The Level of ELMS Success in Satisfying Students at Al-Jouf University During the Corona Crisis

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Summary

The current research attempts to measure the level of the acceptance of the Blackboard System (BBS) during the Corona crisis, and whether this is one of the reasons for the low use of the BBS at Al-Jouf University. To achieve this, the technology accepting model in the time of crisis (TAMTC) has been proposed to measure the degree of acceptance by students, which was then applied to a random sample of 339 of such. The results show a high level of student acceptance, despite their lower use of the system. The research also highlights the importance of upgrading e-courses and that the discontinuation of exam disqualification of students is secondary to their poor course attendance.

Keywords:
E-Learning; Management System; The lower Use; Corona crisis; Blackboard System; Technology Acceptance Model; Time of Crisis.

1. Introduction

The Corona crisis caused the largest disruption to education in history, adversely affecting about 1.6 billion students in more than 190 countries across all continents [1].

Most governments responded by temporarily closing their educational institutions, ultimately effecting 1,480,292,206 students worldwide on April 24, 2020 [2]. This implies a significant danger to education if efforts are not exerted to reduce the effects of the pandemic by employing distance learning strategies and e-learning management systems [3].

The main reason for relying on ELMS is their ability to provide all the required educational services to remote learners, which helps reduce the chances of contracting the virus while still obtaining acceptable educational results, in particular the Blackboard, Google Classroom, Moodle, and Skooler systems [4].

Many countries have made widespread use of e-learning systems in the face of Covid-19 so that their educational systems can continue to provide, at the very least, basic services to students [5].

Saudi Arabia has exerted exceptional efforts to alleviate the effects of the pandemic in a way that ensures the continuation of remote education for more than seven million students at various educational levels, moving rapidly from in-person education to distance education [6].

2. Literature Review

The Saudi government is very keen to improve e-learning through a clear policy of appointing experts to various universities who are responsible for developing institutional capabilities for e-learning [7].

Al-Jouf University is acting according to a clear and specific plan to develop its e-learning system, due to which it has approved the BBS for e-learning and, over the last five years, has managed to achieve qualitative progress with regard to building e-courses, training programmers, and in activating the BBS tools [8]

The Blackboard is considered a Responsive & Advanced; that is characterized by a modern, intuitive, fully responsive interface, and that provides a strong educational experience that goes beyond traditional LMS [9].

Despite the advantages of the BBS and the efforts made by Al-Jouf University to ensure the activation of its tools, it was noticed that student attendance in virtual lectures gradually decreased, starting from the twelfth academic week, when the university revoked the regulation relating to exam disqualification as secondary to low attendance rates. Figure (1) shows attendance rates from the eleventh to the fourteenth academic week [10].

Figure 1 shows that student attendance is related to the avoidance of exam disqualification; however, when this rule was revoked, most students showed increased absenteeism, consistent with the reports from the concerned

supervisors. In these reports, it was mentioned that there was low student activity on the system, and most of the students were not completing their assignments, especially from the twelfth week onwards to the end of the academic year. To study the reasons for this reluctance, the Technology Acceptance Model (TAM) was used, being the main tool that was utilized in previous related research [11-13].
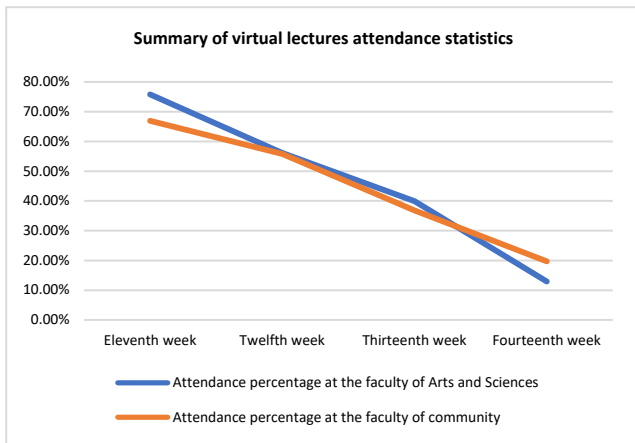

Figure 1. Proportional student attendance of virtual lectures from the eleventh to the fourteenth academic week

TAM is a consequence of the "Theory of Reasonable Action", devised by Fred Davis with the aim of modelling user acceptance of information systems and technologies [14].

It has also been used with the aim of describing general standards of computer acceptance that explain users' behaviour through the investigation of perceived usefulness, perceived ease of use, and the external variables that may influence their beliefs [15].

