experience in using the system. Thus, universities should emphasize specifically on the effectiveness and functionality of E-learning system, as well as raising students' awareness about the realistic goals and benefits of E-learning system. This information can be conveyed through the support of lecturers and management.

They can increase students' understanding of how E-learning system improve student learning and academic performance. The quality of E-learning system content must be improved by providing up-to-date content that fits students' needs.

The features needed to communicate and collaborate actively such as chat, discussion forum, e-mail, social network can be proposed to be integrated into E-

learning system so that the perceived usefulness increase, which will further enhance the perceived ease of use of the system.

H3a-d: Perceived Ease of Use positively influences the predictive power of Technology Infrastructure, Instructor Characteristics, E-learning System Resources and Student Characteristics in the type of E-learning platform preferred

The LDA results showed that when mediator, PEU was introduced, from 67.5 % to 70.1% of cases were correctly classified. Thus, the mediator was able to improve the predictive ability of the independent variables into classifying the respondents into the type of E-learning platform that was preferred.

This demonstrated that although as a stand-alone construct, PEU did not significantly influence the type of E-learning platform preferred, but it was able to positively influence the discriminatory power of the predictors in classifying the respondents between the two categories (Moodle and rest of LMSs)

This shows that the perceived ease of use increased the predictive power of technology infrastructure, Instructor characteristics, E-learning system resources and student characteristics in determining which E-learning platform millennials preferred.

5.2 Frank Reflection of Respondents About the Study (Open-Ended Questions)

A total of **27** respondents gave their feedback on all the 5 open ended questions. The overall feedback percentage was 35.1%

Percentage of each item of the open questions

- 29 respondents have given their feedbacks on the first open question. The feedback percentage is 37.7%
- 32 respondents have given their feedbacks on the second open question. The feedback percentage is 41.6%.
- 31 respondents have given their feedbacks on the third open question. The feedback percentage is 40.3 %.
- 27 respondents have given their feedbacks on the third open question. The feedback percentage is 35.1%
- 37 respondents have given their feedbacks on the third open question. The feedback percentage is 48.1%

5.2.1 Open Question 1: How can teachers encourage and support online learning

Out of 77 respondents, 29 respondents have given their feedbacks on the first open ended question.

The answers were further analyzed and classified into suggestion clusters:

Suggestion 1: Teachers should assume a more proactive role: Motivate, encourage and keep resources updated, respond promptly to student doubts

From the answers given by the 29 respondents, a common theme was their need of a more proactive role of the lecturers and instructors in the E-learning platforms. Respondents suggested that lecturers should keep all the course materials and resources updates. Respond to their queries and mails promptly.

Some respondents claimed that “lecturers did not respond” to their doubts or any other problems they faced for their courses when they contacted them through the E-learning system despite the easy access to the internet at all times.

Some respondents mentioned that course materials were updated in a haphazard manner and were not up to date, which was an inconvenience to the students who wanted access to the learning materials needed. A respondent also suggested that teachers should have sufficient training in using the E-learning system, so they could correctly provide students with what they need.

5.2.2 Open Question 2: What were the challenges you faced while using the E-learning system?

32 respondents have given their feedbacks on the second open ended question. The feedback percentage is 41.6%.

Main issues based on their responses were narrowed down to: User interface issues, slow system, server crash, unattractive display and obsolete resources with unclear instructions. In general respondents had issues with various features of the E-learning systems.

With the most common issue being the bad video quality, Moodle provides a Rewind system, which allows students to review the lecture they attended in a traditional classroom, or in case they could not attend, but can view it from the comfort of their homes. But as the video and sound quality is bad, students could not utilize this feature as effectively as they would like.

Also, when certain lectures were conducted online, the quality was subpar, thus demotivating their use of the E-learning platform.

A lot of other issues faced by respondents included, crashing of the system, weak wi-fi signals in the university, bad user interface, confusing instructions and inefficient Turnitin (plagiarism checker).

Suggestion 2: Better Technology Infrastructure

Based on the complaints of the respondents, the E-learning platform designers should improve on the software, easier User Interface, clearer instructions and user-friendly website experience.

5.2.3 Open Question 3: Does E-learning improve your learning performance? Which part was most useful and/or interesting?

31 respondents have given their feedbacks on the third open ended question. Most respondents believed that E-learning was useful and supplemented their learning. They also gave suggestions on what else could be added to improve the system's efficiency.

Respondents' suggestions are classified as:

Suggestion 3: Rewind Lectures: good quality online lectures could save time.

Provision of more online tests and quizzes: Could help improve skills and test knowledge before exams.

Resources and access to digital libraries and other educational material: A one stop focus to study could reduce time in searching for resources online and elsewhere. And the resources can be easily accessed anywhere as needed.

5.2.4 Open Question 4: Would you prefer to take up a subject online or in a classroom? Why?

27 respondents gave their feedback on the 4th open ended question. Most respondents said that they preferred to have traditional face to face classroom education for direct communication with the teacher but would like it to be supplemented by online classes. Some respondents were in favour of online classes, due to its convenience and easy access. 11 respondents favoured blended learning,

their reasoning being that some material and knowledge may not be on the web and thus, the practical, real life experience of a lecturer in classroom is necessary, but a virtual availability of educational resources would also supplement their learning.

5.2.5 Open Question 5: How could the institution improve the course and the online services it provides to students? For example, should the institution provide blog, e-portfolio, or wiki capabilities

37 respondents have given their feedbacks on the fifth open ended question. Based on their responses, suggestions were classified below:

Suggestion 4: All respondents agreed that the E-learning platforms could offer more resources to help students in their learning endeavors. More resources including, provision of wiki capabilities, blogs, access to digital libraries, video tutorials, free e-books, use of apps within website like kahoot, quizlets for testing knowledge. A respondent also stated that video tutorials on how to use the website should also be made available for all students.

Some were of the agreement that links, free e-books and resources for referencing should also be provided.

5.3 Conclusion

This study was able to successfully create a framework where the 4 predictors (Independent Variables) were successfully able discriminate between millennials' preference for Moodle versus rest of LMSs. Student Characteristics was found to have the highest discriminatory ability amongst all the predictors. Moodle was preferred by the respondents as compared to rest of LMSs.

Also, the present study contributes to existing research body by examining the predictive power of several independent variables namely Technology Infrastructure, Instructor Characteristics, Student Characteristics and E-learning

Resources on the type of E-learning preferred. Under the LDA analysis, the results obtained from the current study showed that all 4 independent variables were successfully able to classify the respondents into the two categories of the dependent variable, with Student characteristics having the highest predictive power amongst the 4.

The result of the research showed that Millennials preferred Moodle as compared to the rest of LMSs. Thus, showing that Moodle had high credibility on the basis of its technology infrastructure and the system resources. Although the ability of the instructor to motivate and engage the students and their own self-efficacy was also important in influencing their decision regarding the platform they preferred.

As most millennials grew around technology, as digital natives, they expect to be allowed to use multiple technological devices (e.g., tablets, laptops) as part of their learning experience. This allows them to accomplish more in an efficient manner (Sweeney, 2016).

They also require clear expectations and instructions for completing assignments, and if this is not provided, it can negatively impact their learning progression and confidence (Roberts, Newman, & Schwartzstein, 2014). Thus, this study has proven that as more millennials enter higher education and the workforce, it is important to understand what helps them derive value from the online learning platforms, indicating that Universities, lecturers from Boomer and Generation X as well as the E-learning platform developers should focus on understanding the needs and concerns of millennials.

5.4 Limitations

Due to time constraints, the sample size for this study was considerably smaller (n=77), thus it cannot be considered a representative of groups of millennials to whom these results could be generalized to. Secondly, there is also the lack of prior

research in this area by using the LDA methodology and therefore, further studies can be conducted in the area of E-learning. An excessive number of measurements for dependent and independent variables is the main obstacle that researchers have faced in trying to develop a successful E-learning model. Evidently, there is a need for a comprehensive success model for multiple levels of success (Eon & Ashill, 2018).

