

Assessment of the Contingency Theory on Performance Mobile Learning in the Palestinian Higher Education Institutions during Coronavirus Pandemic: Moodle Case Study

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Abstract: COVID-19 which declared by The World Health Organization (WHO) as pandemic in March 2020 created a contingency situation that affected all human life situation and there has been a huge shift in the way people teach, learn and work. Such pandemic situation provided uncertainty environment in the Palestinian Higher Educational Institutions (HEIs), especially since they had to utilize a full learning environment such as Moodle replacing the conventional (face-to-face, blended, or hybrid). This study aims to investigate the factors of contingency theory on students' performance of Moodle as m-learning system in the Palestinian HEIs during coronavirus pandemic. However, the contingent learning management systems are flexible in choosing and adapting strategies to suit change in situation at a particular period in time during running of the education institutions. The primary data was collected by distributing questionnaires (survey) to the students of six Palestinian higher education in Gaza strip. 480 students have successfully responded to answer the questionnaire. Results shows that the Design Maturity explain 50.8% of the Moodle performance. Furthermore, among its variables Management variable is the best predictor of Moodle Performance followed by Implementation. The best predictor of Contingency variables is Individual followed by Tasks and Environment with 50.1% of explanation of the Design Maturity. Indeed, students registered some recommendations and a practical comment that should be considered by the universities to make some actions to enhance Moodle performance and its utilization in their environments.

Keywords: Online Learning, m-learning, e-learning, Contingency Theory. Moodle Performance.

I. INTRODUCTION

Technology is changing at an exponential rate over time and influenced by many factors. Such changing affect all lifestyle and all human activities. However, education is one of that daily activities especially in the higher education. Nowadays, all Palestinian Higher Educational Institutions (HEIs) are utilized e-learning in several levels [1] especially during Coronavirus pandemic (COVID-19) [2].

COVID-19 which declared by The World Health Organization (WHO) as Public Health Emergency of International Concern on 30 January 2020 and a pandemic on 11 March 2020 [3], created a contingency situation that affected all human life situation including the education in Palestine [2, 4, 5].

Such pandemic situation provided uncertainty environment in the HEIs, especially since they had to utilize an alternative learning system replacing the conventional (face-to-face, blended, or hybrid) that should provide a full learning environment such as Moodle [6].

Contingency theory states that there is no a standard or one practice to accomplish a task in Management Information System (MIS), instead it should depend on the practical situation [7, 8]. Indeed, the contingency theory approach is a theoretically justified choice to deal with the uncertainties of fully utilization of any online learning system.

The Contingency theory predicts what will be found when the past or present situation is evaluated [9, 10]. Moreover, the contingency variables influence the performance of the information systems [7]. That means, the contingent learning management systems are flexible in choosing and adapting strategies to suit change in situation at a particular period in time during running of the education institutions.

II. MOODLE MOBILE LEARNING

Mobile learning (m-learning) is considered the next form of e-learning using mobile technologies to facilitate education for teachers and learners anywhere and anytime [11]. However, e-learning and m-learning have the most similar elements and services; such services can be categorized into two types that are *pedagogical services* such as learning materials and *informative services* such as admission and registration [12, 13]. Engaging the m-learning services in the higher education environment will improve the availability of education [14].

Moodle is an open-source learning management system (LMS). It is a free and distributed under the GNU General Public License [6]. Moodle has developed on pedagogical online principles. Moreover, it utilized two underlayer theoretical perspectives such as Social Constructionism and Connected Knowing [15]. However, Moodle used for online educators and trainers to achieve learning goals [16, 17]. Mobility is fully supported in Moodle since it has many themes that supported the responsive characteristic and Moodle app is available on Google Play and App store [6].

Since COVID-19 hit, there has been a huge shift in the way people teach, learn and work. Furthermore, Moodle has widely used in HEIs as well as schools specially during the COVOID 19 [18, 19, 2].