The TAM model has undergone several significant developments [16]. TAM2 was developed as an extension to TAM in that it was developed to preserve TAM's original form whilst adding additional variables that might affect its perceived usefulness and behavioral intention [17]. The Unified Theory of Acceptance and Use of Technology (UTAUT) model has reduced the number of variables to four: expected performance, expected effort, social impact, and facilitation conditions, with the four main intermediate variables of gender, age, volunteering, and experience [18]. TAM3 added a complete form of IT system approval [19].

In the context of the current research, the aforementioned models have been used to develop TAMTC by including additional external variables, adding the motivation for use during crises and classifying the type of use into positive, negative and rejection, as shown in Figure 2.

Employing the TAMTC model to measure the level of acceptance of students could potentially help uncover the necessary developmental aspects required of the BBS tools and the digital content provided through them at Al-Jouf University, especially since the E-Systems for distance education in higher education institutions have become indispensable and their need will increase in the future [20].

Figure 2. TAMTC Model

The Covid-19 global health crisis has highlighted the role of educational technology in achieving social distancing and protecting student societies from infection by the virus [21].

Saudi Arabia was one of the first countries to attach great importance to educational technology. As evidence, a study conducted by the Organization for Economic Cooperation and Development in cooperation with Harvard University showed that The Kingdom presented 13 of 16 indicators on the average level of readiness for e-learning [22]. As such, Al-Jouf University has exerted considerable efforts in this regard by implementing training and evaluation strategies to ensure the effective use of the e-learning system.

Despite the efforts made by various universities, e-learning continues to face challenges in the form of (1) technical challenges, and (2) challenges related to academic curricula [23]. At Al-Jouf University, the technical challenges were represented in form of poor internet connections, especially in remote areas. According to the report issued by the Deanship of E-Learning and Distance Education, 2020, the challenges related to the academic courses were identified as being the number and quality of the e-courses produced by Al-Jouf university, as the available e-courses represent only 2.2% of all courses at the university, and their design lacks the use of modern technologies and strategies in handling and presenting their educational content.

After applying the BBS acceptance measurement for the Corona crisis on the basic sample of research and

analysing the responses of the participating students, it was possible to identify the challenges they faced while using the BBS by finding their approval ratios. Table (1) clarifies the nature of these challenges and their extent based on the percentage of student approval:

Table 1. The nature of the challenges facing students of Al-Jouf University and their extent when using the BBS

Challenges	Approval percentage	Its degree
The large number of technical problems that occur while using Blackboard.	59.29%	Medium
The difficulty students encounter solving technical Blackboard problems on their own.	56.64%	Medium
Using Blackboard requires a lot of mental effort.	57.82%	Medium
The interaction between Blackboard tools and the university's absence and attendance system	82.89%	Too high

Table (1) indicates approval percentages ranging between 56.64% to 82.89%, which range from a medium to very high degree of agreement as to the existence of these challenges. The agreement rating was based on a five-point Likert measurement [24].

3. Methodology

The current research relied on the descriptive approach and was based on three main axes: the first was reviewing previous studies; the second was to collect the data necessary to measure the level of student acceptance of the BBS; and the third was to analyze and describe the data collected from the measurements used and gaining the results necessary to answer the research questions.

3.1 Participants

The current research community numbers 24,996, which represents all the students at Al-Jouf University. The sample was chosen randomly by working on the e-distribution of the TAMTC measurement, for which 348 responses were received and of which a further nine were excluded as they did not complete the measurement. Thus, the basic sample was 339 students; Table (2) reports the details of the basic sample.

Table 2. Details of the basic sample considered in the current research

Categories		Student Numbers in The Sample
Gender	Male	96
	Female	243
Region	Skaka	13
	Tabrgl	114
	Guryat	212
Field of study	Theoretical Majors	279
	Scientific Majors	60
Operating System Used	iOS	247
	Android	47
	Microsoft Windows	45
Average Time of Use	Less than or equal to 4 hours	187
	From 5 to 8 hours	133
	From 9 to 12 hours	19
Grade Levels	1	69
	2	29
	3	55
	4	30
	5	51
	6	20
	7	37
	8	48
Total Sample Number		339

3.2 Research Procedures

The research procedures are as follows:

- Building a measurement of acceptability of the BBS during the pandemic according to the TAMTC model and its suitability for application: the previous literature was reviewed to build the measurement, where the initial version had consisted of three main dimensions: perceived usefulness, perceived ease of use, and motivation for use during crises. The initial version was peer reviewed then applied to an exploratory sample of 25 students to calculate the validity and reliability of the measurement.

