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Impact of Learning Management System in Pharmacy Education in Selected Universities in Southern Nigeria and Contributing Factors

E.O. IRENITEMI*[1]A,B,C,D,E,F., O.J. OLA-OLORUN[2] A,B,C,D,E,F, A.O. JEGEDE[2] B,C,D,E,F, A.E. IGHORODJE[3] B,C,D,E

[1]Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan, Ibadan, Nigeria
[2]Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife, Nigeria
[3]Department of Clinical Pharmacy and Pharmacy Management, Madonna University, Elele, Nigeria.

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of article.

Abstract

Introduction: Information and communication technologies (ICT) continue to impact the learning landscape all over the world, particularly the use of learning management system (LMS.). The study assessed the impact of Learning Management System (LMS) in pharmacy education and explored factors influencing its adoption for learning in selected Universities in Southern Nigeria.

Method: The study samples consist of 66 pharmacy lecturers and 779 undergraduate pharmacy students, drawn from four universities, by employing a multistage sampling method and primary data sources. The instruments employed were two sets of questionnaires, one for each of the lecturers and students. Collected data were summarised using descriptive statistics including frequencies, percentages, weighted averages (WA) and medians while inferential statistics namely independent samples t-tests and analysis of variance (ANOVA) were employed in answering research questions about variables at 5% level of significance.

Results: The results show that the impacts of LMS in pharmacy education include improving educational outcome, for lecturers (80.8%; WA 2.7) and for students (55.5%; WA 2.2); promoting collaborative learning, for lecturers (76.9%; WA = 2.7), and among students (59.2%, WA 2.4) and promoting students' independent learning, for lecturers (92.3%; WA 3.0) and for students (68.3%; WA 2.6)). Factors reported as important in adoption of LMS technology are institutional support for technology tools (84.9%, WA = 3.7), electricity availability (93.9%, WA = 3.8), price of technology (62.1%; WA = 3.4) and internet access (87.9%, WA=3.7).

Conclusion: The study concludes that the impact of LMS technology in pharmacy education include promoting student's independent learning, improving educational outcomes and promotion of collaborative learning among students; while the most important factors facilitating the adoption of technology for learning were electricity, availability of internet connectivity and institutional support for technology use.

Keywords: Learning Management system, pharmacy education, learning

INTRODUCTION

Advancement in technology has changed the way teaching, learning and communication are being done (Makrakis, 2012). Information and communication technology (ICT) has permeated all forms of human endeavour, changing the way things are being done. Education is not left out as proficiency in ICT use is

now considered an important skill and a foundation for education (Sharma *et al.*, 2009). Some software applications such as learning management systems (Lonn and Teasley, 2009), e- learning platforms (Educause, 2008), interactive learning systems, among others (Luo and Lei, 2012) have emerged specifically for the purpose of education. Also, social networking tools such as blogging, bookmarking, podcasting, which were developed solely for social interactions are now being deployed for instructional interventions (Cain and Fox, 2009).

Implementation of novel online educational technologies (EdTech) in Pharmacy curricula has been noticed in developed countries such as, USA, Canada, Australia and European countries (Alkoudmani and Elkalmi, 2015). The employment of new technologies to enhance learning in medical academic environments has been made possible by advances in technology, especially in the growing world wide web (Chu *et al*., 2010). Podcasting, webinars, and internet-based learning management systems (LMS) like Moodle have been used in pharmacy and medical education for interactive knowledge sharing (Alkoudmani and Elkalmi, 2015).

