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# Analysis of User Interface Design and Technological Aspects of Learning Management System

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**Abstract:** *In past, many universities in Pakistan launches Distance Education programs to address the diverse educational needs of student. Many of them were banned by Higher Education Commission. Investigating learners and instructors' perceptions about user interface design and technological aspects of the LMS in distance education can provide guidance and recommendations for institutes of higher education that are considering expanding the use of distance education formats. This study was conducted on the 2 years master-level students and their instructors at the Virtual University of Pakistan, which is offering all its programs through LMS. A stratified sampling technique was use. According to the findings of the study, the interface design of VU-LMS is suitable for students and technologically has flexible features and functions. Both students and instructors were satisfied with the LMS. It provides a suitable environment for teaching learning process.*

**Key Words:** Distance Education, Learning Management System, Technology, Interface Design

## Introduction

The present scenario changed due to the arrival of new educational technologies in the modern system of education. New technologies also changed our daily lifestyle (Bosamia, 2013). The teaching and learning process is now changed by a powerful learning system. It made the teaching and learning process more interesting and useful (Ramadhani, 2019). Developing an e-learning platform for imparting distance education programs is a big challenge. The Distance education programs offered through new technologies getting popularity day by day. The basic reason for its popularity is the flexibility of access, time, money, and place (Sadeghi, 2019). However, in Pakistan, the adoption of new technologies is not up to the mark as in other developing countries (Farid, 2018). The rise of innovative technologies in e-learning changed ways of the teaching-learning process from pedagogical aspects to evaluation. The paradigm shifts from old traditional ways to new advancements in technology. This paradigm affects learners, instructors/tutors, management staff, technical staff, supporting staff, and also institutions (Khan, 2001). This change brings innovative development in the field of e-learning programs. It tends to be useful for a wide range of learning in any institution or organization. Through LMS students have the opportunity to study at home. LMS has so many advantages for students. In previous years, many

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universities in Pakistan started distance education programs through e-learning but were later on banned by the HEC. After covid-19 the importance of LMS increases due to its feature. VUP is the only university in Pakistan, which is a pioneer in terms of e-learning in distance education.

According to Habib (2019), a Learning Management System provides a virtual atmosphere to remove the face-to-face environment with modern technologies. The communication in LSM is synchronously or asynchronously through the internet and different devices. According to Lonn and Teasley (2009), Learning Management Systems is a web-based software that provides a platform to share material, deliver online lectures, upload assignments, to conduct quizzes and other exams. Meanwhile, Almrashdeh et al. (2011) point out that an LMS is helpful for planning, implementing, and evaluating the teaching-learning process.

The first web browser LMS appeared in the 19th. According to Silva (2013), Learning Management Systems are criticized due to the concept of people that technologies simply virtualize non-virtual classrooms. However, according to the author, the main issue its designs, delivery system, and structure. Furthermore, the use of an LMS requires careful studies, particularly about educational and financial aspects. Better use of technological aspects like access, compatibility, and usability helps to impart.

More than 70,000 institutions, universities, and agencies are utilized learning management systems all over the world but Pakistani universities have their learning management system but not using them properly. Analyzing the technological changes helps to improve the system of any institution. The review of policies and programs identifies the needs. The students' and instructors' perception about the system imparting the programs helps to identify the needful changes. Therefore, it is necessary to analyze and understand the current practices of the institution, which are imparting distance education programs for a better teaching-learning process.

The Virtual University of Pakistan is the first university in Pakistan, which is completely based on information and communication technology. It is a federally chartered university established in 2002. The university was imparting its distance education programs through modern information and communication technologies. It provides low-price higher education through the internet, LMS, and televisions. This is the only university in Pakistan that is offering all its programs through LMS. More than 200 campuses are providing education with the particular idea of "global education at the doorstep".