- The values of the students' responses were calculated according to a five-point Likert measurement, which are estimated at 5, 4, 3, 2, and 1. The process of distributing and applying the measurement took a period of eight academic weeks.

- After implementing the measurement, the statistical treatment of the data was performed using SPSS Version 20 at a significance level of 0.05.

3.3 Evaluation Criteria

The performance of the classifier model was described using a confusion matrix as shown in table 3, which included the real values vs the predicted values, as well as whether they were true or false.

Table 3: Confusion Matrix

Sample	Observed	Predicted	
		Positive	Negative
70% of Training	Positive	TP	FN
	Negative	FP	TN
30% of Testing	Positive	TP	FN
	Negative	FP	TN

Where:

TN- True Negative

TP-True Positive

FN-False Negative

FP-False Positive

3.4 Naïve Bayes

In this study, the Nave Bayes (NB) is used. It works with huge datasets, is simple to use, and can be used to evaluate and forecast high-dimensional data. This algorithm determines the probability for each class using several independent input variables and the Bayesian theorem. It has been dubbed a powerful machine learning algorithm because to its extensive and effective use in a variety of settings, including spam categorization, weather forecasting, and sentiment analysis. To assess the prediction accuracy, the model was used as a single learner with varied parameters. Furthermore, it was used with several ensemble approaches including as boosting, bagging, stacking, and voting.

The Bayes rule is used in Naive Bayes, as well as a strong assumption that the qualities are conditionally independent of one another. Despite the fact that this independence condition is routinely violated in practice, naive Bayes delivers classification accuracy that is competitive. We trained the Nave Bayes model using 70% of the data and tested it on the remaining data set for validation, just as we did with the prior model. The first try was accurate to the tune of 89 %. The validation testing results had an even better accuracy of 91 %, which is the best result in ML approaches as shown in table 4.

Table 4: Confusion Matrix of Navin Bayes Technique

Samples	Observed	Predicted (%)
Training	Overall Percent	89.4%
Testing	Overall Percent	91.7%

This study using only the e-learning parameters and found that nave Bayes had the greatest accuracy rate. One of the difficulties encountered was that the machine learning outcomes varied from one try to the next, even though the data was the same. This might be owing to the little amount of data, as machine learning models with more training data tend to be more accurate as shown in figure 3.
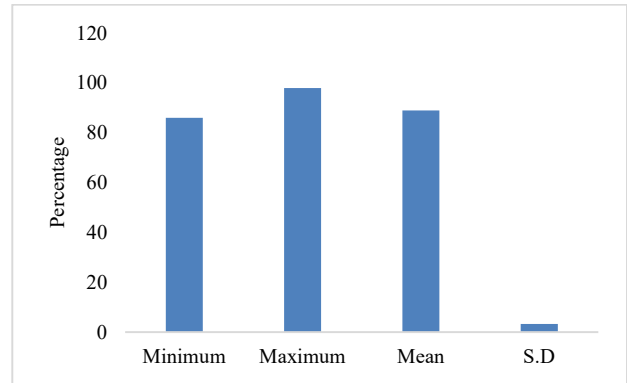

Figure 3. Validation of Naive Bayes in e-learning Management

4. Results

After analyzing the results of applying the measurement to the basic research sample, the following was revealed:

4.1 The Level of Student Acceptance of the BBS at Al-Jouf University During the Corona crisis

The percentages of student agreement (the research sample) were determined on the measurement phrases to judge their level of acceptance of the BBS, as shown:

Table 5. Average approval percentages for acceptance of the e-Learning system

Dimensions	Mean	Standard deviation	Lowest value	Greatest value	Weighted average	Approval percentage
Perceived Usefulness	48.23	11.26	12.00	60.00	4.02	80.39
Perceived ease of use	56.08	10.22	23.00	80.00	3.50	70.10
Motivation for use during crises	45.21	5.71	25.00	58.00	3.48	69.56
Total	149.52	23.73	78.00	194.00	3.65	72.94

Table (5) shows that the average approval percentages ranged between 69.56% and 80.89%, which indicate the high acceptance of the BBS by the students according to the Likert measurement [24].

4.2 The Extent of the Difference in the Level of Acceptance of the BBS Among Students According to Gender, Region, Field of Study, Operating System Used, Average Time of Use the Blackboard (Hours/Day), and Grade Levels of Students as Variables

Gender Variable: The effect of gender (male, and female) was measured using the T-test, as shown in Table (6).

