An Empirical Examination of Antecedents Determining Students' Usage of Clickers in a Digital Marketing Module

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Abstract: As more and more educational institutions are integrating new technology such as clickers into their learning system, it becomes increasingly essential to have an understanding of students' perceptions about such technology on their overall learning process. The incorporation of clickers into teaching instructions has created implications for teaching practices and student satisfaction. The purpose of this research is to understand student use and satisfaction with clickers in a large undergraduate digital marketing class in a British university. To do so, we propose a conceptual model based on information systems (IS) success models to understand student's usage behavior and satisfaction with clickers. The data were analysed based on 138 valid responses gathered from the students, where clickers are effectively used for teaching and learning purposes. The results provided a strong support for all eight hypothesised relationships and adequate variance on its key dependent variables in the proposed research model.

***Keywords**:* Clickers, Higher Education, IS Success Models, Student, Usage, United Kingdom

Reference to this paper should be made as follows: Rana, N.P. and Dwivedi Y.K. (---) 'An Empirical Examination of Antecedents Determining Students' Usage of Clickers in a Digital Marketing Module,' *International Journal of Business Information Systems,* Vol. 0, No. 0, pp.00-00.

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1 Introduction

Information technology (IT) has been recently considered as a strategic resource in educational settings, offering educational institutions a unique opportunity to enhance student motivation and improve their learning outcomes (Bojinova and Oigara, 2013; Gorard et al, 2000; Henderson et al, 2015; Madni et al, 2015; Rana et al, 2016b; Roblyer and Wiencke, 2003; Tlhoaele et al, 2014; Volman and Dam, 2007). IT

acceptance in education remains a crucial concern of information systems (IS) research and practice. Although IT is playing an increasingly significant role in modern education, resistance to IT remains important in education sector (Mandal et al, 2016; Xu and Yu, 2004). Understanding the conditions under which ITs are or are not accepted and used by students continues to be a significant issue (Escobar-Rodriguez and Monge-Lozano, 2012).

A number of emerging technologies have been used to allow students to participate in real time polling and assessment in the classroom (Nielsen et al, 2014; Voelkel and Bennett, 2013). Although these technologies are discussed under a variety of terms, one of the most frequently used terms for this device is "clickers" (Hoanca, 2013). Clickers refer to a wireless system that enables professors to ask questions and have students respond those using hand-held devices. The questions and the results summarising the student responses can be presented instantaneously on the classroom's projector (Han and Finkelstein, 2013). Clickers offer an opportunity to help alleviate students' fears of participating by offering a way for them to contribute without revealing their responses publicly. Moreover, the instant feedback allows instructors the opportunity to immediately evaluate how well the content of the module being covered is understood by the class. Based on the understanding, the instructors can then adjust the course content and the pace of delivery accordingly (Fryling, 2013; Koppel and Berenson, 2009).

Clickers have been adopted in recent years as a way to promote an active learning environment (Cunningham, 2006; Fryling, 2013; Hoffman and Goodwin, 2006). The immediate feedback that clickers offer has been shown to engage students more actively in the classroom (Fryling, 2013; Stowell et al, 2010). Generally, students in large classroom settings have

responded positively to the use of clickers and they have been found to enhance student participation (Fryling, 2013; Mollborn and Hoekstra, 2012). The use of clickers helps students to understand the concepts of the course materials and significantly improves their learning process (Blasco-Arcas et al, 2013; Rana et al, 2016a).

Business education has received some of the toughest criticisms as studies have found business undergraduates spend less time studying and have smaller gains on standardised tests than other undergraduates. These problems are likely partially attributable to business students' lack of engagement and accountability, problems that are aggravated by large class sizes at many colleges and universities. An increasingly adopted classroom technology to address these issues is "clickers" (Hedgcock and Rouwenhorst, 2014). Our experience of using clickers in a large classroom setting also designates that clickers tend to be an effective tool for delivering quality education by constructively engaging students, enhancing students' participation in the learning process, and providing them effective feedback on time. At the time of intense competition among universities where they intend to attract students from all across the world, the use of a technology like clickers in the classrooms would give advantage to the universities' overall drive to provide and promote quality education.