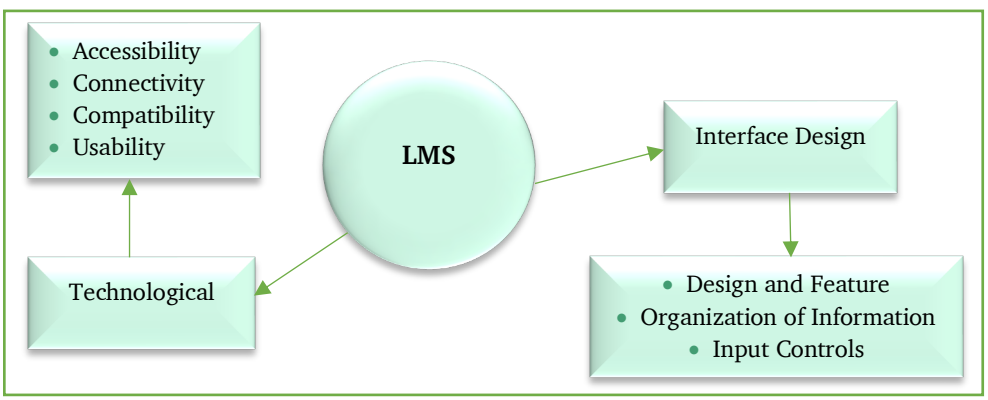


**Figure:** Interface Design and Technological Aspects of LMS

Technological and Interface Design aspects of LMS are much important for implementing distance education programs. The current study highlights the students' and instructors'

perceptions of the technological and interface design aspects of LMS.

1. To ascertain the interface design aspects of the learning management system in e-learning
2. To explore the technological aspects of learning management system in e-learning.

## Method

The research conducted in this study was mixed-method research. A self-developed questionnaire was used to collect the data. To find out the content validity of the tests, five experienced and knowledgeable teachers were consulted. In light of suggestions by the experts, changes were incorporated. All the students enrolled in Master Level programs at the Virtual University of Pakistan were the population of the study. A stratified sampling technique was used to collect the data. The sample size of the study consisted of 398 students. A Google Form was developed for data collection. The data were collected through an online survey. Online interviews with instructors were conducted to view their perceptions of LMS. The collected data were analyzed with the help of the SPSS program by using different statistical techniques. The detail of the sample is as under:

**Table 1.** Detail of Sample (Students)

| Faculty | ICT | Punjab | Sindh | KPK | Balochistan | Total |
|---|---|---|---|---|---|---|
| Management | 18 | 103 | 22 | 07 | 02 | 152 |
| Science | 01 | 62 | 01 | 03 | 01 | 68 |
| Arts | 08 | 47 | 07 | 03 | 01 | 66 |
| CS &IT | 07 | 86 | 14 | 04 | 01 | 112 |
| Total | 34 | 298 | 44 | 17 | 05 | 398 |

**Table 2.** Detail of Sample (Instructors)

| Management | Science | Arts | CS &IT | Total |
|---|---|---|---|---|
| 03 | 03 | 03 | 03 | 12 |

## Results and Findings

### Students' Perception

**Table 3.** Technological Aspects

| S. No | Statement | SDA | DA | UN | A | SA | Mean |
|---|---|---|---|---|---|---|---|
| **Accessibility** | | | | | | | |
| 1 | LMS is easily accessible on any device or browser. | 1 (1%) | 8 (2%) | 16 (4%) | 130 (32%) | 243 (61%) | 4.52 |
| 2 | It is easy to track the tasks available on LMS. | 24 (6%) | 42 (11%) | 14 (3%) | 126 (32%) | 192 (48%) | 4.06 |
| **Connectivity** | | | | | | | |
| 3 | Time taken to load the web page is appropriate. | 28 (7%) | 28 (7%) | 24 (6%) | 227 (57%) | 91 (23%) | 3.82 |
| 4 | LMS takes time during work to respond. | 170 (43%) | 37 (9%) | 35 (9%) | 93 (23%) | 63 (16%) | 2.60 |
| **Compatibility** | | | | | | | |
| 5 | LMS is compatible with personal computer. | 2 (1%) | 9 (2%) | 11 (3%) | 144 (36%) | 232 (58%) | 4.49 |

| S. No | Statement | SDA | DA | UN | A | SA | Mean |
|---|---|---|---|---|---|---|---|
| 6 | LMS is well integrated with new technologies. | 1 (1%) | 13 (3%) | 32 (8%) | 182 (46%) | 170 (42%) | 4.27 |
| 7 | Sometime LMS gave error messages. | 65 (16%) | 116 (29%) | 18 (5%) | 118 (30%) | 81 (20%) | 3.09 |
| **Usability** | | | | | | | |
| 8 | Instructions given on LMS are clear and useful. | 9 (2%) | 22 (6%) | 17 (4%) | 191 (48%) | 159 (40%) | 4.18 |
| 9 | Uploading assignments on LMS is easier and faster. | 9 (2%) | 19 (5%) | 18 (4%) | 115 (29%) | 237 (60%) | 4.39 |
| 10 | Downloading process of reading material is easy on LMS. | 9 (2%) | 28 (7%) | 12 (3%) | 142 (36%) | 207 (52%) | 4.28 |
| 11 | LMS is system friendly and technically supported. | 6 (2%) | 20 (5%) | 7 (2%) | 157 (39%) | 208 (52%) | 4.36 |