Table 6. Statistical significance of the sum of the dimensions and the total sum of the measurement according to gender

Statistical connotations / Dimensions	Male N=96		Female N=243		Difference between medians	T-value	Indication level
	M	±SD	M	±SD			
Perceived Usefulness	48.18	12.63	48.26	10.70	0.08	0.06	0.95
Perceived Ease of Use	57.02	10.32	55.70	10.18	1.32	1.07	0.29
Motivation for use during crises	44.81	6.56	45.37	5.35	0.56	0.81	0.42
Total	150.01	26.09	149.33	22.79	0.68	0.24	0.81

Note. The tabular (T) value was significant at the 0.05 level = 1.96.

Table (6) shows that the effect of gender is statistically insignificant.

Region Variable: The effect of the region (Sakka, Tabrgel, and Qurayyat) was measured using the F-test, as shown in Table (7).

Table 7. The significance of the differences in the sum of the dimensions and the total sum of the measurement according to region

Statistical Connotations / Dimensions	The source of the contrast	sum Squares	Degree of freedom	Average Squares	F-value	Indication level
Perceived Usefulness	Between groups	269.34	2	134.67	1.06	0.35
	Within groups	42591.25	336	126.76		
	Sum	42860.59	338			
Perceived Ease of Use	Between groups	231.34	2	115.67	1.11	0.33
	Within groups	35074.66	336	104.39		
	Sum	35306.01	338			
Motivation for use during crises	Between groups	84.24	2	42.12	1.29	0.28
	Within groups	10954.46	336	32.60		
	Sum	11038.71	338			
Total	Between groups	489.67	2	244.84	0.43	0.65
	Within groups	189900.91	336	565.18		
	Sum	190390.58	338			

Note. The tabular (F) value is significant at the 0.05 level = 3.02.

Table (7) shows that the effect of the region is statistically insignificant.

Field of Study Variable: The effect of the field of study (humanities, and science field) was measured using the T-test, as shown in Table (8).

Table 8. The significance of the differences between the sum of the dimensions and the total sum of the measurement according to field of study

Statistical Connotations / Dimensions	Humanities N = 278		Science field specialties N = 61		Difference Between Medians	T-value	Indication level
	M	±SD	M	±SD			
Perceived usefulness	48.59	11.04	46.59	12.20	2.00	1.26	0.21
Perceived ease of use	55.67	10.38	57.93	9.32	2.27	1.57	0.12
Motivation for use during crises	45.27	5.67	44.95	5.94	0.32	0.39	0.69
Total	149.53	23.62	149.48	24.42	0.06	0.02	0.99

Note. The tabular (t) value is significant at the 0.05 level = 1.96.

Table (8) shows that the effect of the field of study is statistically insignificant.

The Operating System Used Variable: The effect of the operating systems (Windows, Android, and iOS) was measured using the F-test, as shown in Table (7).

Table 9. The significance of the differences in the sum of the dimensions and the total sum of the measurement according to operating system

Statistical connotations / Dimensions	The source of the contrast	Sum Squares	Degree of freedom	Average Squares	F-value	Indication level
Perceived usefulness	Between groups	396.76	2	198.38	1.57	0.21
	Within groups	42463.83	336	126.38		
	Sum	42860.59	338			
Perceived ease of use	Between groups	236.43	2	118.22	1.13	0.32
	Within groups	35069.57	336	104.37		
	Sum	35306.01	338			
Motivation for use during crises	Between groups	44.03	2	22.01	0.67	0.51
	Within groups	10994.68	336	32.72		
	Sum	11038.71	338			
Total	Between groups	1074.86	2	537.43	0.95	0.39
	Within groups	189315.72	336	563.44		
	Sum	190390.58	338			

Note. The tabular (F) value is significant at the 0.05 level = 3.02.

Table (9) shows that the effect of the operating system is statistically insignificant.

The Average Time of Using the Blackboard Variable: The effect of the average time of using the Blackboard (hour/day) was measured using the F-test, as shown in Table (10).