Learning Management System (LMS) is a software application that automates the administration, tracking, and reporting of training events which uses the internet as a medium to support education and the learning process (Cavus and Momani, 2009; Simanullang and Rajagukguk, 2020). It allows users to share information and to collaborate online (Lonn and Teasley, 2009). It is designed to facilitate the packaging of interactive multimedia, teaching materials, lecture assignments, online discussions, learning videos and even interactive video conferences and is one of the methods of delivering electronic learning (Ulker and Yilmaz, 2016; Rabiman *et al*., 2020). It can be utilised by educational institutions to manage the education process, rather than merely delivering lectures and course materials electronically as it involves the management and organisation of e-learning activities into a system, such as assignments, syllabus, messages, student enrolment, examinations, lesson plans, and so on (Almaiah *et al*., 2020). LMS has been reported to be sustainable, affordable and efficient especially, providing a great alternative to face-to-face classes through free virtual classes when school activities have to cease in the case of a state of emergency, such as the one of COVID-19 pandemic emergency (Juárez-Santiago *et al*., 2020). It has been said to provide unique advantages to educational institutions such as motivating students and increasing their participation in class activities, as well as enhance learning and improve communication among its users, while at the same time saving costs through enhanced efficiency (Naidu, 2006; Aczel *et al*., 2008; Mahdizadeh *et al*., 2008). A number of LMS tools are available in the market such as: *ATutor*, *Moodle*, *WebCT*, *Learn.com*, *Joomla LMS*, *Krawler LMS* and *Blackboard* (Alkoudmani and Elkalmi, 2015).

Pharmacy educators are beginning to introduce the use of technology into Pharmacy education in a bid to improve on the training of pharmacy professionals (Fox, 2011). Technology is now being utilised to supplement the traditional face-to-face method of teaching (Marchand *et al*., 2014). However, because most technology tools evolved independently, and were not specifically designed for education, lecturers seeking to introduce new technologies into their courses have to make a choice of the technology tool that will meet their needs. Lecturers face the challenge of devising a unified and integrated approach to technology that accommodates the needs of both the lecturers and the students (Ramanathan *et al*., 1997).

Internet-based technologies have been successfully adopted for use in Pharmacy education in some developed countries, and have proven effective (Marchand *et al*., 2014; Salter *et al*., 2014; Curley *et al*., 2018). In Nigeria also, Learning Management System (LMS) was introduced to Pharmacy students in the Doctor of Pharmacy (PharmD) degree programme in the University of Benin (UNIBEN), which is a federal university in the southern part of Nigeria, using an open-source programme, Docebo (Erah and Dairo, 2008). Many of the faculty members and students that participated had a positive attitude to it and affirmed its potential to make teaching and learning more effective (Erah and Dairo, 2008). However, its usefulness and impact are yet to be fully evaluated subsequently and in other Pharmacy schools in Nigeria. This study aimed to assess the impact of LMS technology on pharmacy education in the selected universities and the responsible factors.

METHODOLOGY

Study period

The data were collected between March 2020 and July 2021.

Study design

The study was a cross-sectional survey of lecturers and students in selected Pharmacy schools in Southern Nigeria.

Study Area and Locations

The study was carried out at Obafemi Awolowo University, Ile-Ife, Osun State, University of Benin, Benin, Edo State, Igbinedion University, Okada, Edo State, and Olabisi Onabanjo University, Sagamu, Ogun State.

Sources of data

Primary data were collected from the lecturers and students of the Faculties of Pharmacy in the four schools with the aid of two sets of questionnaires, one set for the lecturers and the other for the students.

Population of the study

The population comprises 161 pharmacy lecturers and 1530 undergraduate Pharmacy students at the selected universities in Southern Nigeria. Pharmacy undergraduate students in 100 level were excluded from the study because they were still under the Faculty of Sciences and not yet being taught by pharmacy lecturers. Postgraduate students of pharmacy were also excluded.

Sampling procedure

The sampling frame for the study comprised pharmacy lecturers and 200-600 level undergraduate pharmacy students at the selected schools of pharmacy in Southern Nigeria. The sampling was stratified using the type of university ownership as basis of stratification and this includes the Federal (represented by Obafemi Awolowo University and University of Benin), State (represented by Olabisi Onabanjo University) and Private (represented by Igbinedion University). Lecturers in all Pharmacy Faculty departments and students across all five professional levels were drawn into the study. Although most Pharmacy schools had four levels in the professional classes as at the time of the data collection (that is, 200 to 500 levels), the University of Benin had five levels (200 to 600 levels). This is because Pharmacy education is in a transition state in Nigeria, changing from the traditional Bachelor of Pharmacy (B. Pharm) curriculum to the more clinically oriented Doctor of Pharmacy (PharmD) programme and the University of Benin has already keyed into the new programme with five levels of professional classes in contrast to the other schools each of which have four levels. The calculated sample sizes for a 95% confidence interval, 2- tailed, and 5% level of significance were 114 and 767 for lecturers and students respectively using Krejcie and Morgan (1970) sample size calculation (Bukhari, 2021).