Item 1 in Table 1 shows that overall 93% of respondents (32% agree and 61% strongly agree) were in favor of the statement that LMS is easily accessible on any device or browser. On the other hand, 3% of respondents (1% strongly disagree and 3% disagree) were disagree with the statement and the remaining respondents (4%) were no views about the statement. The mean score 4.52 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 2 shows that overall 80% of respondents (32% agree and 48% strongly agree) were agree that it is easy to track the tasks available on LMS whereas 7% respondents (6% strongly disagree and 11% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.06 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 3 shows that overall 80% respondents (57% agree and 23% strongly agree) were in fovour of the statement that the time taken to load the web page is appropriate. On the other hand, 14% respondents (7% strongly disagree and 7% disagree) were disagree with the statement and the remaining respondents (6%) were no views about the statement. The mean score 3.82 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 4 shows that overall 39% respondents (23% agree and 16% strongly agree) were agree that LMS takes time during work to respond whereas 52% respondents (43% strongly disagree and 9% disagree) were disagree with the statement and the remaining respondents (9%) were no views about the statement. The mean score 2.60 (less than mid value 3), also supports the lower agreement level on the statement. Item 5 shows that overall 94% respondents (36% agree and 58% strongly agree) agree that LMS is compatible with personal computers. On the other hand, 3% respondents (1% strongly disagree and 2% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.49 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 6 shows that overall 88% of respondents (46% agree and 42% strongly agree) were agree that LMS is well integrated with new technologies whereas 4% of respondents (1% strongly disagree and 3% disagree) disagreed with the statement and the remaining respondents (8%) were no views about the statement. The mean score 4.27 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 7 shows that overall 50% of respondents (30% agree and 20% strongly

agree) were agree that sometimes LMS gave error messages whereas 45% of respondents (16% strongly disagree and 29% disagree) were disagree with the statement and the remaining respondents (5%) were no views about the statement. The mean score 3.09 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 8 shows that overall 84% respondents (48% agree and 40% strongly agree) were agree that the Instructions given on LMS are clear and useful. On the other hand, 8% respondents (2% strongly disagree and 6% disagree) were disagree with the statement and the remaining respondents (4%) were no views about the statement. The mean score 4.18 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 9 shows that overall 89% respondents (29% agree and 60% strongly agree) were agree that uploading assignments on LMS are easier and faster whereas 7% respondents (2% strongly disagree and 5% disagree) were disagree with the statement and the remaining respondents (4%) were no views about the statement. The mean score 4.39 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 10 shows that overall 88% respondents (36% agree and 52% strongly agree) were agree that downloading process of reading material is easy on LMS whereas 9% respondents (2% strongly disagree and 7% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.28 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 11 shows that overall 91% respondents (39% agree and 52% strongly agree) were agree that LMS is system friendly and technically supported whereas 7% respondents (2% strongly disagree and 5% disagree) were disagree with the statement and the remaining respondents (2%) were no views about the statement. The mean score 4.36 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 5 shows that overall 81% respondents (42% agree and 39% strongly agree) were agree that the fee challan generating and depositing process is easy whereas 16% respondents (10% strongly disagree and 6% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 3.95 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement.

**Table 4.** Interface Design Aspects

| S. No | Statement | SDA | DA | UN | A | SA | Mean |
|---|---|---|---|---|---|---|---|
| **Design and Feature** | | | | | | | |
| 1 | I liked using the interface of LMS. | 13 (3%) | 18 (5%) | 14 (3%) | 136 (34%) | 217 (55%) | 4.32 |
| 2 | Color and background is normal harmonious for the LMS. | 11 (3%) | 13 (3%) | 19 (4%) | 118 (30%) | 237 (60%) | 4.40 |
| 3 | The website has an attractive design. | 5 (1%) | 17 (4%) | 10 (3%) | 151 (38%) | 215 (54%) | 4.39 |
| 4 | The site provides relevant information for the course. | 27 (7%) | 19 (5%) | 6 (1%) | 144 (36%) | 202 (51%) | 4.19 |
| 5 | The interface design of LMS is confusing me. | 183 (46%) | 71 (18%) | 23 (6%) | 58 (15%) | 63 (16%) | 2.36 |