Table 10. The significance of the differences of the sum of the dimensions and the total sum of the measurement according to the average time of using the Blackboard per day

Statistical Connotations / Dimensions	The source of the contrast	sum Squares	Degree of freedom	Average Squares	F-value	Indication level
Perceived usefulness	Between groups	98.54	2	49.27	0.38	0.69
	Within groups	40335.41	309	130.54		

Statistical Connotations / Dimensions	The source of the contrast	sum Squares	Degree of freedom	Average Squares	F-value	Indication level
	Sum	40433.95	311			
Perceived ease of use	Between groups	10.27	2	5.14	0.05	0.95
	Within groups	32974.95	309	106.72		
	Sum	32985.22	311			
Motivation for use during crises	Between groups	67.59	2	33.79	1.02	0.36
	Within groups	10265.72	309	33.22		
	Sum	10333.30	311			
Total	Between groups	274.97	2	137.48	0.24	0.79
	Within groups	180029.95	309	582.62		
	Sum	180304.92	311			

Note. The tabular (F) value is significant at the 0.05 level = 3.02.

Table (10) shows that the effect of the average time of using the Blackboard is statistically insignificant.

Grade Levels Variable: The effect of the grade levels (1, 2, 3, 4, 5, 6, 7, and 8) was measured using the F-test, as shown in Table (11).

Table 11. The significance of the differences between the sum of the dimensions and the total sum of the measurement according to grade levels

Statistical Connotations / Dimensions	The source of the contrast	sum Squares	Degree Of freedom	Average Squares	F-value	Indication level
Perceived usefulness	Between groups	1941.74	7	277.39	2.24*	0.03
	Within groups	40918.85	331	123.62		
	Sum	42860.59	338			
Perceived ease of use	Between groups	1497.68	7	213.95	2.09*	0.04
	Within groups	33808.33	331	102.14		
	Sum	35306.01	338			
Motivation for use during crises	Between groups	686.11	7	98.02	3.13*	0.00
	Within groups	10352.60	331	31.28		
	Sum	11038.71	338			
Total	Between groups	10507.22	7	1501.03	2.76*	0.01
	Within groups	179883.36	331	543.45		
	Sum	190390.58	338			

Note. The tabular (F) value is significant at the 0.05 level = 2.03

Table (11) shows that the effect of the grade levels is statistically significant, and the DUNCAN test was used to determine which level has more acceptance of the BBS in each of the three dimensions of the measurement separately

(tables 12, 13, and 14) then the total degree of acceptance (table 15):

Table 12. DUNCAN test at the 0.05 level to compare the differences between the grade levels in the first dimension (perceived usefulness)

Grade levels (Ascending order)	Number	Level	
		A	B
2	29		44.86
1	69		45.62
3	55	47.69	47.69
5	51	47.92	47.92
7	37	48.27	48.27
4	30	50.33	50.33
6	20	51.85	
8	48	52.13	

Table (12) shows that there are differences between the sixth level versus the first and second levels in favour of the sixth level, and the existence of differences between the eighth level versus the first and second levels in favour of the eighth level.

Table 13. DUNCAN test at the 0.05 level to compare the differences between the grade levels in the second dimension (perceived ease of use)

Grade levels (Ascending order)	Number	Level	
		A	B
2	29		50.69
5	51	54.82	54.82
7	37	55.84	
1	69	55.91	
3	55	56.24	
8	48	57.94	
4	30	58.87	
6	20	59.00	

Table (13) shows that there are differences between the first, third, fourth, sixth, seventh and the eighth levels versus the second level in favour of the predecessor.

Table 14. DUNCAN test at the 0.05 level to compare the differences between the grade levels in the third dimension (motivation for use during crises)

Grade levels (Ascending order)	Number	Level	
		A	B
2	29		41.79
1	69	44.10	44.10
7	37	44.89	
5	51	45.22	
3	55	46.04	
4	30	46.10	
6	20	46.75	
8	48	46.98	

Table (14) shows that there are differences between the third, fourth, fifth, sixth, seventh and the eighth levels versus the second level in favour of the predecessor.

Table 15. The DUNCAN test at the 0.05 level to compare the differences between the grade levels in total degree of the measurement

Grade levels (Ascending order)	Number	Level A	Level B
2	29		137.34
1	69	145.64	145.64
5	51	147.96	147.96
7	37	149.00	
3	55	149.96	
4	30	155.30	
8	48	157.04	
6	20	157.60	

Table (15) shows that there are differences between the third, fourth, sixth, seventh and the eighth levels versus the second level in favour of the predecessor.

The Correlation between Perceived Usefulness, Perceived Ease of Use, and Motivation for Use During Crises: The Correlation Matrix Was Calculated between the Measurement Dimensions, as Reported in Table (16):

Table 16. Correlation matrix between the dimensions of the measurement that accepts the BBS

Dimensions	First dimension	Second dimension	Third dimension
perceived usefulness			
perceived ease of use	0.557*		
motivation for use during crises	0.770*	0.616*	

Note. The tabular (R) value is significant at the 0.05 level = 0.195

It is clear from table (16) that:

- There is a significant direct correlation between the first dimension (perceived usefulness) and the second dimension (perceived ease of use), where R = 0.557, and that these are greater than the tabular value of R at the 0.05 level.