Most previous studies on E-learning have focused on the critical success factors (CSFs) categories from the perspective of the teachers and students. But they have considerably varied. Selim (2017) identified 7 factors, 4 focusing on instructor characteristics, technology, support and E-learning system and 3 focusing on student characteristics.

More research can also be undertaken in the area of comparing different LMSs based on different categories and features, from the perspective of teachers, universities and students to estimate which is the best fit for each of these end user types. Through personal interviews and more data collection, more predictors and factors can be identified to build upon the existing framework of this study.

Thirdly, we would like to acknowledge the deficiencies in the questionnaire, which could have been more specific about the features of E-learning platforms, based on the suggestions and responses in the open-ended questions, questions regarding the design, seamless experience, video quality, and resources should also have been added. In future research, specific questions to understand the differences of E-learning platforms should also be added.

Discriminant Analysis has too many assumptions (multivariate normality, homoscedasticity, non-multicollinearity, mutually exclusive grouping, absence of outliers) which may not be practical when applied to real data (Yan and Dai, 2012). In practice, the class means and covariances are not known and so either the maximum likelihood estimates or the maximum a posteriori estimate may be used in place of the exact value for the analysis.

Another complication in applying LDA to real data occurs when the number of measurements of each sample (i.e., the dimensionality of each data vector) exceeds the number of samples in each class. In this case, the covariance estimates do not have full rank, and so cannot be inverted (Martinez and Kak, 2011).

5.5 Recommendations

Based upon the findings from this study, some possible actions that universities and LMS developers can take are listed as follows:

a) E-learning system designers should improve the ease of use through user-friendly interface design, easy access to the system, and by giving clear instructions to users.

b) Menu, content, and information presented can be added with images, videos, or sounds to make it easier for students to understand.

c) The design of E-learning system must meet the aesthetic, attractive, user-friendly, readable, organized, flexible, reliable, and secure aspects to match user's needs.

d) Universities should provide video tutorials for a seamless transition for students and lecturers alike, to become adept in using the E-learning platform.

e) Teachers should be more encouraging, motivate students to use the E-learning platforms and provide up to date resource materials to students, and also undergo periodic training to use updated versions of the system.

f) Teachers should also be able to communicate to students the importance and effectiveness of E-learning to supplement their traditional classroom knowledge.

g) E-learning platforms should provide a feedback portal for students, so they can provide their suggestions, concerns and complaints which can further be improved upon and fixed by the LMS developers.

h) Teachers can further increase students' interest by providing them with opportunities to interact electronically with each other and the teachers using online forums, discussion boards and chat rooms.

i) Stable Wi-fi, Online and Offline help desks, free access to digital libraries on and off campus and availability of tests and quizzes should also be provided by the university in conjunction with the software developers.

j) Universities should also analyze based on their location, resource availability, cultural context in which they operate and the needs and concerns of their students and staff before identifying the LMS platform and customizable features that would be the best fit for them.

5.6 Practical Contribution

a) This study is highly significant in establishing the predictors of a successful E-learning platform. This information could be helpful in academic and corporate set up.
b) For higher education institutes it can help to avoid barriers that hinder the development and expansion of E-learning and also for the platform developers in understanding the needs and concerns of the end users.
c) As more than 75% of the work force will consist of Millennials by 2035 as well as currently the majority of students in higher education comprise of millennials (Deliotte, 2015), this study provides an insight into their preferences and concerns regarding various E-learning platforms.
d) If implemented correctly, E-learning can be seen as a promising way for improving the quality of higher education and effectiveness of learning.
e) It can give increased flexibility of learning experience to student, enhances access to information resources for more students.

f) E-learning encourages innovative pedagogical methods, new ways of learning and interacting by the easy sharing of the new practices among learners and teacher communities, as well as by more transparency and easier comparison and cross fertilization of materials and methods. Based on this, this study provides a robust framework upon which further research can be built where the online learning continuum can be modified in accordance with the personal learning environments (PLE) based on millennial values (Nick Van Dam, 2008; Milligan et al., 2006). Through which students can demonstrate their preferences in software, functionality, web tools, individual application and those aspects of the software that they choose to include in their spaces. So, a flexible and simple E-learning platform that can let students integrate their own resources from Web 2.0 could be the future of E-learning (Bartolomé and Cebrian-de-la-Serna, 2017).

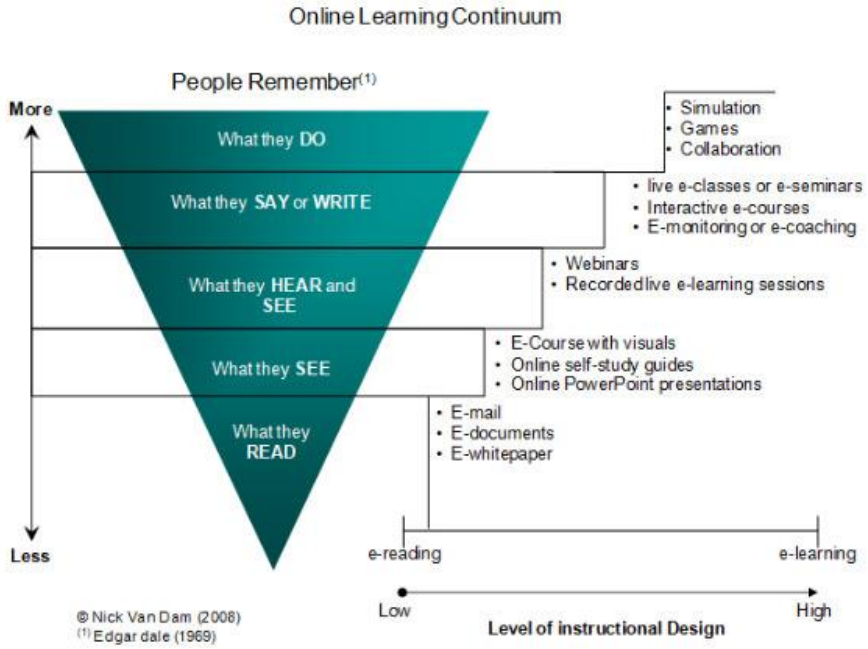


Figure 5.1 Online Learning Continuum

Table 5.6.1 Personal learning environment

PLE (MILLIGAN ET AL.)	DESCRIPTION	MILLENNIALS' VALUES
Learn with other people	Manage and create relationships, forming connections between contacts that are not part of a formal learning network	Collaboration Contribution
Control their learning resources	Allow them to structure, share, and annotate resources they find or have been given	Engagement Participation
Manage the activities they participate in	Provide opportunities for them to create as well as join activities that bring together people and resources	Creativity Innovation strategies
Integrate their learning	Allow them to integrate learning from different institutions and sources, re-using evidence of competency and making links between formal and informal learning	Vision Leadership

5.7 Management Contribution

In recent years, numerous studies have explored the Critical success factors of E-learning platforms (Alhaleeb and Rowley, 2018; Taha, 2014; Selim, 2017; Abdel-Gawad and Woollard, 2015). Studies have also been done on the acceptance of E-learning from the perspectives of students and teachers based on TAM (Abdullah and Ward, 2016; Abdurachman et al., 2018) as well as on comparison of E-learning platforms on the basis of different categories and features (Al-Ajlan and Zedan, 2014; Subramaniam, Zainuddin and Alatawi, 2018).

This study has provided a different research approach by use of Linear Discriminant Analysis. The objective of this E-learning framework is thus to enhance current learning practices by understanding issues and challenges faced by millennials utilizing the E-learning systems, and also gauging their preference regarding which system works with least effort and the same time does not compromise on the quality of the education.

This research provided through empirical evidence, the predictors which were able to successfully distinguish Millennials' preference of E-learning platforms. Thus,

this work was able create a well-defined research framework upon which further research can be built to improve our understanding of E-learning environments through addition of more predictors and comparison dimensions for different end user (Software developers, Universities, Lecturers, Students, Corporates, Employees). The outcome of this work also enriched with the existing E-learning frameworks and literature.