| S. No | Statement | SDA | DA | UN | A | SA | Mean |
|---|---|---|---|---|---|---|---|
| 6 | LMS has flexible features and functions. | 14 (4%) | 19 (5%) | 6 (1%) | 155 (39%) | 204 (51%) | 4.30 |
| **Organization of Information** | | | | | | | |
| 7 | The organization of information on LMS screen is clear. | 5 (1%) | 25 (6%) | 11 (3%) | 196 (49%) | 161 (41%) | 4.21 |
| 8 | I can easily understand the material on LMS. | 43 (11%) | 19 (5%) | 15 (4%) | 133 (33%) | 188 (47%) | 4.02 |
| 9 | Time taken to understand the contents on LMS. | 88 (22%) | 52 (13%) | 32 (8%) | 105 (27%) | 121 (30%) | 3.30 |
| **Input Controls** | | | | | | | |
| 10 | The interface design of LMS is well integrated with all tools. | 6 (2%) | 13 (3%) | 19 (5%) | 145 (36%) | 216 (54%) | 4.38 |
| 11 | Easy to learn how to navigate help topics. | 16 (4%) | 41 (10%) | 13 (3%) | 115 (29%) | 213 (54%) | 4.18 |

Item 1 in Table 2 shows that overall 89% respondents (34% agree and 55% strongly agree) agree that they liked using the interface of LMS. On the other hand, 8% respondents (3% strongly disagree and 5% of disagree) were disagreed with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.32 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 2 shows that overall 90% respondents (30% agree and 60% strongly agree) were agree that color and background are normal and harmonious for the LMS whereas 6% respondents (3% strongly disagree and 3% disagree) were disagree with the statement and the remaining respondents (4%) were no views about the statement. The mean score 4.40 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 3 shows that overall 92% respondents (38% agree and 54% strongly agree) were agree that the website has an attractive design whereas 5% of respondents (1% strongly disagree and 4% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.39 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 4 shows that overall 87% respondents (36% agree and 51% strongly agree) were agree that the site provides relevant information for the course whereas 12% respondents (7% strongly disagree and 5% disagree) were disagree with the statement and the remaining respondents (1%) were no views about the statement. The mean score 4.19 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 5 shows that overall 31% respondents (15% agree and 16% strongly agree) were agree that the interface design of LMS is confusing them whereas 64% respondents (46% strongly disagree and 18% disagree) were disagree with the statement and the remaining respondents (9%) were no views about the statement. The mean score 2.36 which is less than 3, also supports the lower level of agreement of respondent on the statement. Item 6 shows that overall 90% of respondents (39% agree and 51% strongly agree) were agree that LMS has flexible features and functions whereas 9% respondents (4% strongly disagree and 5% disagree) were disagree with the statement and the remaining respondents (1%) were no views about the statement. The mean score 4.30 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 7 shows that overall 90% respondents (49% agree and 41% strongly

agree) were agree that the organization of information on LMS screen is clear. On the other hand, 7% of respondents (1% strongly disagree and 6% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.21 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 8 shows that overall 80% respondents (33% agree and 47% strongly agree) were agree that they can easily understand the material on LMS whereas 16% respondents (11% strongly disagree and 5% disagree) showed disagreement disagreed with the statement and the remaining respondents (4%) were no views about the statement. The mean score 4.02 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 9 shows that overall 57% respondents (27% agree and 30% strongly agree) were agree that LMS is system friendly and technically supported whereas 35% respondents (22% strongly disagree and 13% disagree) were disagree with the statement and the remaining respondents (8%) were no views about the statement. The mean score of 3.30 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 10 shows that overall 90% respondents (36% agree and 54% strongly agree) were agree that Interface design of LMS is well integrated with all tools. On the other hand, 5% respondents (2% strongly disagree and 3% disagree) were disagree with the statement and the remaining respondents (5%) were no views about the statement. The mean score 4.38 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement. Item 11 shows that overall 83% respondents (29% agree and 54% strongly agree) were agree that easy to learn how to navigate help topics whereas 7% respondents (4% strongly disagree and 10% disagree) were disagree with the statement and the remaining respondents (3%) were no views about the statement. The mean score 4.18 (greater than mid value 3), also supports the higher level of agreement of respondents on the statement.