III. CONTINGENCY THEORY MODEL

Weill and Olson [7] developed a model of contingency theory to fit the environment of Management Information System (MIS). As shown in Figure 1, the model assumes a rational behavior of MIS users. That means if a better MIS is designed, rational users will willingly use it, thus improving their contribution to organizational performance. However, there is a linear effect of contingency variables on MIS variables, and that lead to direct effect on MIS performance [7].

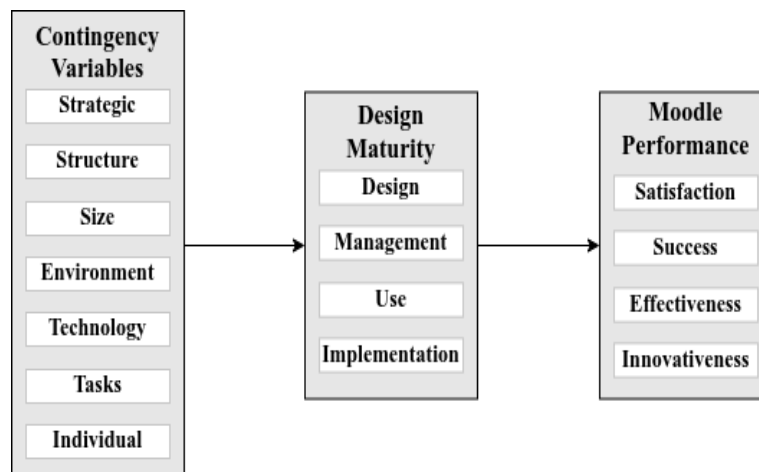


Figure 1: Contingency Moodle Performance

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One of the contingency theory strengths is its capability to predict nature that provides an understanding to the types of proper MIS that will be most effective in specific situations such as pandemic COVID-19, in the education environment.

The model of the *Contingency Moodle Performance* was constructed based on the contingency theory [7] which includes three factors that are: *Contingency*, *Design Maturity*, and *Moodle Performance*. Table 1 shows the items of the model factors and its adaptation references.

Table 1: Items of Contingency Moodle Performance Model's factors

Variable	Items	Reference
Contingency	Strategic	[20]
	Structure	[21]
	Size	[22]
	Environment	[23]
	Technology	[24]
	Tasks	[25]
	Individual	[24]
Design Maturity	Design	[26]
	Management	[27]
	Use	[28]
	Implementation	[29]
Moodle Performance	Satisfaction	[30]
	Success	[29]
	Effectiveness	[31]
	Innovativeness	[32]

IV. METHODOLOGY

Both primary and secondary data were collected for this study part. The primary data was collected by distributing questionnaires (survey) to the students of six Palestinian higher education in Gaza strip, that are University of Palestine (UP), Islamic University of Gaza (IUG), Al-Quds Open University (QOU), Al-Azhar University–Gaza, Al-Aqsa University, and Gaza University (GU). However, a purposive (non-probability) sampling method was used in selecting the participants (subjects).

To determine the sample size, the study used the rule of thumb by Roscoe [33] by multiplying the number of variables by 10. The model of *Contingency Moodle Performance* consisted of fifteen variables. Therefore, following the rule, the minimum sample size required is 150. However, to ensure this minimal response number, 480 respondents were collected from distinctive universities with different study programs and study levels. Indeed, the questionnaire was piloted and verified for language and understanding issues, since it was translated to Arabic language to meet the study environment.

The instrument comprises four sections that are general information; *Contingency* factors affecting the design maturity of the Moodle mobile education system; *Design Maturity* factors affecting the *Performance* of the Moodle mobile education system; and information systems factors affecting performance during the use of Moodle for mobile education. Some of the sections' items were generated from previous research and modified to fit the context of study and its environment when necessary. However, new items were developed through a literature review on the study environment.