E-learning is a large and growing market with an increasing customer base including academic and corporate set ups. Global players are focused on innovating efficient E-learning management solutions to strengthen their product offering which will give them a competitive advantage.

As more millennials enter universities and workforce, it is now imperative to focus on satisfying their needs and concerns in order to maximize their potential through effective E-learning solutions.

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APPENDIX

Appendix 1: Content Anlaysis

Sr No.	Journal	Title	Author	Variables	Country	Findings	Relevance to our study
1	Computers in Human Behavior	Developing a General Extended Technology Acceptance Model for E-Learning (GETAMEL) by analysing commonly used external factors	Fazil Abdullah, Rupert Ward	IV: Experience, Subjective Norm, Enjoyment, Computer Anxiety, Self-efficacy DV: Perceived ease of use, Perceived usefulness	UK	The best predictor of student's PEOU of e-learning systems is Self-Efficacy, followed by Enjoyment, Experience ,Computer Anxiety and Subjective Norm. The best predictor of student's PU of e-learning systems is Enjoyment, followed by Subjective Norm, Self-Efficacy and Experience	The GETAMEL model helps to identify the key external factors for acceptance of e-learning.
2	Journal of Theoretical and Applied Information Technology	E-LEARNING ACCEPTANCE ANALYSIS USING TECHNOLOGY ACCEPTANCE MODEL (TAM)	ANGELA, CHATRINE SYLVIA, HANDOKO, EDI ABDURACHMAN	IV: Self efficacy, Subjective Norm, Experience DV: Perceived ease of use, Perceived usefulness, Behavioural intention to use	Indonesia	The result of this study showed that self-efficacy, subjective norm, and experience has significant positive effect on perceived ease of use. Perceived ease of use has significant positive effect on perceived usefulness. Perceived usefulness has significant positive effect on behavioral intention to use, perceived ease of use has no significant effect on behavioral intention to use.	An understanding of student acceptance behavior toward the system is also important in order to improve online learning environment.
3	Computers & Education	E-learning critical success factors: Comparing perspectives from academic staff and stuents	Abdullah Alhabeeba, Jennifer Rowley	IV: Student characteristics, E-learning system, Experience, Ease of access, Instructor characteristics, Ease of use of eLearning support, Support and training, E-learning tools, Engagement Technology Infrastructure,Instructor characteristics, eLearning systems resources, Ease of access, Searching support DV: Critical Success Factors for E-learning	Saudi Arabia	This research makes a useful contribution to understanding the factors that might affect the success of e-learning, and can be used to inform government and university policy making regarding investment in e-learning. Being well-informed regarding what matters and is important when designing and implementing an eLearning system is vital for the success of these system	Helps to understand the factors that are important to teachers and students on successful adaptation of e-learning
4	Procedia - Social and Behavioral Sciences	Malaysian Teachers' Levels Of ICT Integration And Its Perceived. Impact On Teaching And Learning	Irfan Naufal Umara, Amat Sazali Abu Hassan	IV: Technology knowledge (TK) Pedagogical knowledge (PK) DV: ICT Integration	Malaysia	the teachers' ICT integration is at the low level, while their pre-integration of ICT is at the moderate level, (ii) ICT is perceived to bring positive impact on their teaching although time constraint might hinder its use, and (iii) ICT is also perceived to influence their students' learning	Teachers perspective on the use of e-learning and its effectiveness is equally important to be studied
5	Procedia Economics and Finance	Blended Learning Web Tool Usage among Accounting Students: A Malaysian Perspective	Azleen Shabrina Mohd Nora, and Nor Aziah Abu Kasim	Qualitative Study Frequency of using Blendspace, Ease of use, Usefulness, Accounting students attitude, Differences between the *Blendspace* and MMLS, Improvement to the *Blendspace* usage	Malaysia	This research discovered that the frequency of using *Blendspace* among the accounting students was influenced by the assessment and familiarity in using it. The factors contributing to the usage of *Blendspace* was also identified namely ease of use, usefulness and students' attitude.	the findings are useful to understand the usage of blended learning web tool by students

6	Telematics and Informatics	Business undergraduates' perceived use outcomes of Moodle in a blended learning environment: the roles of usability factors and external support	Ifinedo, P., Pyke, J., Anwar, A.,	IV: usability factors (i.e., perceived ease of use, perceived usefulness, and satisfaction) and external support (i.e., teacher and peer support) DV : undergraduates' use outcomes of Moodle in a blended learning environment.	Canada	Usability factors have positive effects on students' use outcomes; contrary to predictions teacher and peer support did not.	help us gain an understanding of antecedent factors likely to enhance students' use outcomes of Moodle.
7	Journal of Public Affairs Education	Comparing the Effectiveness of Classroom and Online Learning: Teaching Research Methods	Anna Ya Ni	IV: Mode of instruction, classroom and Online DV: Student Performance	America	student performance as measured by grade is independent of the mode of instruction.	Helps us understand how to exploit and integrate the comparative advantages of different modes of instruction to specific courses by offering not only fully face-to-face or online but also hybrid classes to overcome the constraints of time, place, and resources.
8	Procedia Manufacturing	Digital age learning and Business engineering education: A pilot study on student's E-skills	Elena Fleaca and Radu Stanciu	IV: information and data processing; digital communication; digital content creation; digital problem solving. DV: Students E-skills	Romania	the results of data analysis demonstrated the need for improving certain descriptors accountable for building digital skills of students with respect to: i) evaluating data, information and digital content; ii) managing digital identity; iii) integrating and re-calibrating digital content; and iv) identifying needs and technological responses to solve problems.	innovation through the adoption of digital teaching and learning can help improve learning outcomes embedded in clear teaching goals which should be linked to critical thinking and the ability to engage graduates positively and competently in the digital environment.
9	The International Journal of Management Education	Effectiveness of teaching methods in business education: A comparison study on the learning outcomes of lectures, case studies and simulations	Mehdi Farashahi, Mahdi Tajeddin	IV: Problem solving, Interpersonal skills and self awareness DV: Effectiveness of the teaching methods (lectures, case studies, simulations)	Canada	students perceive simulation as the most effective teaching method for developing their interpersonal skills and self-awareness followed by case study and lecture respectively. Regarding problem solving skills we found that simulation and case study are perceived as being similar but more effective than lectures.	Helps to assess the effectiveness of teaching methods based on students' perceptions especially lecture based teaching
10	The Online Journal of New Horizons in Education	Effectiveness of MOODLE-enabled blended learning in private Indian business school teaching niche programs	Dr. Ela Goyal and Dr. Suhas Tambe	IV:User experience, benefits and barriers of MOODLE DV: Use of MOODLE	India	The major finding in this study has been that students can adapt themselves quite readily to an online mode of teaching	Since our institute has implemented MOODLE on a larger scale for its courses, thus making it an effective area of study
11	Procedia-social and behavioural sciences	Effects of e-learning on students' motivation	Safiyeh Rajaee Harandi	IV:E-learning DV:Student Motivation	Iran	This study highlighted the significant relationship between e-learning and students' motivation so, students are more likely to be more motivated when applying e-learning. If students are more motivated to learn, then they are more likely to be engaged; and if they are engaged and engaged successfully, they are more likely to achieve the learning objectives	How E-learning could motivate university students
12	Computers and Education	Examining the students' behavioral intention to use e-learning in Azerbaijan? The General Extended Technology Acceptance Model for E-learning approach	Ching-Ter C., Su C.-R. & Hajiyev J.	IV: SN, Experience, enjoyment, self efficacy, perceived ease of use, perceived usefulness Moderator: Technological Innovation DV: Behavioural Intention to use E-learning	Taiwan	Subjective norm (SN), Experience (EXP) and Enjoyment (ENJOY) positively and significantly influence students' perceived usefulness (PU) of e-learning, while Computer anxiety (CA) has a negatively effect. EXP, ENJOY and Self-efficacy (SE) positively and significantly affect their perceived ease of use (PEOU) of e-learning. It is also seen that SN has a positive and significant impact on BI to use e-learning, while Technological innovation (TI) significantly moderates the relationship between SN and PU, PU and BI to use e-learning. This study also determines a negative and significant relationship between CA and PU, in the context of students' e-learning.	Helps to understand the use of GETAMEL model in e-learning setting