Despite recent interests in the role of clickers, several aspects prevent researchers from fully realise its influence on student learning (see Kay and LeSage, 2009). First, there is a lack of quantitative research, which, if based on sound theory, could help us better understand the role of clickers in student learning and the underlying mechanisms (Blasco-Arcas et al, 2013; Fies and Marshall, 2006) that explain the subsequent impact on their behavioral intentions and satisfaction outcomes. Second,

the prior research studies on clickers have been conducted on a limited set of educational settings, mainly on technical and scientific subjects such as such as mathematics, chemistry, engineering, and astronomy. However, none of them have explored students' use behavior and satisfaction with this technology. Therefore, the objective of this research is to explore students' perception about the use of clickers in the Digital Marketing module in a large classroom setting.

2 Literature Review

A number of studies (e.g., Blasco-Arcas et al, 2013; Farag et al, 2015; Fryling, 2013; Guthrie and Carlin, 2004; Han and Finkelstein, 2013; Marshall et al, 2012; Rana and Dwivedi, 2016; Thoms and Williams, 2010) have researched clickers in the field of business studies. The review of literature indicates the most of the quantitative studies (e.g., Fryling, 2013; Hedgcock and Rouwenhorst, 2014; Stagg and Lane, 2010) are quite exploratory in nature where their analyses are primarily limited to analyse the means, medians, and standard deviations of the responses on the data gathered on different scales and reported the students' or instructors' perceptions about the use of clickers in small and large classroom settings. For example, Fryling (2013) found that use of clickers resulted in improving class participation. Hedgcock and Rouwenhorst (2014) examined the effectiveness of providing immediate feedback with clickers on multiple measures of student performance, including exam scores, self-reported understanding, and attitudes. The study analysed the survey responses using basic statistical analyses such as mean, standard deviation, and analysis of variance. Similarly, Stagg and Lane (2010) adopted a quantitative approach to examine the effectiveness of clickers toward improving information literacy of business students. The use of clickers allowed the teacher to effectively determine a baseline of student

understanding. The literature review also suggests that questions related to students' engagement, performance, participation, feedback, active learning experience, satisfaction, attendance, and attitude were some of the most studied items analysed across the different studies. For example, some studies (e.g., Fryling, 2013) analysed how use of clickers enhances students' engagement and participation whereas some others (e.g., Premuroso et al, 2011) explored their performance and satisfaction. However, findings of these studies are exploratory in nature and deserve further investigation.

Moreover, some other quantitative studies (e.g., Blasco-Arcas et al, 2013; Chui et al, 2013; Dunnett et al, 2011; Eastman et al, 2011; Keough, 2012; Lojo, 2009) examined the different factors including student performance, attitude, satisfaction etc. but are largely inconclusive and need additional attention. For example, Chui et al (2013), Dunnett et al (2011), Keough (2012), and Lojo (2009) have just analysed mean, standard deviations, and hypothesis-based t-test to analyse certain factors such as students' performance, attendance, and satisfaction for clicker and non-clicker users and compare these statistics to understand their perceptions on clickers use. Although couple of studies (e.g., Blasco-Arcas et al, 2013; Eastman et al, 2011) on clickers have developed research models and tested them using structured equation modelling, they are largely based on the selection of some of the frequently encountered factors that influence students' attitude, satisfaction, and overall performance. For example, Blasco-Arcas et al (2013) examined the impact of learning and engagement on student performance.