Questionnaire design

The questionnaires for both the lecturers and students comprise two main sections, aside from demographics, the first for impact and the second for factors influencing LMS adoption. A question was asked on whether the respondent had used LMS before or not for education in pharmacy, and only those who gave positive response were asked to proceed to the first section having nine and ten items for lecturers and students, respectively with responses on a 5-point Likert scale of Strongly disagree", "Disagree", "Can't say", "Agree" and "Strongly agree" and weighted scores of 1 through 5 respectively. The second section, designed to elicit information on the factors influencing the adoption of LMS, employs another 5-point Likert type scale of "Can't say", "Not important", "Slightly important", "Important" and "Very important" with weighted scores of 0-4 respectively having two sub-sections. The first sub-section comprises eleven and nine items on facilitators for lecturers and students, respectively while the second sub-section is made up of thirteen and seven items on barriers to LMS adoption among lecturers and students, respectively.

Validation of Instruments

The internal validity of the instruments was achieved by adapting items from literature reinforced with expert review by senior faculty members with tertiary (Ph.D.) degrees and research interests in the areas of operations management and application of technology in pharmacy systems (Grapes *et al*., 1998; Monaghan *et al*., 2011; Stolte *et al*., 2011; Buchanan *et al*., 2013; Obasuyi and Usifoh, 2013; Kakasevski *et al*., 2014) was done by two professors and a reader. Content validity examination of the first section regarding LMS impact on teaching and learning as well as for the facilitating factors. The instruments were pre-tested for reliability using the test-retest method. Thirty lecturers and students who were not part of the study population participated in the pre-test. Identified errors were corrected before the administration of the questionnaire to the study samples.

Data collection

The questionnaire for each group (lecturers and students) was prepared as Google forms, with unique links generated and sent to each of the respondents. The questionnaires in Google forms were sent to individual lecturers with the assistance of senior faculty members who also assisted in sending frequent reminders to ensure that the lecturers filled the questionnaire. Consent of study participants were sought by introducing the researcher and explaining the purpose of the research at the beginning of the questionnaire. Only consenting individuals were required to fill the questionnaire. It took an average of about nine minutes to complete each of the questionnaire for both the lecturers and students. The

link to the Google form was sent to students in each school through their class representatives who also sent frequent reminders to them to ensure response to the questionnaire. A paltry total of 29 lecturers and 255 students responded to the online Google form. Due to poor response to the Google forms, paper questionnaires were further administered by hand at random to respondents who had not filled the questionnaire and agreed to participate. A total of 50 lecturer questionnaires and 560 student questionnaires were so distributed and the retrieved questionnaires were 37 for lecturers and 524 for students for a returning rate of 74% and 93.57% respectively. The total response from the lecturers was 66 and from the students was 779.

Methods of data analysis

Data collected through Google forms were automatically entered into spreadsheets by the software. This was then exported to Statistical Package for Social Sciences (SPSS) application version 26. Data collected with paper questionnaire were entered by hand into SPSS, coded and cleaned from errors. Descriptive statistics which included frequencies, percentages, weighted averages, medians and mean of weighted averages were used to summarise the data. For the inferential statistics at 5% level of significance, analysis of variance was employed to test for differences in learning management technologies used for learning by pharmacy students across federal, state, and private universities; as well as for differences in technologies used for teaching by pharmacy faculties across federal, state, and private universities. Furthermore, independent samples t-test was carried out to test for difference or otherwise between the factors facilitating as well as those hindering the adoption of technology by pharmacy faculties and pharmacy students.

RESULTS

Cronbach alpha values of 0.81 and 0.91 were obtained for the students' and lecturers' instruments respectively.