13	IEEE: SPECIAL SECTION ON NEW TRENDS IN BRAIN SIGNAL PROCESSING AND ANALYSIS	Extending the Technology Acceptance Model for Use of e-Learning Systems by Digital Learners	AAMER HANIF, FAHEEM QAISAR JAMAL, AND MUHAMMAD IMRAN	IV: SN, perception of external control, system accessibility, enjoyment, result demonstrability DV: PU and PEOU, Attitude and Behavioural intention to use	Pakistan	Findings suggest that a student's attitude is a strong predictor of BI toward using the system with the fact that students find this system easy to use	adaptation of TAM that explains the BI toward using e-learning systems
14	Procedia – Social and Behavioral Sciences	Knowledge, perception and practice on the usage of e-learning among health students in Kuala Lumpur	Nur Zakiah Mohd Saata,Chong PNb, B Omara, Z Manafb, I Ishaka, N Ramlia	IV: knowledge, perception and practice DV : Use of e-learning among lecturers and students.	Malaysia	The perception of the students and lecturer on the e-learning was highly positive indicating that e-learning is successful as a tool for communication other than face-to-face lecture or consulting between lecturer and student.	difference of opinion between lecturers and students regarding the usage of e-learning can improve their knowledge on technology.

15	The Internet and Higher Education	How do medium naturalness, teaching-learning interactions and Students' personality traits affect participation in synchronous Elearning?	Orli Weiser, Ina Blau, and Yoram Eshet-Alkalai	IV: Medium, teaching learning interactions, personality traits DV:Participation in lessons	Israel	The findings of Study 1 revealed passive learning behavior amongst the majority of participants, who tended not to interrupt the instructor's lecture, spontaneously ask questions, or initiate interactions. However, participation was much higher and more frequent when the instructor explicitly encouraged the students to participate, comment, and ask questions. The findings of Study 2 indicated that transferring the responsibility for learning from the instructor to the students, by allowing them to "lead" the lesson, promoted their participation and initiation of interactions.	Helps understand the importance of adapting the teaching methods to the learners' characteristics and of allowing learners to choose their own preferred method from a variety of options.

16	Journal of computer assissted learning	Mobile learning vs. traditional classroom lessons: a comparative study	D. Furió, M.-C. Juan, I. Seguí† & R. Vivó	IV:Use of Iphone, Traditional Classroom DV: Learning effectiveness and Satisfaction	Spain	The analyses showed that the children made significant learning gains about the water cycle, regardless of the method used. Even though the results showed that the iPhone method achieved higher knowledge results than the traditional classroom lesson, no statistically significant differences were found between the iPhone and the classroom lesson. When analysing the motivational outcomes, the results showed that the children found the iPhone game to be more satisfying than the classroom lessons. Since the iPhone game achieved similar learning results and a higher motivational effect than the classroom lesson,	this study helps understand that e-learning can be effectively used as a tool to reinforce student learning to acheive similar results as classroom learning.

17	The internet and Higher education	Supporting students' motivation for e-learning: Teachers matter *on* and *off* line	Fryer, L.K. & Bovee, H.N.,	IV: Prior Competence, time, ability belief, task value, effort beliefs, defecits, prior use of smartphones, computers and percieved teacher support DV:Online course completion Moderator: Gender	Japan	prior language competency moderately predicted ability beliefs, but was not a significant factor within future task value Unexpectedly, gender had a small positive effect on teacher support, with female students experiencing less support than their male counterparts. Results suggested that ability beliefs account for the largest portion of variance explained in e-learning completion, highlighting their particular importance	Helps understand that Strong support from the teacher in these critical first few weeks can have longstanding and substantial effects on the motivation students' experience. Clearly, teachers matter, both *off* and *on*line.

18	Australasian Journal of Educational Technology	Technology acceptance model in technology-enhanced OCLL contexts: A self-determination theory approach	Somayeh Fathali, Takeshi Okada	IV: Perceived competence, perceived autonomy, perceived relatedness DV: PU, PEOU, OCLL Intention and actual performance	Australia	this study found that in order to facilitate users' acceptance of a learning technology, which in turn strongly promotes their continuance intention to use technology, the fulfilment of the three basic psychological needs for competence, autonomy, and relatedness are of great importance. The degrees of the coefficient in the final research model show that among all the determinants of SDT, perceived competence plays the most important role in explaining perceived usefulness and perceived ease of use of the system. Perceived competence as a highly positive predictor of the learners' acceptance of the technology shows that feeling fully capable of using learning technologies is the most crucial factor in the context of technology-enhanced OCLL	Use of the TAM model in understanding critical issues for successful use of e-learning

19	Interactive Learning environments	Understanding MOOC continuance: An empirical examination of social support theory	Jyh-Yih Hsu, Chia-Chen Chen & Po-Feng Ting	IV: Sense of community, perceived gain, computer self efficacy, perceived convenience DV: PEOU,PU,Attitude, Behavioural intention	Taiwan	it is known that the seven variables, perceived convenience, computer self efficacy, sense of community, perceived gains, perceived ease of use, perceived usefulness and using attitude influence intention of learners for using digital learning platforms jointly. In spite of MOOC platform or traditional e-learning platform, using attitude is the biggest influence factor that influences behavior intention. Therefore, the research studied influence of other six variables on total effect of using digital learning platforms. In MOOC platform group, perceived gains (0.468) has the biggest influence, followed by perceived convenience (0.431); in traditional e-learning platform group, perceived usefulness (0.671) has the biggest influence, followed by perceived gains (0.508).	Use of TAM to use of in e-learning

20	Procedia Technology	The use of Moodle e-learning platform: a study in a Portuguese University	Carolina Costaa, Helena Alvelosa, Leonor Teixeira a	IV: Activities and Modules of MOODLE platform Functionalities and tools DV: Use in University	Portugal	The results show that despite Moodle has great potential, it is mainly used as a repository of materials. However, students recognize the importance of the use of other functionalities of this platform in order to promote the success of the teaching/learning process.	Study on the MOODLE platform
21	International Journal of Educational Technology in Higher Education	The roles of academic engagement and digital readiness in students' achievements in university e-learning environments	Hye Jeong Kim, Ah Jeong Hong, Hae-Deok Song	IV: E-learning adoption, E-learning attitude Moderator: Digital readiness, academic engagement DV: Academic achievement	Korea	Although students positively perceived e-learning experiences on campus, they must have strong digital skills to perform academic work and commit to effortful involvement in the context of academic learning in university e-learning environments.	1)suggestions for an integrated approach involving both e-learning and offline environments. 2)user experience design of e-learning systems is the key to enhancing & effective teaching and learning activities.
22	Malaysian Online Journal of Educational Technology	Students' Readiness for E-learning Application in Higher Education	Atousa Rasouli, Zahra Rahbania, Mohammad Attaran	i) gender ii)university iii)subject	Iran, Malaysia	No significant relationship between students' readiness and gender, university, and subject.	Student chosen course effects readiness
23	International Journal of Educational Technology in Higher Education	The utilisation of e-learning facilities in the educational delivery system of Nigeria: a study of M-University	Sunday Chinedu Eze, Vera Chinwendu Chinedu-Eze, Adenike Oluyemi Bello	i)Adequate e-learning Facilities and lecturers level of utilization ii) ease of e-learning adoption over 'face to face' method iii) Major factors inhibiting the adoption	Nigeria	Key factors inhibiting the adoption of e-learning facilities -Attitudes of users -Inadequate internet facility -Inadequate training	Attitude of users, inadequate internet facility, inadequate training of users affect the successful adoption.