Similarly, Eastman et al. (2011) examined whether the students' perception of interactive technology in terms of attention and preparation leads them to positive attitude toward using it and satisfaction with the

technology. However, none of the studies on clickers in the business discipline has ever undertaken any research based on established models of technology adoption or success. To fill in this research gap, this study will test the proposed research model, which is based on the extended Seddon's (1997) IS success model to understand how system quality, information quality, and usefulness of clickers impact students' behavioral intention, use behavior, and satisfaction with this technology. Farag et al. (2015) measured the clicker use in legal studies among business faculty and examined perceptions and factors linked with the adoption of clickers in the discipline. Survey results indicated that most of the legal studies in business faculties have either never used or hardly used clickers and a very few members in the discipline use clickers very regularly. Moreover, Rana and Dwivedi (2016) examined the impact of factors such as usefulness and ease of use on students' acceptance and use of and satisfaction with clickers in a business class. The results provided a strong support for the proposed research model with significant impact of usefulness and ease of use on behavioral intentions and satisfaction.

3 Research model development and hypotheses

3.1 IS success models (DeLone and McLean, 1992, 2003; Rai et al, 2002; Seddon, 1997)

The first IS success model was given by DeLone and McLean (1992) with six factors namely system quality, information quality, use, user satisfaction, individual impact, and organisational impact (DeLone and McLean, 1992). Moreover, as DeLone and McLean (1992) pointed out "usage, either perceived or actual, is only pertinent when such use is voluntary" (p.68). When the usage of the system is mandatory, the number of hours a system is used conveys little information and the usefulness of the system, and so its success. Seddon and Kiew (1996) argued actual use

of the system as a good proxy for usefulness in situations where a tool is used and use is not compulsory. It then offers a simple objective measure of success (Seddon and Kiew, 1996). In order to address criticism by several studies (e.g. Seddon and Kiew, 1996) relating to some of its constructs such as individual and organisational impact and use, Seddon (1997) respecified DeLone and McLean's (1992) model where the perceptual measures of net benefits of IS use included perceived usefulness and user satisfaction as surrogates for IS effectiveness success. Seddon (1997) also argued that the two key variables information quality and system quality from DeLone and McLean's (1992) model are not properties of an IS department. Rai et al. (2002) commented that single organisation settings prevent researchers examining certain class of variables including organisational impact. Seddon (1997) supported for the removal of system use as a success variable in the causal success model claiming that use is behavior suitable to be included for process model and not for the causal model. However, DeLone and McLean (2003) in the formulation of the extended IS success model argued that use will continue to be a significant indication of IS success for a number of systems. In addition, given the difficulties in explicating the multi-dimensional aspects of use, DeLone and McLean (2003) suggested intention to use or behavioral intention as an appropriate alternative measure where individual's attitude toward using the system is significant to explore.

3.2 Overview of proposed research model

Based on the above originating research on IS systems success, we included constructs such as *system quality*, *information quality*, and *perceived usefulness* and dependent variables including *behavioral intentions, use behavior*, and *user satisfactions*. To see the model in the

broader perspective, *information quality* and *perceived usefulness* were considered as not only the determinants of behavioral intentions, but also presented to determine the student's satisfaction (as specified in Seddon's (1997) IS success model). Moreover, student's actual system use is also considered to be a direct determinant of his/her satisfaction with the technology. DeLone and McLean's (1992) IS success model posits that positive experience with *use* will lead to a greater *user satisfaction* in a causal sense. Seddon (1997) postulates the significant impact of *system quality* and *information quality* on *perceived usefulness*. Moreover, the research (e.g., Gorla *et al*, 2010) implementing the IS success model has also supported the significant impact of *system quality* on *information quality*. In other words, the better quality of the system using clickers would ensure the clear and relevant information to be used by the students.