The demographics of the respondents are presented in Table 1 (for the lecturers) and Table 2 (for the students). Whereas the males were the domineering gender (62.1%) among the lecturers, the female were the domineering gender (54.0%) for students. A larger percentage (53.0%) of the lecturers consumed above 5 gigabytes of data monthly which is comparable, though slightly higher than (50.1%) reported by the students.

Table 1: Demographic Profile of Lecturer-Respondents

	Variables (n=66)	Frequency	Percentages (%)
Age of respondents	21-30	4	6.06
	31-40	19	28.79
	41-50	25	37.88
	51-60	13	19.70
	61-70	5	7.58
	Total	**66**	**100.00**
Gender	Male	41	62.12
	Female	25	37.88
	Total	**66**	**100.00**
Monthly Data Consumption in GB	3-5GB1-2GB	265	39.397.58
	>5GB3-5GB	3526	53.0339.39
	Total>5GB	**66**35	**100.00**53.03
	Total	**66**	**100.00**

Table 2: Demographic Profile of Student-Respondents

	Variables (n=779)	Frequency	Percentage (%)
Age	<16 years	1	0.13
	16 - 20 years	302	38.77
	21 - 25 years	410	52.63
	26 - 30 years	51	6.55
	>30 years	15	1.93
	Total	**779**	**100.00**
Gender	Male	358	45.96
	Female	421	54.04
	Total	**779**	**100.00**
Monthly Data Consumption	<1GB	17	2.18
	1-2GB	139	17.84
	3-5GB	229	29.40
	>5GB	394	50.58
	Total	**779**	**100.00**

Table 3 shows the impact of Learning Management Systems on student's learning as reported by lecturer-respondents. An overall Mean of Weighted Averages of 3.4 was reported.

Table 3: Impact of Learning Management Systems (LMS) on Students' Learning as Reported by Lecturer-Respondents

S/N	Variables (n=353)	Strongly Disagree	Disagree	Can't say	Agree	Strongly Agree	Median	Mean
	x	1	2	3	4	5		
1	LMS promotes students' independent learning	0	0	2	18	6	4	4.15
2	LMS promotes collaborative learning among students	0	1	5	13	7	4	4
3	LMS improved educational outcomes	0	1	4	15	6	4	4
4	LMS motivates students to learn	1	4	6	12	3	4	3.46
5	LMS helps students to better understand difficult concepts	1	5	11	7	2	3	3.15
6	LMS increases students' productivity	1	5	10	9	1	3	3.15
7	LMS boosts students' confidence	1	4	13	7	1	3	3.12
8	Students perform better when taught using LMS	1	5	13	6	1	3	3.04
9	*LMS is a distraction for students	7	6	10	2	1	3	2.38
	MWA							3.38

*Mdn = Median; WA = Weighted Average; MWA = Mean of Weighted Averages; x = weighted score; *= Negative statement with weighted scores reversed*

Table 4 presents the impact of LMS on learning as reported by the student-participants.

Table 4: Impact of Learning Management Systems (LMS) on Learning as Reported by Student-Respondents

S/N	Variables (n=353)	f (%) Strongly Disagree	Disagree	Can't say	Agree	Strongly Agree	Mdn	WA
	x	1	2	3	4	5		
1	LMS promotes students' independent learning	27(7.58)	37(10.39)	49(13.76)	160(44.94)	83(23.31)	4	3.66
2	LMS promotes collaborative learning among students	34(9.58)	62(17.46)	49(13.80)	147(41.41)	63(17.75)	4	3.4
3	LMS improves educational outcomes	32(9.07)	58(16.43)	67(18.98)	138(39.09)	58(16.43)	4	3.37
4	LMS boosts students' confidence	39(11.05)	76(21.53)	72(20.40)	112(31.73)	54(15.30)	3	3.19
5	LMS increases students' productivity	46(13.07)	55(15.63)	82(23.30)	128(36.36)	41(11.65)	3	3.18
6	LMS motivates students to learn	54(15.30)	67(18.98)	71(20.11)	114(32.29)	47(13.31)	3	3.09
7	Students learn faster with LMS	56(15.86)	76(21.53)	90(25.50)	93(26.35)	38(10.76)	3	2.95
8	Students learnt better with LMS	59(16.76)	80(22.73)	83(23.60)	93(26.42)	37(10.51)	3	2.91
9	LMS helps students to better understand difficult concepts	67(19.03)	84(23.86)	71(20.17)	88(25.00)	42(11.93)	3	2.87
10	*LMS is a distraction for students	64(18.18)	101(28.69)	70(19.89)	70(19.89)	47(15.35)	3	2.82
	MWA							3.14