24	12th IEEE International Workshop on Future Trends of Distributed Computing Systems	Why Moodle	Ajlan Al-Ajlan, Hussein Zedan	Moodle versus othe virtual learning environments	UK	In this study they have succeeded in finding that optimal VLE platform, and it is Moodle.	Understanding the features, capabilities and technical aspects of Moodle and other platforms
25	Procedia Technology	The use of Moodle e-learning platform: a study in a Portuguese University	Carolina Costaa, Helena Alvelosa, Leonor Teixeira	Use of Moodle and its primary usage of its tools	Portugal	The results show that despite Moodle has great potential, it is mainly used as a repository of materials. However, students recognize the importance of the use of other functionalities of this platform in order to promote the success of the teaching/learning process.	How students use Moodle

26	Telematics and Informatics	Business undergraduates' perceived use outcomes of Moodle in a blended learning environment: the roles of usability factors and external support	Princely Ifinedoa, Joanne Pykeb, and Amar Anwara	IV: Satisfaction, teacher support, peer support, PEOU, PU Control: Age, gender, year of study, computer knowledge, academic discipline DV: Percieved learning assistance, Academic performance, positive impacts on learning	Ca nad a	Study found that usability factors have positive effects on students' use outcomes; contrary to predictions teacher and peer support did not.	The findings of the study offer useful insights that can help HE administrators gain an understanding of antecedent factors likely to enhance students' use outcomes of Moodle.
27	Telematics and Informatics	The social impact of technology on millennials and consequences for higher education and leadership	Manuel Au-Yong-Oliveira a, Ramiro Gonçalv esb, José Martinsb , Frederic o Branco	Attitudes towards leadership and higher education	Por tug al	Motivation and the right work ethic are essential to success; as is being street savvy. Higher education institutions should primarily enlighten, but seek to remain positive and somewhat romantic. Authentic leadership should be preferred, which signifies an important change, brought on also by technology – which has brought people closer, in a more transparent world.	Understanding millennial perspective
28	Universal Journal of Educationa l Research	Reaching the Millennial Generation in the Classroom	Paul E. Kotz	Role of Teachers and students in improving student experience	US A	Millennial students say they want to use the creative side of their brain. Instructors must realize that this millennial generation needs to be nurtured, mentored, developed, and released to grow in their own learning	Understanding the newer generation in a classroom setting

29	From theory to practice: Examining millennials reshaping organizatio nal cultures . (Book)	The Role of Millennial Students in Shaping the Digital Learning Culture in Higher Education	Ramos Salazar, L., & Diego-Medrano , E.	Millennials Characteristics .: Special, sheltered, confident, team-oriented, conventional, pressured, achieveing. Effect on transforming educational learning environment	US A	To adapt to millennials, Baby Boomer and Gen X faculty may continue to shift their teaching approaches to advance students' learning experiences. Through use of digital learning and social media.	Understanding how millennials are reshaping the educational sector in higher education
30	Harvard Medical Teacher	Twelve tips for facilitating Millennials' learning.	Roberts, D. H., Newman , L. R., & Schwart zstein, R. M.	The 12 tips provide detailed approaches and specific strategies for understanding and engaging Millennial Learners and enhancing their learning	US A	With an increased understanding of the characteristics of the current generation of teachers, faculty will be better able to facilitate learning and optimize interactions with Millennial Learners	How millennial education can be aided by the teachers
31	IYSJL	STUDENTS' PREFERENCE FOR TOOLS ON LEARNING MANAGEMEN T SYSTEM	Sofea Nabila Mohd Najmi	LMS tools Level of Satisfaction	Ma lay sia	One of the apparent problems with the Learning Management System tools that are chosen by a university is that it is not based on students' preference	The students' opinion is important as it would help to make their learning experience more meaningful. In order to facilitate students' learning, it is advisable for the university to provide the important tools that are deemed useful by the students to enhance their learning

32	Procedia - Social and Behavioral Sciences	Knowledge, perception and practice on the usage of e-learning among health students in Kuala Lumpur	Nur Zakiah Mohd Saata, Chong PNb, B Omara, Z Manafb, I Ishaka, N Ramlia,	IV: Knowledge, perception practice DV: Usage of E-learning	Malaysia	This study showed that, the e-learning system was commonly used by lecturers and students just for upload lecture notes and download lecture notes.	difference of opinion between lecturers and students regarding the usage of e-learning can improve their knowledge on technology.
33	Malaysian Journal of Learning and Instruction	E-LEARNING READINESS AMONG STUDENTS OF DIVERSE BACKGROUNDS IN A LEADING MALAYSIAN HIGHER EDUCATION INSTITUTION	Donnie Adams, Bambang Suminto no, Ahmed Mohamed & Nur Syafika Mohamad Noor	Level of readiness towards E-learning	Malaysia	Findings identified that students were ready for blended learning.	This study provides insights on students' readiness towards blended learning, particularly in the Malaysian context, discusses implications for blended learning practices in higher education institutions
34	Procedia Computer Science	Evaluation of Moodle Features at Kajaani University of Applied Sciences – Case Study	Deepak KC	Features of Moodle Its usage frequency	Finland	Out of the several features, only a few of them such as assignments, feedback, quiz and workshop modules are considered very essential and are heavily used	Adaptability of Moodle for different classroom Settings

35	Procedia Computer Science	Adaptive User Interface for Moodle based E-learning System using Learning Styles	Sucheta V. Kolekar, Radhika M. Pai*, Manohara Pai	Felder-Silverman Learning Style Model (FSLSM) categorizes learners into a predefined set of learning style classes. FSLSM has eight categories or classes of learners namely Sensing, Intuitive, Global, Sequential, Verbal, Visual, Reflective and Active.	India	This portal identifies the students learning style and accordingly provide material and customize the User Interface (UI) based on that learning style. This will improve the learning capacity of the students. The student generally does not have the time to browse through all types of material for a particular topic, so the portal will customize and provide only those materials which will enhance the learning experience of the student.	How creating new adaptive learning interface can enhance E-learning
36	International Journal of e-Education, e-Business, e-Management and e-Learning,	Learning Management System (LMS) among University Students: Does It Work?	Nor Azura Adzharuddin and Lee Hwei Ling	Use of LMS University Student acceptance	Malaysia	most university students have access to their university''s LMS or similar systems that help to enhance their learning process. Many have also expressed positive views about LMS, therefore proving that LMS is a necessary implementation in all universities worldwide.	Acceptance of LMS in university students
37	Computers in Human Behavior	Evaluating E-learning systems success: An empirical study	Dimah Al-Fraihat, Mike Joy, Ra'ed Masa'deh, Jane Sinclair	1.System Quality 2. Service Quality 3. Information Quality 4. Satisfaction 5. Use 6. Benefits	UK	This study provides universities and higher education institutes with a valid, reliable, comprehensive model and an instrument to evaluate the success of their learning management systems	the study results shed light on important issues and recommendations that should be taken into consideration to improve the perceptions of satisfaction and usefulness, use, and benefits of the e-learning systems.