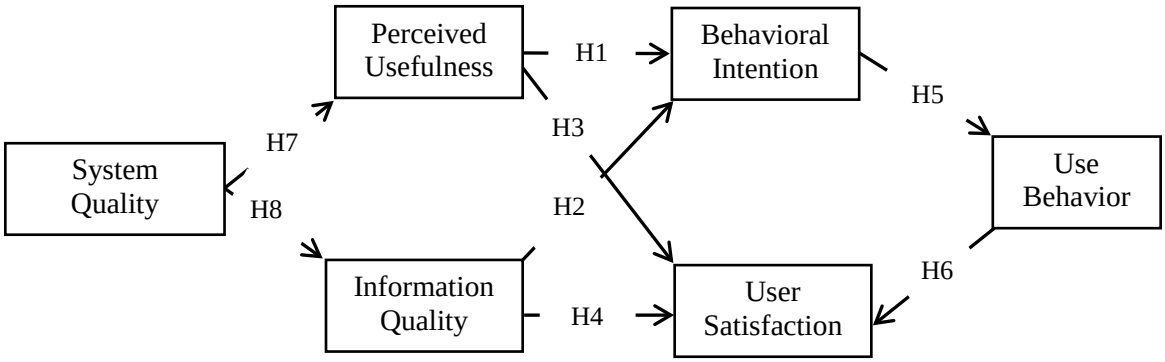

Figure 1: Proposed Research Model (Source: Davis, 1989; DeLone and McLean, 1992, 2003; Seddon, 1997)

Considering support for the various relationships along the different IS success models (e.g. DeLone and McLean, 1992; Seddon, 1997), the proposed research model (see Figure 1) postulates that *perceived usefulness* and *information quality* will have a positive and significant impact on both *behavioral intention* and *user satisfaction*. *Behavioral intention* will have a positive and significant impact on *use behavior*, which, in turn, positively determines *user satisfaction*. Also,

system quality and *information quality* will have a significant impact on *perceived usefulness* and *system quality* also determines *information quality*. In other words, we would postulate eight different hypotheses based on different relationships that have been considered for analysis to our proposed research model.

3.3 Hypotheses development

As illustrated in Figure 1, a total of eight hypotheses are proposed based on the relationships between six constructs. Table 1 presents the hypotheses for the various relationships for the proposed research model significantly supported by the relevant studies of IS adoption and success.

Table 1: Proposed Hypotheses

H#	*IV→DV*	*Supporting Source(s)*
H1	Perceived Usefulness→Behavioral Intention	Al-Debei (2014), Davis (1989), Davis et al (1989), Rana and Dwivedi (2016)
H2	Information Quality→Behavioral Intention	DeLone and McLean (2003), Petter and McLean (2009), Rana et al (2015c)
H3	Perceived Usefulness→User Satisfaction	Rai et al. (2002), Seddon (1997)
H4	Information Quality→User Satisfaction	DeLone and McLean (1992), Petter and McLean (2009), Rana et al (2015a), Rana et al (2015b)
H5	Behavioral Intention→Use Behavior	Davis (1989), Davis et al (1989), Venkatesh et al (2003)
H6	Use Behavior→User Satisfaction	DeLone and McLean (1992), Petter and McLean (2009)
H7	System Quality→Perceived Usefulness	Rai et al. (2002), Seddon (1997)
H8	System Quality→Information Quality	Gorla et al (2010)

[Note: DV: Dependent Variable, IV: Independent Variable, H#: Hypothesis Number]

4 Research Methodology

The sample for this study was gathered from level two undergraduate students of Business from a British university about their perceptions on using clickers in the Digital Marketing module. Every student is given clickers at the time of their admission in the university. The students primarily use clickers for registering their attendance across

all the modules. However, it is also used as an effective tool for student engagement and active participation in teaching and learning process across various modules including Digital Marketing. Clickers use Microsoft's Office PowerPoint in building the content of the module using the TurningPoint application and allow embedding various multiple-choice questions related to the topics of teaching to understand students' attentiveness and engagement with the module. Students have shown their positive intent toward this pedagogical technique for better and in-depth understanding of the course.

There are a total of 151 students for this module. We conducted a paper based questionnaire survey to understand students' perception on the use of clickers and asked them 16 questions (see Appendix A) relating to six variables included in the proposed research model. The survey items were measured using seven-point Likert scale ranging from '1'-(strongly disagree) to '7'-(strongly agree). We conducted this survey during the lecture and seminar sessions to get hold of as many number of students as possible for about two weeks. We distributed this questionnaire to 140 students who were present during the lecture and lab sessions during the specified weeks. Students were asked to go for the most appropriate option as per what they perceive the best response for the questions should be. They were also ensured about the anonymity of their personal identification. Two questionnaires were removed from the final analysis, as they were found incomplete during the scrutiny. Hence, we got 138 valid responses for the final analysis. This research performed the structural equation modelling (SEM) using AMOS 22.0 to develop a research model that represents the eight relationships between six variables.