*Mdn = Median; WA =Weighted Average; MWA = Mean of Weighted Averages; x = weighting score *= Negative statements with weighted scores reversed*

In tables 5 and 6 are presented the factors influencing the adoption of LMS in education as reported by the participants. Table 5 shows the factors facilitating adoption of LMS for learning as reported by both the lecturers and students. It could be seen that all the stated factors except for one (workload reduction) were rated as being very important (Median 4) by the lecturers, and all of them by the students.

The main factors facilitating the adoption of LMS for education (all Median 4) as shown in table 6 include availability of electricity (WA = 3.8), availability of internet connectivity (WA = 3.7) and institutional support for LMS technology use (WA = 3.6). An independent samples t-test of the difference between facilitators of LMS adoption by pharmacy lecturers and pharmacy students shows that there is significant difference (t (843) = 7.429, p = .000) and an independent samples t-test of difference between barriers to LMS adoption by pharmacy lecturers and pharmacy students also shows that there is significant difference (t (843) = 15.240, p = .000).

Table 5: Facilitators of LMS Adoption as Reported by participants

S/N	Item	As reported by Lecturer-respondents (n = 66)			As reported by Student-respondents (n = 756)		
		Median	Mean	Standard Deviation	Median	Mean	Standard Deviation
1	Electricity as a facilitator	4	3.8	0.85	4	3.78	0.69
2	Availability of internet connectivity	4	3.74	0.86	4	3.71	0.75
3	Institutional support for use of LMS technology	4	3.71	0.87			
4	Affordability of internet connectivity	4	3.64	0.92	4	3.68	0.76
5	Institutional provision for LMS technology	4	3.59	0.93			
6	Accessibility	4	3.52	1.03	4	3.62	0.81
7	Innovativeness	4	3.42	1.1	4	3.46	0.88
8	Price	4	3.42	0.98	4	3.37	0.98
9	Versatility	4	3.36	0.99	4	3.52	0.83
10	Students interest in learning with LMS	4	3.3	1.04	4	3.47	0.90
11	Workload reduction	3	3.06	1.05	4	3.32	0.99

Mdn = Median; WA =Weighted Average; MWA = Mean of Weighted Averages; x = weighting score= Negative statements with weighted scores reversed*

Table 6 shows the factors militating against the adoption of LMS as reported by the participants. The main factors acting as barriers against the adoption of LMS as reported by the lecturers, (all with median value of 4) include irregularity of power supply (WA = 3.6), Lack of institutional funding for LMS infrastructure (WA = 3.4), High cost of relevant technological tools (WA = 3.3) Lack of institutional support from school management for use of LMS (WA = 3.3) among others. Whereas, for students, the main barriers to adoption of LMS for learning include irregularity of power supply (WA = 3.4), High cost of internet connectivity (WA = 3.4), Lack of institutional support from school management for use of LMS (3.4), High cost of relevant technological tools (WA = 3.3) and Unavailability of LMS tools for the courses taken (WA = 3.11), among others.

