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Importance Of Interactive Content In Pervasive Learning Environment In The New Normal

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Abstract

E-learning is pervasive these days, especially in the post COVID, learning through technology is the new normal. However, the level of engagement in e-learning environment depends on the extent of interactivity in the learning sessions. This interactivity has to be provided not only through the learning content, but also with the system and with the service provider (Uppal et al., 2017). The purpose of this study is to explore key aspects of interactivity in an e-learning environment, and to test the effect of 'content interactivity' on learner's perception of quality. The findings of this research, conducted by collecting data from 300 plus university students, revealed that student perception concerning e-learning quality would be higher, if the 'learning content' would be more interactive and engaging.

Key Words: E-learning, Interactivity, E-Learning Quality (ELQ) model, Higher Education Institutions (HEIs)

Literature Review

Online learning in higher education has become a major instructional modality in today's technology focused world. Literature suggests that interactivity in the online learning courses, particularly between student-instructor, plays an important role both in student satisfaction (Espasa & Meneses, 2010; X. (Liu, Magjuka, Bonk, & Lee, 2007); (Mahle, 2011); (Park & Choi, 2009); (Thurmond, Wambach, Connors, & Frey, 2002) and user persistence (Morris, Finnegan, & Wu, 2005); (Rovai, 2003); (Tello, 2007). Further, research data suggest that preferences for types of online interactivity vary according to level and type of learner (Glassmeyer, Dibbs, & Jensen, 2011); (Hollenbeck, Mason, & Song, 2011); (Offir, Belazel, & Barth, 2007); Tello, 2007; (Tu & McIsaac, 2002). Accordingly, teaching and learning institutions should focus on creating interactive learning environment to create satisfying learning experiences that provide opportunities for rich and meaningful interactions with students, instructors, and content.

Interactivity is a vital factor that affects student learning satisfaction (Anderson, 2003). Formal an informal interactivity can occur during a course, both within the course material and outside the learning sessions, with the instructor. (Rhode, 2007). Primary forms of formal interactivity include student–student, student–instructor, and student–content (Moore, 1989).

Research data suggest that online courses with high levels of interactivity lead to higher levels of student motivation, improved learning outcomes, and satisfaction compared to less interactive learning environments (Mahle, 2011; Espasa & Meneses, 2010; Park & Choi, 2009; Liu et al., 2007;; Thurmond et al., 2002). Park and Choi assessed 147 adult learners who either completed or dropped out of online courses offered at a large university. Park and Choi found that online learners easily lose motivation and feel less satisfaction if courses

do not stimulate their active participation and/or interaction. In support of these findings, the results from three separate studies (Liu et al., 2007; Mahle, 2011; Offir et al., 2008) noted significant, positive relationships between interactivity and perceived engagement, learning, confidence, relevance, and student satisfaction. In a separate study, Espasa and Meneses electronically surveyed 186 online graduate students in their last week of online learning courses. The results of their study showed a statistically significant relationship between instructor feedback received and learning as measured by student satisfaction and final grades.

Building the right blend of student–student and student–instructor interactivity into online course design has been suggested to not only improve student satisfaction and achievement, but motivation as well (Liu et al., 2007; Offir et al., 2008; Park & Choi, 2009; Mahle, 2011).

Content Interactivity

In traditional distance education models, student content is the only source of learning and/or interaction in the education. This passive unidirectional interaction model is still being followed in many developing countries. The content is transferred to the students in the form of hard copies or digital disks, this completely ignores the concept of interaction with teacher, and students have no sources to rely on other than the course material. In contrast to distance learning, e-learning however emphasizes more on the potential for interaction. Moore (1989) explains the importance of the course in e-learning by giving example of a movie. In order for a movie to convey its meaning to the viewer every one of the actors' actions, reactions and words should be prewritten, and thoroughly analysed according to the script.

Students can interact with teaching materials via text, images, sound, video or combination of these media. Also, streams with the advent of instant messaging and video calling, distance interaction with teachers and peers is much easier. They can also engage in self-paced learning, taking control over both the process and the content of their learning (Trombley & Lee, 2002; Zhang, 2003). Numerous empirical studies have also indicated that information quality is important in determining users' level of satisfaction with the system, which in turn leads to system utilisation (DeLone & McLean, 1992; Katerattanakul & Siau, 1999).