38	Behavioral & Social Methods eJournal	Comparison between two Learning Management Systems: Moodle and Blackboard	Alaa M. Momani	Pedagogical Factor, Learner Environment, Instructor Tools, Course and Curriculum Design, Administrator Tools, Technical Specification	Saudi Arabia	Taking into consideration, the technical and user view-points in describing each feature of each LMS.	Understanding features of Moodle and Blackboard
39	JOURNAL OF INFORMATION SYSTEMS RESEARCH AND INNOVATION	A Study of Comparison between Moodle and Blackboard based on Case Studies for Better LMS	Priyavahani, Subramanian, Nursyafeeka, Zainuddin Alatawi	Communication tools Productivity tool Student involvement tools	Malaysia	Moodle gets better rating as compared to others	This paper has made a comparative study between Moodle and Blackboard, and it was based on 3 kinds of comparison. The first was based on communication tool, and second was productivity tools and third was based on student involvement tools.
40	Conference Paper	Comparing open-source e-learning platforms from adaptivity point of view	N. Ruiz Reyes, P. Vera Candeas, S. García Galán, R. Viciana, F. Cañadas, P.J. Reche	Moodle, Ilias, Atutor, Docebo, Dokeos User friendliness Adaptability	Spain	They have also compared different features of several well known open source e-learning platforms and put emphasis on user friendliness and possibility of adaptivity. Atutor, Ilias and Moodle have appeared to be the best at the moment	compares some widely used open-source e-learning platforms (Docebo, Moodle, Dokeos, Claroline, Atutor and Ilias) from the point of their adaptivity

41	Australasian Journal of Educational Technology	An empirical examination of individual and system characteristics on enhancing e-learning acceptance	Yi-Hsuan Lee, Chan Hsia, Purnomo	IV: Computer self-efficacy, internet self efficacy, instructor attitute towards students, learning content, technology accessibility Moderator: PEOU and PU DV: Perceived intention to use	Taiwan	Both perceived ease of use and perceived usefulness were found to be significant predictors of perceived intention to use. Additionally, perceived usefulness was found to have more predictive power than perceived ease of use on behavioural intention to use.	This study contributes to a better understanding of how to enhance e-learning acceptance through improvement in individual and system characteristics
42	Applied Computing and Informatics	Empirical Investigation of E-Learning Acceptance and Assimilation: A Structural Equation Model	Said S. Al-Gahtani	Computer self-efficacy, Perception of external control, Computer anxiety, computer playfulness, perceived enjoyment, objective usability, ease of use, PEOU,PU, Intention to use, usage behavior	Saudi Arabia	Results show the predicting (promoting/ inhibiting) factors of e-learning technology acceptance, while also examining some related post-implementation interventions expected to contribute to the acceptance and assimilation of e-learning systems. Our results also indicate that TAM3 holds well in the Arabian culture and also outline valuable outcomes such as: managerial interventions and controls for better organizational e-learning management that can lead to greater acceptance and effective utilization	E-learning acceptance factors
43	International Journal of Information and Education Technology	The Acceptance of Social Networking as a Learning Tools at University of Bahrain	Jaflah H. Al-Ammary, Amna K. Al-Sherooqi, and Hajer K. Al-Sherooqi	IV:Computer self efficacy, system design and features, perceived enjoyment, perceived mobility values, perceived interactivity Moderators: PEOU and PU DV:Behavioural intention to use social networks	Bahrain	The study confirmed that perceived usefulness and perceived ease are vital factors for predicting the students' behavioral intention to use social networks as learning tools. Both factors have shown a direct impact on thestudents' behavioral intention. In addition, they were act as moderators for the impact of many factors such as computer self-efficacy, perceived enjoyment and perceived mobility value on the behavioral intention.	Understanding the students' behaviour towards social media usage

44	Human Factors and Ergonomics in Manufacturing & Service Industries	Predicting the Intention to Use a Web-Based Learning System: Perceived Content Quality, Anxiety, Perceived System Quality, Image, and the Technology Acceptance Model	Fethi Calisir,Cigdem Altin Gumussoy	IV: Image, perceived content quality, perceived system quality, anxiety Moderator: PEOU, PU, attitude towards use DV: Behavioural intention to use	Turkey	The findings of the study indicate that perceived usefulness is the strongest predictor of behavioral intention to use a web-based learning system. In addition, a high proportion of perceived usefulness is explained by perceived content quality, and perceived ease of use is explained by perceived system quality and anxiety	Independent variables for TAM
45	Behaviour & Information Technology	Effects of individuals' locus of control and computer self-efficacy on their e-learning acceptance in hightech companies	Jung-Wen Hsia, Chia-Chi Chang & Ai-Hua Tseng	PU, PEOU, Locus of control,computer self-efficacy, behavioural intention to use	Taiwan	Analytical results indicate that locus of control had significant direct effects on perceived usefulness and perceived ease of use. Computer self-efficacy had significant direct effects on perceived ease of use and behavioural intention to use. Overall, analytical results provide strong support for using the extended TAM to explain user acceptance of e-learning systems.	E-learning acceptance variables
46	Proceedings of the 2014 IEEE 18th International Conference on Computer Supported Cooperative Work in Design	A Study of Student Behavior in Accepting the Blackboard Learning System: a Technology Acceptance Model (TAM) Approach	Shu-Chiang Lin, Satria Fadil Persada, Reny Nadlifatin	Perceived interactivity, PEOU, PU, Attitude, behavioural intention, actual usage	Taiwan	The analysis result explained that a value of 36 percent of student' acceptance to use Blackboard Learning System can be described by the evaluated factors. Our findings illustrated that the five factors mentioned have intercorrelated effect to explain the students' behavior and Perceived Interactivity was determined as the key factor.	Use of TAM in e-learning
47	Computational Intelligence and Neuroscience Volume 2018, Article	Student Engagement Predictions in an e-Learning System and Their Impact on Student Course Assessment Scores	Mushtaq Hussain , Wenhao Zhu , Wu Zhang , and Syed Muhammad Raza Abidi	Predicting student engagement in VLE	China	Results demonstrated that the J48, decision tree, JRIP, and gradient-boosted classifiers exhibited better performance in terms of the accuracy, kappa value, and recall compared to the other tested models. Based on these findings, we developed a dashboard to facilitate instructor at the OU. ,ese models can easily be incorporated into VLE systems to help instructors evaluate student engagement during VLE courses with regard to different activities and materials and to provide additional interventions for students in advance of their final exam. Furthermore, this study examined the relationship between student engagement and the course assessment score.	E-learning predictors
48	Pakistan Journal of Distance & Online Learning	Critical Success Factors of E-Learning Systems: A Quality Perspective	Shahid Farid Mubashra Qadir,Moiz Uddin Ahmed, Muhammad Daud Khattak	Perceived usefulness, Well-structured functionality ,Interaction between students and students , Student satisfaction , Robust data protection system , Ease of access of software , Establishing suitable learning models , Interaction of students with instructors/teachers , Perceived ease of use , Perceived playfulness ,Customization adaption , Student interface Good testing and piloting before release ,Quality of interface	Pakistan	CSF rankings were given in the study	CSF of E-learning

Appendix 2 : Survey Questionnaire

05-10-2019

To whom it may concern

We are Bona fide Masters in Business Administration students of Taylor's Business School in Subang Jaya, Malaysia. This survey titled ***"Factors Discriminating Millennials' Preference of E-Learning Platforms : Moodle versus the rest of LMS"*** is conducted in partial fulfillment of this course. With this, we humbly ask for your time and assistance to kindly provide the feedback on this survey.

Please be assured that all the information provided will be kept strictly private and confidential. Feedback data will be used for academic purposes only. Please DO NOT leave any items blank. Your participation is highly valued and appreciated. Should you require any further information, please do not hesitate to contact the correspondent below.

Once again, thank you very much for your cooperation.

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QUESTIONNAIRE

Factors Discriminating Millennials' Preference of E-Learning Platforms : Moodle versus the rest of LMS

This analysis is meant for research work on the factors influencing the adoption of E-Learning in a university system. This analysis is exclusively for research purposes. Please provide the needed information and respond to the questions by ticking your choice.

Note that this evaluation is subjective in nature and there is no "right" or "wrong" answer. Your Cooperation is highly appreciated.

Filtering Questions:

Have you used any E-Learning System before?

YES ☐ NO ☐

If yes, what is the name of the E-Learning System you have used?