Section A (General Information) was not containing any personal identifiable questions. The general information functions as a mechanism to collect users' demographic data which comprises gender, age, study level, study program, device type used. For the items of sections B, C, and D a 5-point Likert scale was anchored by "Strongly Disagree" (1) and "Strongly Agree" (5). For the ranges of five-point Likert-scales were categorized into equal sized categories of low, moderate and high. Therefore, scores of less than 2.33 [$4/3 + \text{lowest value (1)}$] is considered as low; scores of 3.67 [$\text{highest value (5)} - 4/3$] is considered high; and those in between considered moderate.

V. FINDINGS

A. Profile of the Respondents

As shown in Table 2, While majority (67.3%) of the respondents are females, (32.7%) of the respondents are males. This consistent with the current distribution of Bachelor students in the Palestinian HEIs [34]. It is reported that the majority of students 59.82% (39,070 students) are females while 40.18% (26,242 students) are males. Most of the respondents (94.6%) are young (aged between 18-23 years), while 5.4% only are aged more than 23 years old.

Such results It is not surprising since the majority students were in Bachelor level which reflecting the current practice of learning facilities in the higher education. Moreover, this is consistent with the distribution of students in the Palestinian HEIs where MOHE [34] reported that the majority of students are in Bachelor degree (73.81%, 65,312 students over 88,489 registered for academic year 2020/2021).

Table 2: Demographic Data of the Participants

Profile	Classification	N	(%)
Gender	Male	157	32.7
	Female	323	67.3
Age	18-23 years	454	94.6
	More than 23 years	148	30.8
Study Level	1 st year	112	23.3
	2 nd year	104	21.7
	3 rd year	92	19.2
	4 th year	24	5.0
	5 th year	148	30.8
Study program	Science	285	59.4
	Arts	127	26.5
	Business	68	14.2
Devise Type	Smart Phone	210	43.8
	Laptop	240	50.0
	Tablet	30	6.2

While Science study made up the largest groups of respondents, Art studies were 26.5% followed by Business (14.2%). Half of the participants declared that they use laptop for their learning activities on Moodle. However, 43.8% use smart phones and 6.2% use tablet devices.

To conclude, the above discussions indicate that the sample of this study does not deviate significantly from the general population of students in Palestinian HEIs and the sample is therefore deemed representative of the population of interest.

B. Validity and Reliability Testing

Most of the items used to measure the variables have been adopted from the literature. Even though the adopted measurements have been confirmed of its discriminate and convergent validity, it is felt necessary to re-examine the validity of these measures. This is because this study is undertaken in the Palestinian and Arab contexts which may be quite different from other countries and languages.

In order to ascertain whether the measurements used in this study have construct validity, that is, measure what they are supposed to measure, exploratory factor analysis was conducted on all items measuring the constructs of *Contingency*, *Design Maturity*, and *Moodle Performance*. However, factor analysis confirmed that variables for the three factors are statistically valid for this study [35].

Table 3 below summarizes the reliability test of all measures after factor analysis has been done. The Cronpach Alphas (α) of the measures were ranged from .699 to .871 are generally considered sufficient for research purposes [36, 37], hence, the scales can be regarded as relatively reliable.

Table 3: Reliability Coefficients for all variables

Variable	Items	# of items	Reliability (α)
Contingency (28 items) $\alpha = 0.926$	Strategic	3	0.756
	Structure	4	0.784
	Environment	4	0.705
	Technology	7	0.839
	Tasks	7	0.832
	Individual	2	0.618
Design Maturity (10 items) $\alpha = 0.857$	Design	3	0.733
	Management	3	0.749
	Implementation	3	0.609
Moodle Performance (11 items) $\alpha = 0.879$	Satisfaction	3	0.652
	Success	3	0.759
	Effectiveness	3	0.761
	Innovativeness	2	0.731

C. Descriptive statistics

As shown in Table 4, the mean values for all variables (i.e. Strategic, Structure, Size, Environment, Technology, Tasks, Individual, Design, Management, Use, Implementation, Satisfaction, Success, Effectiveness, Innovativeness) fall in the range of 3.28 and 3.81. Indeed, respondents are generally moderate in most variables -except strategic was low (Mean=3.28)- towards the use of the Moodle mobile education system among students in the PHEIs during coronavirus pandemic. However, with standard deviation of all variables are fall in the range .7943 and 1.8888, it indicates that statistically, the variation of all variables among respondents are high.