With the advances of multimedia technology, more multimedia-based e-learning systems are becoming available. These systems integrate and present learning materials in diverse media such as text, image, sound, and video. However, some of the multimedia-based systems suffer from insufficient learner-content interactivity and flexibility because of their passive and, unstructured way of presenting instructional content. Under such a system, learners have relatively little control over the knowledge structure and the learning process to meet individual needs. For example, it may be ineffective and time-consuming to locate a particular segment or to skip a portion of a three-hour instructional video delivered via the Internet, making interactive learning difficult (Zhang, Zhao, Zhou, & Nunamaker Jr, 2004).

Studies show that if the information (learning content) is carefully developed, keeping in mind the aspects of interactivity, students not only engage with the material more but also find the learning experience more satisfying as well.

If students do not get enough opportunities to interact formally and informally in online courses, their learning and satisfaction may be compromised. Of the three types of interactivity that can occur online, student–content interaction has been found to be the strongest predictor of student satisfaction in online courses (Chejlyk, 2006); (Keeler, 2006); (Kuo, Walker, Schroder, & Belland, 2014).

System interactivity

Technology has an important role in delivering learning outcomes, because learners interact

more in e-learning environments than with traditional face to face instruction (Webster & Hackley, 1997). System design facilitates formative interactions, controls organisational activities, and provides correct and sufficient information to reduce uncertainty (Daft & Lengel, 1986). System quality relates to a learner's belief about e-learning performance characteristics (Chiu et al., 2007) and is measured by functionality, ease of use, reliability, flexibility, data quality, portability, integration, and importance (Delone & McLean, 2003). System quality has a strong positive effect on learners' satisfaction (Ozkan & Koseler, 2009) and directly affects user beliefs. Results from Hara & Kling (2001), measuring the quality assessment of an e-learning experience, showed that students faced technical issues in the e-learning system while the instructor was competent (Hara & Kling, 2001). Factors that are relevant for infrastructure and system quality include internet quality, facilitating conditions, reliability, ease of use, system functionality, system interactivity, system response, and equipment accessibility (Wu, Tennyson, & Hsia, 2010; Sun, Tsai, Finger, Chen, & Yeh, 2008).

A study by Pituch and Lee (2006) on the student use of e-learning system stated in their findings that interactivity in distance education has the strongest direct effect on student's use of the e-learning system. Pituch and Lee concluded that systems that allow more interaction amongst teachers and students are more helpful in the learning process. Accordingly, a major issue in the pedagogy in an e-learning environment is the absence of interactive system.

Interactivity with Service provider

In an e-Learning system the service is provided by the developer of the learning course, which is the teacher; with system support provided by administrators. The interaction between the service provider and support provider is very important as the learners expect quick and reliable service and support.

According to Moore (2011) interaction of teacher with students in the classroom is a crucial component of learning. This interaction with teacher and student is defined as the interpersonal communication, which can be in and outside the context of learning, e.g. Counselling advices, and career guidance. Although e-learning is largely independently driven, independence does not mean leaving the student in complete isolation as this can lead to problems (Moore & Thompson, 1990). Morris, Mitchell, and Bell, (1999) mentions that in spite of the highest degree of structured content, the role of teacher as a contact point cannot be replaced by any means. Accordingly, student teacher interaction is one of the most significant type of interaction in e-learning (Zhao, Lei, Yan, Lai, & Tan, 2005). The success of e-learning is directly dependent on the interaction with peers and most importantly with teachers (Magjuka, Shi, & Bonk, 2005).

Student-teacher interaction is different from student-content interaction in that student-content interaction is more about how the course is structured, whilst student-teacher interaction is more about how the two interact.

Interactivity among students and teachers in the classroom may of the critical success factor of learning (Chou, 2003; Fulford & Zhang, 1993), also Ozkan and Koseler (2009), however, mentions that interactivity also plays a vital role in achiveing e-learning objectives of making student, independent and lifelong learners. More interactive classroom environment will lead to more effectiveness and ultimate success of learner (Evans & Sabry, 2003). Online course interactivity, particularly between student and instructor, plays an important role in a student's choice to persist in an online course. Consequently, in university-wide efforts to retain students, online instructors must take care to design courses that provide students the opportunity to interact both with each other and with the instructor in both meaningful and supportive ways.