5 Research Results

As per the questionnaire results, of the overall 138 responses, the male students accounted for 60% of the sample whereas 40% were female students. The remaining sections will present the descriptive statistics, measurement model, and structural model testing for the constructs of the proposed research model.

5.1 Descriptive Statistics

Table 2 presents mean, standard deviation, and Cronbach's alpha (α) for each construct used in the proposed research model. The mean values for all constructs were found close to six on the Likert scale of [1-7] with '7' representing 'strongly agree'. This indicates that users largely responded positively about the clickers. A reasonably moderate standard deviation around one for all the constructs indicate that users' views were not reasonably divergent as far as their perception about using clickers in the module is concerned.

Reliability analysis was implemented using Cronbach's alpha (α). It is used for assessing the reliability of the scale that provides an indication about the internal consistency of the items measuring the same construct (Hair *et al*, 1992; Zikmund, 1994). Cronbach's alpha (see Table 2) for all the constructs was found to exceed the recommended minimum acceptable level of 0.70 (Hair *et al*, 1992; Nunnaly, 1978).

Table 2: Mean and Standard Deviation (SD) of Items (N=138)

Construct	*Mean*	*SD*	*Cronbach's Alpha (α)*
Perceived Usefulness (PU)	5.49	0.88	0.722
System Quality (SYQ)	5.82	0.85	0.799
Information Quality (IQ)	5.48	1.02	0.857
Behavioral Intention (BI)	5.87	0.87	0.872
Use Behavior (UB)	5.92	1.06	0.789
User Satisfaction (US)	5.58	1.06	0.874

5.2 Measurement Model

The study tested the convergent and discriminant validity of the scales using confirmatory factor analysis (CFA) to justify the measurement model. Anderson and Gerbing (1988) recommended three ad hoc tests for convergent validity. Table 3 shows the factor loadings (FLs), composite reliabilities (CRs), and average variance extracted (AVE) for this purpose. FLs are representative of the level of association between scale items and a single latent variable. The loadings are found highly significant in all cases. CRs, similar to Cronbach's alpha, were found well beyond the minimum limit of 0.70 (Hair *et al*, 1992; Nunnaly, 1978) in each case. AVE estimates are measures of the variation explained by the latent variable to random measurement error (Netemeyer *et al*, 1990) and ranged from 0.688 to 0.865 for all constructs. These estimates are found performing better than the recommended lower limit of 0.50 (Fornell and Larcker, 1981). Hence, all three tests related to convergent validity of the scales were supported.

Table 3: Results of Confirmatory Factor Analysis

Measure	*FL*	*CR*	*AVE*
Perceived Usefulness (PU)			
PU2	0.74	0.776	0.688
PU3	0.85		
Information Quality (IQ)			
IQ1	0.95	0.829	0.756
IQ2	0.72		
IQ3	0.67		
System Quality (SYQ)			
SYQ1	0.73	0.824	0.741
SYQ2	0.80		
SYQ3	0.81		
Behavioral Intention (BI)			
BI1	0.91	0.896	0.865
BI2	0.80		
BI3	0.87		
Use Behavior (UB)			
UB2	0.70	0.818	0.761
UB3	0.95		

User Satisfaction (US)			
US1	0.76	0.839	0.769
US2	0.80		
US3	0.83		

Moreover, Anderson and Gerbing (1988) recommended the measure for discriminant validity. To pass this assessment, the factor correlation between a pair of latent variables should be less than the square root of AVE (shown along the diagonal of the table in bold fonts) of each variable as presented in Table 4 through factor correlation matrix. The evaluation of this validity indicates that the square root of AVE for each variable of the pair is always greater than the correlation value for that pair of variables. For example, correlation between use behavior and behavioral intention is 0.706, which is less than the square root of AVE shown along the diagonal of both these variables (i.e., 0.873 and 0.896 respectively). In other words, a variable is considered to be different from other variables if the square root of the AVE for it is greater than its correlations with other latent variables (Smith and Barclay, 1997), which is satisfied for every variable of the proposed research model of the current study.