Table 4: Descriptive Statistics for All Variables

Variable	Items	Mean	Std. Dev.
Contingency (28 items)	Strategic	3.28	0.9450
	Structure	3.33	0.9044
	Size	3.34	1.1888
	Environment	3.41	0.8505
	Technology	3.48	0.7943
	Tasks	3.40	0.8144
	Individual	3.60	0.9853
Design Maturity (10 items)	Design	3.49	0.8946
	Management	3.46	0.9369
	Use	3.81	1.1283
	Implementation	3.51	0.9020
Moodle Performance (11 items)	Satisfaction	3.60	0.8683
	Success	3.43	0.9245
	Effectiveness	3.38	0.9482
	Innovativeness	3.41	1.0285

D. Correlation Analysis

The values of the correlation coefficients (r) indicate the strength of the relationship between variables. The computation of the Pearson product-moment correlation coefficients was performed to obtain an understanding of the relationship between all the variables in the study. Preliminary analyses were performed to ensure no violation of statistics assumptions of normality, linearity, and homoscedasticity [35, 36].

Overall correlation values of the contingency variables showed significant correlations coefficients. Furthermore, correlations amongst the measures of *Strategic, Structure, Size, Environment, Technology, Tasks, and Individual* are significantly correlated. In the same time all values of the *Design Maturity* and *Moodle Performance* variables showed significant correlations coefficients. The correlations amongst the measures of *Design, Management, Use, and Implementation* are significantly correlated. Furthermore, correlations amongst the measures of *Satisfaction, Success, Effectiveness, and Innovativeness* are significantly correlated.

E. Regression Analysis

In order to assess of the factors of contingency theory on performance of Moodle as m-learning system in the Palestinian HEIs during coronavirus pandemic, regression analyses were conducted. However, before conducting the analysis, the data were first examined to detect whether there is any serious violations from the basic assumptions underlying the regression analysis, namely linearity, normality and homoscedasticity [35, 36]. Overall, inspection on data revealed that there was no serious violation of the basic assumptions. Therefore, the use of regression for subsequent analysis is appropriate.

The interpretation of the regression analysis is based on the standardized coefficient beta (β) and R-Square (R^2) which provides evidence to validate and evaluate the model of *Contingency Moodle Performance* [35].

Regression Analysis on the Influence of Design Maturity on Moodle Performance

In order to answer the first research question (Which is the best predictor of *Moodle Performance*: Design, Management, Use, or Implementation), regression analysis on the influence of *Design Maturity* on *Moodle Performance*.

In this analysis, *Design, Management, Use, and Implementation* are treated as the independent variables, whereas factor of *Moodle Performance* as the dependent variables. Through regression analysis procedure, the variables of *Design Maturity* explain 50.8 percent ($R^2 = .508$) of the variance in *Moodle Performance*. Moreover, the model reaches statistical significance (Sig. = .000, this really means $p < .0005$). Table 5 shows that *Management* positively influences *Moodle Performance* ($\beta = .282$) followed by *Implementation* ($\beta = .266$).

Table 5: The Influence of Design Maturity Variables on Moodle Performance

	β	Sig.
Management	.282	.000
Implementation	.266	.000
Design	.227	.000
Use	.095	.014

F= 122.534; Sig. F= .000; N= 480; Dependent Variable: Moodle Performance

Regression Analysis on Factors Influencing Design Maturity

In order to answer the second research question (Which is the best predictor of *Design Maturity*: Strategic, Structure, Size, Environment, Technology, Tasks, or Individual), regression analysis on the influence of *Contingency Variables* on *Design Maturity*.

In this analysis, *Strategic, Structure, Size, Environment, Technology, Tasks, and Individual* are treated as the independent variables, whereas factor of *Design Maturity* as the dependent variables. Through regression analysis procedure, the variables of *Contingency* explain 50.1 percent ($R^2 = .501$) of the variance in *Design Maturity*. Moreover, the model reaches statistical significance (Sig. = .000, this really means $p < .0005$).