- There is a significant direct correlation between the first dimension (perceived usefulness) and the third dimension (motivation for use during crises), where R = 0.770, and that these are greater than the tabular value of R at the 0.05 level.

- There is a significant direct correlation between the second dimension (perceived ease of use) and the third dimension (motivation for use during crises), where R = 0.616, and these values are greater than the tabular value of R at the 0.05 level.

5. Discussions

The high level of acceptance of the BBS among students at Al-Jouf University is due to the advantages of the system in terms of its ease of use, the availability of multiple tools to support students and enable them to communicate with their course professors, as well as the availability of a direct contact with information technology (IT), which is meant to provide technical support and solve any related problems.

The diversity of educational tools (discussion groups, virtual classrooms, multimedia, ...etc.), available on the BBS, is one of the advantages that gives students the freedom to choose from these alternatives according to their preferences.

There is also a mechanism to supervise each student's activity on the system, which would give their instructors detailed feedback for each, and hence the ability to notify them to certain issues that need to be worked on.

The high level of acceptance of the BBS is also due to the training program that the e-learning unit in each college works on, as proposed and implemented under the supervision of the Deanship of e-learning, which targets the development of students' ability to use the BBS. The supervision of the BBS activity level is operated through cooperation between the e-learning units and different departments, to encourage the instructors to achieve the target activity level that was added as a part of their annual appraisal.

The absence of difference in the level of acceptance of the BBS regarding gender, region, field of study, operating system, and average time of use, can be attributed to the following:

- The existence of unified procedures for all university students (technical support, training, activation levels) contributed to achieving equal opportunities among all students, despite the differences in the above-mentioned variables. This is in accordance with the results of the research conducted by [25] in which he indicated that the difference in the field of study did not affect the acceptance level of using the mobile adaptive learning applications.

- The BBS has responsive features as it provides compatible copies for each device that can be used to run it. Compatible copies of the Blackboard application are available for users of the system through smart mobile devices, whether they are running iOS or Android.

Reasons for variations in BBS acceptance due to the difference in the grade levels can be attributed to the following:

- The experience in using the BBS among higher levels students led them to demonstrate a higher level of acceptance of the system.

- In the perceived ease of use dimension, Level 1 students' performance was higher than those at Level 2. This may be due to the exposure of Level 1 students to intensive training before joining the university, which included BBS-related skills.

The existence of a positive correlation between the three dimensions of the BBS acceptance measurement may have been due to the standardized procedures used for all students and the interest in achieving the optimal and effective use of the BBS and ensuring access to as many of its features and capabilities as possible.

Also, continuous training and the guidelines provided by the Deanship of E-learning on how to deal with the system tools increased students' ability to use the system, which in turn was reflected in the perceived usefulness and motivation for use during crises, as it is the case with Corona crisis. Authors in [13] agreed with the current result regarding the existence of a positive correlation between perceived usefulness and perceived ease of use.

6. Research Limitation

The current research was limited to verifying the level of BBS acceptance during the Corona crisis at Jouf University in the KSA during the first semester of the 2020-2021 academic year.

7. Conclusion

The current research aimed to determine the level of acceptance of the BBS, especially after transferring to e-learning because of Covid-19 restrictions. The Blackboard Acceptance Measurement for the Corona crisis was built based on the TAMTC model and then applied to the research sample. The results of the application showed the high level of student acceptance of the BBS and lack of influence in this regard from the external variables (except for an academic level), and the positive interrelationship among the three dimensions of the measurement.

Despite the positive results of the research, there are several challenges that may have negative effect on the use of the BBS, the most important of which is the link between the attendance and exam registration which might have a negative effect on the students. Also, the non-attractive design of e-courses, which needs to have more interactive techniques [8].

In conclusion, this research recommends improving the design quality and production of attractive e-courses presented through the BBS, and to introduce a different approach to motivate students to participate rather than rely on the link between attendance level and exam registration.

The research also points out the need to conduct further studies on the types of BBS used in the TAMTC model. This is in addition to the need of introducing more external variables to the measurement, comparison of the levels of BBS acceptance among different universities in the Kingdom of Saudi Arabia (KSA), as well as the dire need for conducting similar research once the pandemic is over.

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