Table 6: Barriers to LMS adoption as reported by respondents

S/N	Item	As reported by Lecturer-respondents (n = 66)			As reported by Student-respondents (n = 756)		
		Median	Mean	Standard Deviation	Median	Mean	Standard Deviation
1	Irregularity of power supply	4	3.59	1.13	4	3.24	1.11
2	Lack of institutional funding for LMS infrastructure	4	3.44	1.25	3	2.89	1.29
3	High cost of relevant technological tools	4	3.29	1.11	4	3.28	1.04
4	Lack of institutional support from school management for use of LMS	4	3.27	1.1	4	3.36	1.03

5	Unavailability of LMS tools for the courses I'm involved in	4	3.26	1.48	3	3.08	1.13
6	High cost of internet connectivity	4	3.2	0.89	4	3.42	1.04
7	Decline of students' attendance in classes due to use of learning technology	3	2.61	1.39	3	2.86	1.26
8	Students' lack of interest in learning with LMS tools	3	2.58	1.2			
9	Satisfaction with my current teaching method	3	2.41	1.35			
10	Insecurity (Exposure of lecturers' materials)	2	2.24	1.05			
11	Unawareness of useful technological tools relevant to the course taught	2	2.09	1.35			
12	Burdensomeness of LMS use in the courses I'm involved in	2	2.02	1.09			
13	Non-applicability of LMS technology in the (courses) I'm involved in	2	1.98	1.32			

*S/N = Serial number; n = Number of respondents; Weighting scores: Can't say = 0; Not important = 1; Slightly important = 2; Important = 3; Very important = 4, *= Negative statements with weighted scores reversed*

DISCUSSION

The higher number of male respondents suggests there may be more male than female pharmacy lecturers. This reflects gender imbalance in the Nigerian academia as earlier reported by Ogbogu (2011) and Olaogun *et al*. (2015). Almost all respondents were high data consumers, which suggests that they have access to the internet.

The age range of student respondents is similar to what was obtained in a study among pharmacy students at University of Nigeria and Nnamdi Azikiwe University, in which more than 90% were between ages 16 and 25 (Ukoha-kalu *et al*., 2019). The finding that most of the students were high data consumers (greater than 3 gigabytes per month) suggests that they spend a considerable amount of time on the internet. In a study by Erah and Dairo (2008), it was reported that not many students owned computers, and they could only access the internet by visiting cybercafés. The findings of this study show that there has been an improvement in internet and computer accessibility over the years.

The fact that less than half of the student-respondents and even lesser proportion of the lecturers reported using LMS implies that they had not effectively adopted the technology. Furthermore, the fact that the impact of LMS on students as reported by lecturer-respondents show that they did disagree that it was having positive impact on learning was learning because a sizable portion of the participants responded with the 'Can't say' option. The first four items of the table (4) which have positive rating were those for which the participants were ready to offer responses which were positive. The lecturers could not offer positive responses probably because they were not involved in the use of LMS. However, the fact that users of LMS agree on some positive improvements that might be seen with use of LMS such as "promotion of students' independent learning", "promotion of students' collaborative learning", "improved educational outcomes" and "students' motivation to learn" implies that it is a promising educational technology tool.

The responses of students were similar to that of lecturers, as they also agreed that LMS independent learning, promoted for them collaborative learning, as well as, improved their educational outcomes, motivated them to learn, However, it could not be established in this study that LMS boosts students' confidence, increase students' productivity, motivates students to learn, helped students learn faster, helped students learn better or helped students to better understand difficult concepts. This is probably because majority of the students had not used it enough to be able to draw conclusions on its benefits.

Thus, LMS required to be used on a larger scale to appreciate its impact. It has been reported that the use of LMS in education depends more on institutional support and on the lecturers than on students and that is why the statement made more than a decade ago remains valid that many university schools of pharmacy in Nigeria have still not yet fully exploited the potential of e-Learning probably because of lack of technical and pedagogical readiness to support e-Learning (Erah and Dairo, 2008; Yusuf, 2011; Obahiagbon and Osahon, 2014). The fact that users of LMS agree on some positive improvements that might be seen with use of LMS shows that it is a promising technological tool in education, as reported in previous studies (Erah and Dairo, 2008; Simanullang and Rajagukguk, 2020).