Table 6 shows that of all the variables included in the regression equation, only two variables emerged as significant predictors of *Design Maturity*, these are *Size* ($\beta = .060$) and *Structure* ($\beta = .059$). However, results show that the most influence *Design Maturity* was *Individual* ($\beta = .251$) followed by *Tasks* ($\beta = .167$) and *Environment* ($\beta = .158$).

Table 6: The Influence of Contingency Variables on Design Maturity

	β	Sig.
Individual	.251	.000
Tasks	.167	.001
Environment	.158	.000
Technology	.127	.006
Strategic	.124	.002
Size	.060	.122
Structure	.059	.186

F= 67.829; Sig. F= .000; N= 480; Dependent Variable: Design Maturity

T-tests (*Independent-Samples T-Test* and *One-Way ANOVA*) was conducted to explore the impact of *gender*, *age*, *study level*, *study program*, and *devise type* groups on levels of all measurements. Results indicate that there is no statistically significant difference in the mean of all variables, i.e. respondents with different *gender*, *age*, *study level*, *study program*, and *devise type used* are found to perform similar level of *Contingency*, *Design Maturity*, and *Moodle Performance* variables.

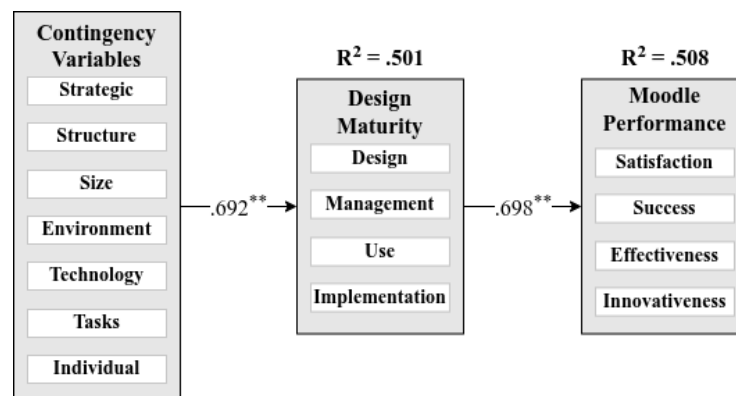


Figure 2: Research Model with Correlation Coefficients and R-Square

For the open-ended question that asked in the questionnaire "*Do you have any comment on the Moodle performance in your university during the COVID-19?*", students registered some recommendations and a practical comments that should be considered by the universities to make some actions to enhance Moodle performance and its utilization in their environments.

VI. CONCLUSION

During the *Coronavirus Pandemic* Palestinian HEIs were utilized the Moodle as online learning systems. Furthermore, Student’s perspective is very important to assess the success of utilizing m-learning in the higher education environment since it based on user-centered, especially on the contingency. Findings of this study confirmed that the usage of Moodle by students in the higher education environment have positive influence on the education performance. Consequently, the contingency variables are important to influence students’ use of m-learning. This suggesting that the HEIs should pay more attention to facilitate the more service of Moodle in their learning environment. Furthermore, both academics and administrators should care about some students comments such as “Need more information about advanced features”, “Connection sometimes is slow especially during exam and peak time”, “User interface needs to be improved”, “Some teachers are not interested in it and are have low skills with the online services”, and “We need enough staff to follow up on students' problems”

With regards to assess the contingency theory on performance Moodle as a m-learning in the Palestinian HEIs, Results shows that the Design Maturity explain 50.8% of the Moodle performance. Furthermore, among its variables Management variable is the best predictor of Moodle Performance followed by Implementation. The the best predictor of Contingency variables is Individual followed by Tasks and Environment with 50.1% of explanation of the Design Maturity. Indeed, students registered some recommendations and a practical comments that should be considered by the universities to make some actions to enhance Moodle performance and its utilization in their environments.

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