Moodle ☐ Others, please specify ☐

Section A	**Profile of Respondents**			
	Age: 15-20 ( ) 21-26 ( ) 27-32 ( ) 33-38 ( ) Gender: Male ( ) Female ( ) Nationality: Malaysian ( ) Non-Malaysian ( ) Student ( ) Employed ( ) Others ( ) Academic Level: Undergraduate ( ) PGD ( ) Master ( ) Ph.D. ( ) Others…….……..			
Section B	Independent Variable	Adopted	Adapted	Author
1.	Technology Infrastructure			
	a) Easy access to the internet		I have easy access to the internet on a daily basis	Alhabeeb and Rowley, 2018
	b) Browsing is easy		I can easily browse through the E-Learning website	

	c) Availability of sufficient computer labs		There are sufficient computer labs in the university for me to utilize when I need it	
	d) Availability of technical support		Help desk is easily available and helpful when I need it	
	e) Ease of registration for E-learning courses		I find it easy to register for E-learning courses	
2.	Instructor Characteristics			
	a) Instructor's enthusiasm while teaching using ELearning tools		Instructor's enthusiasm while using E-Learning tools to teach affects my acceptance towards Elearning	Alhabeeb and Rowley, 2018

	b) Instructor's ability to motivate the students to use the E-Learning system		Instructor’s ability to motivate me to use E-Learning system is important	
	c) Instructor's ability to use the E-Learning system effectively		I tend to learn more via ELearning System if the instructor is skilled	
	d) Instructor's ability to provide adequate resources for student utilization		Instructor's ability to provide me with adequate resources will enhance my	

			learning journey	
3.	Student Characteristics			
	a) My experience and knowledge about computers b) My ability to find things in eLearning system c) My willingness to participate in e-learning d) The level of my enjoyment while using technology e) My ability to do what the lecturers expect me		I have confidence in my knowledge and experience about computers I am confident in my ability to find things in the Elearning system I am willing to participate in the E-learning I enjoy using Elearning system for my course completion	Alhabeeb and Rowley, 2018 Sylvia and Abdurchman,

	to do in regards of use of the elearning system		I have confidence in my ability to do what lecturers expect me to do while using the Elearning system	2018
4.	E-learning System Resources			
	a) Availability of online test/quizzes b) Availability of required learning material c) Availability of communications with the instructor in the eLearning system		Online tests/quizzes are available for my utilization Resources required for the courses are available on the website I am easily able to contact the instructor through the E-learning	Alhabeeb and Rowley, 2018

	d) Measurement of learning progress e) Access to the e-learning resources on and off campus		system I can easily measure my progress in the course I can easily access the Elearning resources on and off campus	
Section C	Mediator Variable			
	Perceived Ease of Use			
	a) I can easily sign into the system b) I can easily navigate the system. c) I can easily access course materials I require.	✓ ✓ ✓		Sylvia and Abdurchman, 2018

	d) I can easily submit my assignments into the system. e) I can easily use the online chat function f) I can easily use Turnitin (Plagirism checker) g) I can easily check the progress of my course h) The interaction in the elearning system is clear and easy to understand. i) The use of e-learning system increases my learning effectiveness. j) The use of e-learning system makes my learning easier.	✓ ✓ ✓ ✓ ✓ ✓ ✓		

Section E	Open Ended Questions			
	What do you enjoy most when using the E-learning System What were the challenges you faced while using the e-learning system? Does E-learning improve your learning performance? Which part was most useful and/or interesting? Would you prefer to take up a subject online or in a classroom? Why? How could the institution improve the course and the online services it provides to students? For example, should the institution provide blog, e-portfolio, or wiki capabilities?			

References

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Appendix 3 : First 20 Respondents SPSS Data

	SystemName	Gender	Age	Nationality	Full2	AcademicLevel	DisciplineMajor	TI1	TI2	TI3	TI4	TI5	IC1	IC2	IC3	IC4	SR1	SR2	SR3	SR4	SR5	SC1	SC2	SC3	SC4
1	Moodle	Male	21-26 years ...	Malaysian	Part time student	Master	Business	Strongly Agree	Strongly Agree	Agree	Neither disagr...	Strongly Agree	Agree	Agree	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Agree	Neither disa...	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree
2	ATutor	Male	21-26 years ...	Malaysian	Part time student	Undergrad...	Business	Strongly Agree	Agree	Agree	Agree	Agree	Neither disa...	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Agree	Strongly Agree	Agree	Strongly Agree	Agree
3	Others	Male	27-32 years ...	Malaysian	Full time student	PGD	Marketing	Strongly Agree	Agree	Agree	Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Agree	Agree	Neither disa...
4	Moodle	Female	16-20 years ...	Malaysian	Part time student	Undergrad...	what	Neither disagr...	Neither disa...	Strongly Agree	Strongly Agree	Agree	Neither disa...	Strongly Agree	Neither disagr...	Disagree	Agree	Agree	Neither disa...	Agree	Agree	Agree	Neither disa...	Neither disagr...	Disagree
5	Moodle	Female	21-26 years ...	Malaysian	Part time student	Undergrad...	Computer Sci...	Strongly Agree	Strongly Agree	Strongly Agree	Disagree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Disagree	Strongly Agree	Strongly Agree	Agree	Neither disagr...	Neither disa...
6	Others	Male	21-26 years ...	Non-Malaysian	Full time student	Master	mba	Agree	Agree	Agree	Neither disagr...	Agree	Strongly Agree	Neither disa...	Strongly Agree	Neither disa...	Agree	Neither disagr...	Agree	Agree	Neither disa...	Neither disagr...	Agree	Neither disagr...	Agree
7	Moodle	Female	21-26 years ...	Malaysian	Full time student	Undergrad...	Food Science...	Strongly Agree	Strongly Agree	Neither disa...	Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
8	Others	Female	21-26 years ...	Malaysian	Full time student	Undergrad...	Bachelor (Hon...	Strongly Agree	Agree	Strongly Agree	Agree	Neither disagr...	Neither disa...	Agree	Strongly Agree	Neither disa...	Strongly Agree	Agree	Neither disa...	Disagree	Neither disa...	Neither disagr...	Agree	Agree	Strongly Agree
9	Others	Female	27-32 years ...	Malaysian	Full time student	Undergrad...	Accounting an...	Strongly Agree	Strongly Agree	Strongly Agree	Neither disagr...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Neither disa...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
10	Others	Male	21-26 years ...	Malaysian	Full time student	Undergrad...	Marketing	Agree	Agree	Agree	Agree	Agree	Neither disa...	Agree	Neither disagr...	Agree	Neither disa...	Agree	Neither disa...	Agree	Neither disa...	Neither disagr...	Neither disa...	Neither disagr...	Agree
11	Others	Male	27-32 years ...	Malaysian	Full time student	Undergrad...	finance	Strongly Agree	Agree	Neither disa...	Neither disagr...	Neither disagr...	Agree	Disagree	Strongly Agree	Neither disa...	Neither disa...	Neither disagr...	Neither disa...	Disagree	Disagree	Neither disagr...	Neither disa...	Neither disagr...	Neither disa...
12	Moodle	Male	21-26 years ...	Malaysian	Full time student	PGD	Engineering	Agree	Strongly Agree	Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Agree	Agree	Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Agree
13	LMS	Female	21-26 years ...	Malaysian	Full time student	Undergrad...	Mass comm	Strongly Agree	Agree	Agree	Agree	Agree	Neither disa...	Agree	Agree	Agree	Agree	Agree	Neither disa...	Neither disa...	Strongly Agree	Neither disagr...	Neither disa...	Neither disagr...	Neither disa...
14	Moodle	Female	27-32 years ...	Malaysian	Full time student	Undergrad...	Degree in glob...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Agree	Strongly Agree	Strongly Agree	Agree	Agree	Agree	Strongly Agree	Agree	Agree	Agree	Agree
15	ATutor	Female	27-32 years ...	Non-Malaysian	Full time student	Ph.D.	Business	Neither disagr...	Disagree	Disagree	Strongly Disa...	Strongly Disa...	Neither disa...	Agree	Disagree	Agree	Strongly Dis...	Agree	Agree	Disagree	Neither disa...	Disagree	Disagree	Disagree	Agree
16	Others	Male	33-38 years ...	Malaysian	Part time student	Master	Engineering/ ...	Agree	Neither disa...	Strongly Dis...	Strongly Disa...	Disagree	Agree	Strongly Dis...	Strongly Agree	Strongly Agree	Disagree	Strongly Disa...	Strongly Dis...	Disagree	Strongly Dis...	Strongly Agree	Agree	Strongly Agree	Disagree
17	Others	Male	27-32 years ...	Malaysian	Full time student	Master	PhD in Busine...	Strongly Agree	Strongly Agree	Neither disa...	Disagree	Agree	Neither disa...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Neither disa...	Strongly Agree	Strongly Agree	Agree	Agree	Strongly Agree	Agree
18	Moodle	Female	21-26 years ...	Malaysian	Full time student	Undergrad...	Communicatio...	Strongly Agree	Agree	Strongly Dis...	Strongly Disa...	Strongly Agree	Strongly Dis...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Dis...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
19	LMS	Male	27-32 years ...	Malaysian	Full time student	Undergrad...	business mgmt	Strongly Agree	Agree	Neither disa...	Agree	Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Disagree	Agree	Neither disa...	Disagree	Neither disa...	Agree	Agree	Disagree	Neither disa...
20	Moodle	Female	33-38 years ...	Malaysian	Full time student	Undergrad...	Human resour...	Agree	Agree	Agree	Agree	Agree	Agree	Neither disa...	Agree	Agree	Agree	Neither disagr...	Agree	Agree	Agree	Agree	Strongly Agree	Agree	Neither disa...