Moore and Thompson (1990) argue that teacher's feedback is critical to the learning of the student. While some researchers have argued in support for more interaction between the students and the teachers. However, critics argue that more is not always better when it comes to student-teacher interaction in e-learning, e.g. Mazzolini and Madison (2003) observed that increased efforts of interaction by the teacher, through increased number of messages, does not result in increased interaction from the students.

Zhao, et al. (2005 concluded that, of all the available forms of interaction in e-learning, the most significant one is the student-teacher interaction. This was supported by Magjuka, et al. (2005) who concluded that e-learning success depends most significantly on the interaction between human participants, i.e. either learner to learner interaction and learner to teacher interaction. Therefore, our work, draws attention towards interactivity, as an important factor in successful implementation of e-learning system.

Shih, Martinez-Molina and Muñoz (2008) provided more in depth study on the role played by teachers in e-learning and concluded that teachers can improve effectiveness of e-learning by providing constructive and prompt feedback to the students. Teachers can also support the students in learning how to use the system because different individuals can have different perceived IT self- efficacy. In this manner the teachers can lift the level of performance of the students and help reduce the rate of withdrawal, which is unfortunately, quite high in e-learning courses. In addition, by considering design of the interaction during course, teachers can promote learner to learner interaction, which considering the role of social interaction in human performance, is likely to help the students both personally and professionally (Abulibdeh and Hassan, 2011).

By looking at the literature, there appears to be a number of benefits associated with appropriate use of interactivity for learning in the literature. We can see that there are three dominant aspects or dimension of interactivity with respect to e-Learning, which are content interactivity, system interactivity and service interactivity. Interactivity is vital in the case of e-Learning as face to face interaction with the content provider is not always possible. Interactivity is not only important for the learning content, but also is equally important for the system through which the e-Learning is being provided. This includes the website or software through which the e-Learning is being delivered. Similarly, the interaction with the service and support providers is also key for the success of e-Learning systems. Looking at all the benefits that interactivity presents, and researches that support the same, we formulated the hypothesis as below. In this experiment, will test the effect of interactivity from the point of service, information and system dimensions, using ELQ model by Uppal et al, 2017.

H1: Interactivity improves the overall effectiveness of e-learning.

To test his hypothesis, we used e-Learning Quality (ELQ) model, which has the following constructs:

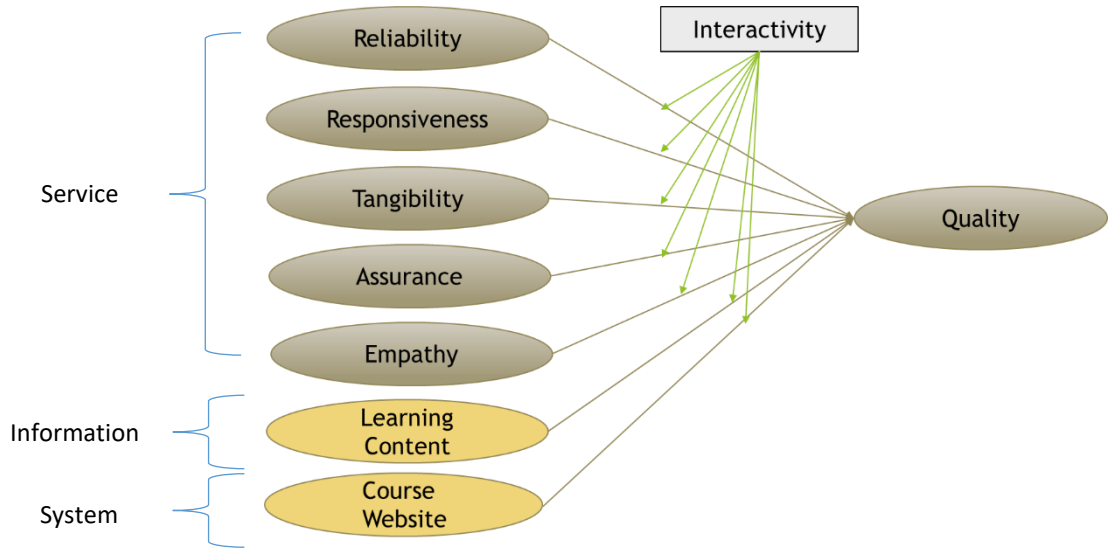

Figure 3: Research model for interactivity

The Experiment Model

We collected data from around 430 students from two local universities in Pakistan. We asked the students about their perception of quality of their e-learning experience, if the material 'Learning Content' was presented in an interactive manner.