## Instructors' Perception

The majority of the instructors said that the learning management system is accessible and compatible with all devices. According to a respondent, *LMS is good and he can manage it on all devices. There is no accessibility but other browsers create issues."* One respondent said that *"LMS is helpful because students and teachers both access from all over the world.. Remote areas students also get easy access with their teachers through LMS."* All respondents agreed that the procedure for uploading assignments is quite easy for students on LMS. One responded said that *"University create a simple way to type and upload assignments. As compared to the traditional way, it saves money and time."* According to the views and opinions of different respondents: The study material of all programs is available on the university website and at the libraries of virtual campuses. The ease of access to information and material is a most helpful way for learners. All activities on LMS are flexible and easily handled by learners and as well instructors. The VU-LMS is better software for access to the course, delivery of study material, tracking, and evaluation of students. The majority of the respondents were technologically satisfied with LMS.

The design and interface of the LMS help the learners and as well instructors handle the tasks. According to one respondent, "*the interface design of the learning management system fulfills the needs of the students. It connects the instructor and learner. For better interaction between instructor and learner and an effective teaching-learning process, interface design helps to create interest. It helps to do tasks comfortably."* The LMS interface design should be comfortable for students and teachers while using the application. According to the respondent, *"interface design of LMS creates user interest and if interface design is not attractive students need more time to complete tasks. But VU LMS has an attractive design and flexible features.*" Different navigation controls used in LMS help students for searching different tasks on LMS. A respondent explained that *"students should read the contents at the start to understand the interface design which helps them*

*in future for better understanding. Otherwise, they feel difficulty using and working on LMS." Simplicity is the key factor for understanding.* A respondent said that *"according to my point of view, LMS interface design is simple and student can easily understand the contents and tasks."* The simple design and colour are useful for learners. Overall respondents were satisfied with the interface design of LMS.

## Conclusion and Discussion

This research highlights the students' and instructors' perceptions of the technological and interface design aspects of LMS. LMS is a platform for the smooth conduct of the teaching and learning process. To teach, evaluate and conduct different tasks, the technological and interface design of LMS has more importance than other aspects. Because accessibility is the key factor for the successful implementation of LMS. The biggest advantage of LMS is that all the stakeholders can access it anytime and anywhere. Findings of the study showed that students and instructors both are agree that LMS accessible and easy to track the tasks. The LMS of VU is accessible on all devices The study of (Habeeb, 2019) also indicates the same results. Nowadays everyone has an android phone. Results shows that LMS is compatible on all devices like PC, Laptop, and mobile phones but sometimes technical issues create problems. However, as per the perception of instructors sometimes, accessibility issue was faced on browsers other than internet explorer. They recommend always using internet explorer to access the LMS. Tracking the daily or occasional tasks on LMS is easy for all. Students faced connectivity issues. Both participants show that LMS takes adequate time to load the webpage. The same results were also indicated in the studies of Alturki, (2021) and Abuhlfaia (2019). Interface design is the first impression and experience of students after getting admission. Findings show that the interface design of LMS/website is well integrated with other tools. Instructors views that all information on the courses was available on-site and fulfill the users' needs. In creating and providing an effective environment in online learning, interface design is very important. Interface design helps for the delivery of study materials and announcements of different tasks on electronic devices. Instructors opinion that the interface design of VU-LMS is attractive and suitable for learners. Results of the study found that the student's experience with the interface design of LMS was great. They like the interface design of LMS. The attractive design of the interface also helps the students for memorizing the information available to them (Mandel 1997). Downloading study material is also easy on LMS. Most students used LMS to download different subjects' notes. (Muhammad et al. 2017). The navigational tools used in LMS help students to regulate their tasks (Mandel 1997). Both instructors and students find LMS helpful to navigate the tasks on LMS. An effective LMS should be well-compatible with advanced technologies to offer distance education programs. The findings support that students' and instructors' satisfaction is linked with technical support (Green, 2012). The LMS of VUP is solid and well-integrated with the technologies and provides a suitable environment for learning. The functions and features in the interface design were aligned with the users' needs. It is recommended to improve the system to eradicate the error messages using LMS.

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