SR4	SR5	SC1	SC2	SC3	SC4	SC5	PEU1	PEU2	PEU3	PEU4	PEU5	PEU6	PEU7	PEU8	PEU9	PEU10	HowcanteachersencourageandsupportonlinelearningDoesElearningmproveyourlearningperformanceWhichpartwasmostusefulWhatwerethechallengesyoufacedwhileusingtheelearningsystemWouldyouprefertotakeupasubjectonlineorinaclassroomWhyHowcouldtheinstitutionimprovethecourseandtheonlineservicesprov
Neither disa...	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Agree	Strongly Agree	Neither disagr...	Strongly Agree	Strongly Agree	Strongly Agree	Agree	
Agree	Agree	Strongly Agree	Agree	Strongly Agree	Agree	Agree	Strongly Dis...	Strongly Dis...	Strongly Dis...	Disagree	Disagree	Strongly Disa...	Disagree	Strongly Agree	Agree	Strongly Agree	
Strongly Agree	Strongly Agree	Agree	Agree	Agree	Neither disa...	Neither disa...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Show case study/ best practice	Nothing interesting. Just raw learning	UI/UI not good enough	Online if busy	Should provide wiki capabilities
Agree	Agree	Agree	Neither disa...	Neither disagr...	Disagree	Neither disa...	Disagree	Neither disa...	Agree	Neither disa...	Strongly Agree	Strongly Agree	Agree	Agree	Strongly Agree	Agree	
Disagree	Strongly Agree	Strongly Agree	Agree	Neither disagr...	Neither disa...	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Neither disa...	Strongly Agree	Agree	Strongly Agree	Agree	Agree	Strongly Agree	Constant involvement of assignm...	Yes. You can access learning materials o...	Internet access mainly	Online	E portfolio
Agree	Neither disa...	Neither disagr...	Agree	Neither disagr...	Agree	Neither disa...	Agree	Neither disa...	Agree	Neither disa...	Agree	Neither disagr...	Neither disagr...	Strongly Disa...	Strongly Agree	Neither disa...	
Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Dis...	Strongly Dis...	Strongly Dis...	Strongly Dis...	Strongly Dis...	Neither disagr...	Strongly Disa...	Neither disagr...	Agree	Agree	Provide more related resources	Yes, the quiz provided is useful	N/A	In a classroom, because can ask question ...	Wiki capabilities
Disagree	Neither disa...	Neither disagr...	Agree	Agree	Strongly Agree	Neither disa...	Strongly Agree	Agree	Agree	Neither disa...	Agree	Neither disagr...	Neither disagr...	Agree	Strongly Agree	Strongly Agree	explain the benefits	yes, especially the elearning online datab...	it takes quite some times to get a reply f...	i prefer classroom as i can get motivation w...	institution should provide a kind of result page...
Neither disa...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Dis...	Strongly Dis...	Strongly Dis...	Strongly Dis...	Strongly Dis...	Strongly Disa...	Strongly Agree	Agree	Agree	Agree	Offer guidance and help when st...	Yes. It's convenient. I can access to the s...	Not enough resources in the system.	Yes. It's convenient.	It will be great if the institution can provide mo...
Agree	Neither disa...	Neither disagr...	Neither disa...	Neither disagr...	Agree	Agree	Neither disa...	Agree	Neither disa...	Strongly Agree	Neither disa...	Agree	Agree	Agree	Strongly Disa...	Agree	Force	Yes	No	Classroom ,easy focus	No
Disagree	Disagree	Neither disagr...	Neither disa...	Neither disagr...	Neither disa...	Neither disa...	Neither disa...	Neither disa...	Neither disa...	Neither disa...	Neither disa...	Neither disagr...	Neither disagr...	Agree	Strongly Agree	Agree	lay down the benefits in using E-l...	the slides	nothing	classroom, with a lecturer explaining things ...	wiki capabilities
Agree	Strongly Agree	Strongly Agree	Agree	Strongly Agree	Agree	Agree	Strongly Agree	Agree	Disagree	Agree	Neither disa...	Disagree	Neither disagr...	Strongly Agree	Agree	Strongly Agree	
Neither disa...	Strongly Agree	Neither disagr...	Neither disa...	Neither disagr...	Neither disa...	Neither disa...	Strongly Dis...	Neither disa...	Neither disa...	Disagree	Disagree	Disagree	Disagree	Strongly Agree	Strongly Agree	Neither disa...			Lack of explanation	Classroom. Direct participation	
Agree	Strongly Agree	Agree	Agree	Agree	Agree	Agree	Strongly Dis...	Disagree	Strongly Dis...	Disagree	Strongly Dis...	Strongly Disa...	Strongly Disa...	Disagree	Disagree	Disagree	Teachers have to be really active...	No	Teachers not replying on time	Classroom. More interactive and hands-on r...	Since its an online service, teachers should b...
Disagree	Neither disa...	Disagree	Disagree	Disagree	Agree	Neither disa...	Agree	Disagree	Neither disa...	Agree	Agree	Agree	Disagree	Strongly Disa...	Strongly Disa...	Agree	By telling them it's importance	Yes	Website are blocked	No	Wiki capabilities
Disagree	Strongly Dis...	Strongly Agree	Agree	Strongly Agree	Disagree	Strongly Agree	Neither disa...	Neither disa...	Neither disa...	Neither disa...	Strongly Agree	Disagree	Agree	Disagree	Strongly Disa...	Strongly Agree					
Strongly Agree	Strongly Agree	Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Strongly Dis...	Disagree	Disagree	Strongly Dis...	Strongly Dis...	Neither disagr...	Strongly Disa...	Neither disagr...	Agree	Agree					
Strongly Dis...	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Dis...	Disagree	Strongly Dis...	Strongly Dis...	Strongly Dis...	Strongly Agree	Strongly Disa...	Strongly Agree	Strongly Agree	Agree	Informing the students of its ben...	Yes it does, I can access it remotely	No WiFi zone	Classroom because of the learning atmosph...	Institutions should provide a list of blogs etc (...
Disagree	Neither disa...	Agree	Agree	Disagree	Neither disa...	Agree	Neither disa...	Disagree	Neither disa...	Agree	Strongly Agree	Agree	Disagree	Strongly Agree	Strongly Agree	Agree	Provide no choice but only e-lear...	don't have to physically obtain material or ...	download / upload crash	both. Online can't 100% substitute yet	a linkage between platforms to provide seaml...
Agree	Agree	Strongly Agree	Strongly Agree	Agree	Neither disa...	Neither disa...	Agree	Neither disa...	Neither disa...	Agree	Agree	Agree	Agree	Agree	Strongly Agree	Strongly Dis...	Review after online learning	No. I would need lecturer for further explan...	Need more explanation or clarification on ...	In a classroom. Better understanding with e...	Institution to provide blog for related subject