Respondents Profile

A questionnaire was used to collect participant data, which consisted of two sections. The first part included the questions related to demographic data. A five point Likert scale was used for all questions in section two. The questionnaire was distributed to students in different classes at two leading public universities in Lahore, Pakistan. University student (undergraduates, postgraduates and executives) were used to collect data. These students were enrolled in BSc Applied Management, BBA honours, MBA, EMBA, BSc Sciences and BSc Engineering programs. Data was collected from a total of 430 students, most of whom had previously had exposure to e-learning content, participated in the survey. After careful screening, 384 responses were found to be valid. Details of the demographics of respondents are shown in the tables1, 2 and 3 below.

D1_Gender

		Frequency	Percent
Valid	Male	186	48.4
	Female	198	51.6
	Total	384	100.0

Table 1: Gender

		Frequency	Percent
Valid	BSc Honors	113	29.4
	MBA	235	61.2
	Engineering	6	1.6
	BSc Sciences	30	7.8
	Total	384	100.0

Table 3: Education Level

		Frequency	Percent
Valid	Below Rs. 20,000	27	7.0
	Rs. 21,000 to Rs. 50,000	80	20.8
	Rs. 51,000 to Rs. 100,000	112	29.2
	Above Rs. 100,000	165	43.0
	Total	384	100.0

Table 3: Household Income

Reliability and Validity

To check the reliability of scale, we conducted Cronbach Alpha (Cronbach, 1951; Nunnully, 1978) to measure internal consistency. The extracted Cronbach alpha values for our quality factors are shown in Table 4. All alpha (α) values are greater than (>) 0.70, which implies factors are highly correlated and interchangeable (Jarvis et al., 2003).

Factor Label	**Number of Items**	**Cronbach's alpha (α)**
Assurance	6	0.949
Reliability	7	0.964
Responsiveness	5	0.951
Empathy	4	0.903
Tangibility	4	0.884
Learning Content	8	0.964
Learning Quality	4	0.943
Course Website	8	0.968

Table 4: Scale Reliability

Exploratory Factor Analysis (EFA)

To see if the observed variables adequately correlated, i.e. met reliability and validity criteria, we conducted an EFA using Principal Component Analysis, with Promax rotation (see Table 4). We selected Promax for two reasons, first because our sample size was adequately large, i.e. n=384. Secondly, since Promax is suitable when multiple factors are correlated. The cumulative variance of the eight

factors was 75.646%, and all extracted factors had eigenvalues above 1.0. All the communalities for each variable were significantly high; i.e. all were above 0.300, with most being above 0.700. The Kaiser-Meyer-Olkin and Bartlett's test for sampling adequacy was significant, showing that the chosen variables were sufficiently correlated (Table 5).

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.859
Bartlett's Test of Sphericity	Approx. Chi-Square	19598.090
	df	1035
	Sig.	.000

Table 5: KMO and Bartlett's Test

The seven factors that were extracted in the pattern matrix (Table 3) were, however, used for further analysis. Terms measuring the same construct exhibited high construct loadings, i.e. suggesting adequate convergent validity. According to Hair et al. (2010), the minimum threshold value recommended for a sample size of 384 is 0.350. Since all loaded values were above 0.50, it confirms that the factors had sufficient discriminant validity, and no unexpected cross-loading occurred (Table 6).

Rotated Pattern Matrix[a]

	Factor							
	1	2	3	4	5	6	7	8
CW_4	.920							
CW_1	.899							
CW_3	.891							
CW_2	.889							
CW_5	.888							
CW_6	.867							
CW_7	.822							
CW_8	.817							
LC_1		.895						
LC_2		.892						
LC_3		.889						
LC_4		.887						
LC_6		.878						
LC_5		.868						
LC_7		.832						
LC_8		.814						
RA_1			.925					
RA_3			.908					
RA_2			.901					
RA_4			.874					
RA_6			.870					
RA_7			.865					

RA_5			.855								
AS_1				.911							
AS_4				.861							
AS_5				.855							
AS_3				.853							
AS_2				.842							
AS_6				.839							
RS_1					.918						
RS_3					.896						
RS_4					.878						
RS_2					.848						
RS_5					.842						
LQ_2						.927					
LQ_4						.893					
LQ_3						.868					
LQ_1						.803					
EM_3							.852				
EM_4							.841				
EM_2							.797				
EM_1							.764				
TA_3								.833			
TA_1								.816			
TA_2								.786			
TA_4								.712			

Extraction Method: Maximum Likelihood.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Table 6: Pattern Matrix

After exploratory factor analysis we used SEM to prove the convergent and discriminant validity of extracted construct; for that reason Confirmatory factor analysis was performed using AMOS.