Facilitators of technology are factors which make it easy to adopt and use technology for teaching and learning by faculties and students respectively. Their presence/availability encourages the use of technology for teaching and learning (Buabeng-Andoh, 2012). The fact that lecturers consider availability of electricity as an important factor in technology adoption is not unexpected as most technologies require electricity to function (Aviara, 2014). They also consider innovativeness as an important factor which may be because, for any technology to be adopted, it ought to be cutting-edge and offer new and better ways of doing things, and not just trying to reinvent the wheel. Internet access was also considered of high importance as most technologies require internet to function. Institutional provision and support for technology are also considered important. This could be attributed to the high cost of purchasing and installing some of the technology tools (Buchanan *et al*., 2013; Yusuf *et al*., 2013). However, the lecturers felt that workload reduction (Median 3) is not as important as others in facilitating the adoption of the LMS in their work, rather they probably perceived it as likely to increase their burdens. The factors that were considered as important facilitators for technology adoption by students are similar to those reported by lecturers with the exception of workload reduction which the students considered as equally important.

Some barriers to technology adoption in tertiary education in Nigeria were identified in a previous study by Yusuf *et al*. (2013) in Nigeria as including inadequate computer-savvy teachers, irregular power supply, high cost of technology tools, poor funding support for computer education in the institutions. Similar barriers were identified by Alkoudmani and Elkami (2015) in a study carried out in Malaysia. Some of these barriers such as irregular electricity supply, high cost of technology tools, poor funding for use of technology, were also identified in this study.

Many of the factors identified by lecturers as barriers to technology adoption depend largely on the institution as they are responsible for providing funding for ICT infrastructure (Yusuf *et al*. (2013). Some decisions for technology introduction into the teaching process cannot be taken by the lecturers on their own without the approval of the institution, which would be responsible for providing the infrastructure necessary for successful implementation. To an extent, the same factors which were seen as facilitators when present/available become barriers when absent; electricity, internet access, relevant technology tools and institutional support are examples. This is in line with previous research reports whereby users of technology in workplaces tend to have phobia for adopting technology for reasons bordering on increase of their burdens and job losses (Afolabi and Oyebisi, 2007).

The students identified factors similar to those reported by lecturers as barriers to adoption of technology for learning. Thus, the same interventions will resolve the problems associated with technology adoption for both teaching and learning. The provision of constant electricity supply in the academic environment will benefit both lecturers and students as they will be able to utilise technology tools and devices, for example, their mobile phones, computers, multimedia projectors, among others, which require electricity to function. High cost of internet connectivity is one of the costs that is usually incurred by users of technology (Folorunso *et al*., 2006). It is therefore not surprising that both lecturers and students identified this as a barrier to technology adoption. This can be mitigated if the institutions provide free or subsidised internet (Wi-Fi) in the school premises.

Despite the significant findings of this study, a notable limitation is the low sample size of the lecturers which may not be representative of the population, thus limiting the generalisability of the findings of the study. This was due to the Covid-19 lockdown which hindered free movement to allow for physical contact with the remaining lecturers coupled with time and financial constraints. Another limitation is the scale of importance employed for the measurement of the impact as it did not perfectly capture its size which could have been expressed as being very small, small, moderate, big, and very big or the highness which could have been expressed as very low, low, moderate, high and very high.

CONCLUSION

The study concludes that although LMS has great potential as a learning tool, its impact is yet to be fully felt because its use is not yet widespread. The impacts of LMS in pharmacy education include improving educational outcomes, improving collaborative learning among students and promoting students' independent learning. LMS was not considered a distraction for students. The three most important factors facilitating the deployment of technology for teaching are electricity, availability of internet connectivity and institutional support for technology use, while irregular power supply, lack of institutional funding for ICT infrastructure and high cost of relevant technology tools are barriers. For learning, availability of electricity, availability and affordability of internet connectivity are facilitators of technology deployment, while irregular power supply, high cost of internet connectivity and high cost of technology tools are barriers.

ETHICAL CONSIDERATIONS

Ethical clearance for the study (number HREC NO: IPHOAU/12/1471) was obtained from the Institute of Public Health, Obafemi Awolowo University.

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*Address for correspondence: Enitan O. Irenitemi
Department of Clinical Pharmacy and Pharmacy Administration
Faculty of Pharmacy
University of Ibadan,
Ibadan, Nigeria
Telephone: +2348038106086
E-mails: ennytomi@gmail.com

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