Confirmatory Factor Analysis (CFA)

After testing the scale reliability, convergent and divergent validity was tested. Convergent validity can be established if two indicators correspond to each other. Divergent validity is the degree to which two dissimilar constructs can be easily differentiated. Construct reliability is the measure used to check the reliability of the extracted constructs, the threshold value is 0.7 in our case CR for all 8 extracted factors is above 0.90 (See Table 7).

	CR	AVE	MSV	ASV	CW	AS	EM	RS	RA	TA	LQ	LC
Course Website(CW)	0.967	0.784	0.052	0.029	**0.886**							
Assurance (AS)	0.949	0.758	0.052	0.018	0.150	**0.870**						
Empathy(EM)	0.904	0.702	0.122	0.035	0.022	0.118	**0.838**					
Responsiveness (RS)	0.952	0.798	0.077	0.027	0.161	0.228	0.277	**0.893**				

Reliability (RA)	0.959	0.795	0.031	0.008	0.177	0.064	-0.052	0.053	**0.892**			
Tangibility (TA)	0.890	0.670	0.122	0.042	0.157	0.165	0.349	0.042	0.082	**0.818**		
Learning Quality (LQ)	0.944	0.807	0.080	0.033	0.217	0.089	0.167	0.132	0.011	0.282	**0.899**	
Learning Content (LC)	0.965	0.773	0.052	0.023	0.229	0.030	0.062	0.099	0.103	0.180	0.222	**0.879**

Table 7: Discriminant and convergent validity

All fitness values are within acceptable criteria limits, depending on the test, hence implying a good model fit (see Table 8). The Chi-square/df value equaled 2.83; where a value between 2.0 and 5.0 is considered acceptable (Hau 2010). Our RMSEA value is 0.069, and our CFI and NFI values are 0.91 and 0.868 respectively; demonstrating good model of fit, thus supporting the results and validating the proposed model.

Index	**Value**	**Criterion**
Chi – Square /Df	2.83	2.0 – 5.0
RMSEA	0.069	0 – 0.1
CFI	0.91	0 ~ 1
NFI	0.868	0 ~ 1

Table 8: Goodness of Fit Statistics

Regression Results

The ELQ model, has been used to measure the perception of e-learning quality, ensuring consideration of 'service', 'information' and 'system' dimensions. Seven hypotheses were tested as independent variables, i.e. the original five SERVQUAL dimensions, plus the proposed dimensions - 'Learning Content' and 'Course Website'(see Table 9).

			Estimate	S.E.	C.R.	P
E-Learning Quality	←	Learning Content	0.153	0.053	3.008	0.003
E-Learning Quality	←	Tangibility	0.216	0.071	4.017	***
E-Learning Quality	←	Reliability	-0.046	0.051	-0.895	0.371
E-Learning Quality	←	Responsiveness	0.072	0.053	1.41	0.158
E-Learning Quality	←	Assurance	0.013	0.059	0.247	0.805
E-Learning Quality	←	Empathy	0.070	0.065	1.334	0.182
E-Learning Quality	←	Course Website	0.144	0.043	2.825	0.005

Table 9: Regression Weights

Conclusion

From the table, we can see that the "Learning Content", "Tangibility" and "Course Website" are significant. This means that students perceive the e-learning material to be of higher quality, if that material is more interactive. This is in line with the literature which states that the interactivity improves the perception of quality of the learning material. Research data suggest that online courses with high levels of interactivity lead to higher levels of student motivation, improved learning outcomes, and satisfaction over less interactive learning environments (Espasa & Meneses, 2010; X. Liu et al., 2007; Mahle, 2011; Park & Choi, 2009; Thurmond et al., 2002)

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