Table 4: Factor Correlation Matrix

Variable	*PU*	*IQ*	*SYQ*	*BI*	*UB*	*US*
PU	0.830					
IQ	0.300**	0.869				
SYQ	0.382**	0.519**	0.861			
BI	0.568**	0.406**	0.446**	0.896		
UB	0.478**	0.244**	0.390**	0.706**	0.873	
US	0.606**	0.398**	0.458**	0.705**	0.700**	0.877

[Note: Square root of AVE on Diagonals in **Bold**] [Significance: **p<0.01]

5.3 Structural Model Testing

The overall model fit statistics looks adequate as can be seen from Table 5. The test of overall model fit resulted in a χ^2 value of 125.647 with degrees of freedom (DF) of 94 and a probability value of less than 0.016. The significant p-value indicates that the absolute fit of the model is less

than desirable. However, although the χ^2-test of absolute model fit is sensitive to sample size and non-normality, a better measure of fit is χ^2 over DF. This ratio for the proposed research model here is 1.337, which is within the suggested [3-1] bracket (Chin and Todd, 1995; Gefen, 2000).

Table 5: Model Fit Summary for the Research Model

Fit Statistics	*Recommended Value*	*Model Value*
Chi-Square (χ^2)/Degree of Freedom (DF)	≤ 3.000	125.647/94=1.337
Probability Value (p)	> 0.05	0.016
Goodness of Fit Index (GFI)	≥ 0.900	0.903
Adjusted Goodness of Fit Index (AGFI)	≥ 0.800	0.859
Comparative Fit Index (CFI)	≥ 0.900	0.979
Tucker-Lewis Index (TLI)	≥ 0.950	0.973
Root Mean Square Error Approximation (RMSEA)	≤ 0.060	0.050

In addition to the above-mentioned ratio, we also report some of the fit indices. Descriptive fit statistics compare a specified model to a baseline model, typically the independence model, with a view to show the superiority of the proposed research model. We report the Goodness-of-Fit index (GFI), the adjusted GFI (AGFI), the Comparative Fit Index (CFI), and the Tucker-Lewis index (TLI). Gerbing and Anderson (1992) found CFI as one of the most stable and strong fit indices. We also report RMSEA (Root Mean Square Error of Approximation), which measures the discrepancy per degree of freedom (Steiger and Lind, 1980).

The GFI should be at or above 0.90 (Hoyle, 1995), while the AGFI should be at or above 0.80 (Chin and Todd, 1995; Segars and Grover, 1993). The CFI statistics should be at or above 0.90 (Bentler and Bonett, 1980; Hoyle, 1995). TLI is more restrictive and requires a value of 0.95 or above (Hu and Bentler, 1999). Finally, RMSEA has been suggested to represent a reasonable error of approximation and indicative of good fit between the hypothesised model and the observed data if it is below the more restrictive threshold of 0.06 (Hu and Bentler, 1999). Table 6

illustrates these statistics and found all of them in accordance within the recommended levels.

Having established the relative suitability of the model's fit, it is appropriate to examine individual path coefficients corresponding to our hypotheses as presented in Table 6.

Table 6: Path Coefficients and Hypotheses Testing

Constructs' Relationship	*Standardised Regression Weight*	*Critical Ratio (CR)*	*Significance (p)*	*Hypothesis-Supported (YES|NO)*
PU→BI	0.681***	6.587	p<0.001	H1-YES
IQ→BI	0.192*	2.224	p=0.026	H2-YES
PU→US	0.383***	3.329	p<0.001	H3-YES
IQ→US	0.163*	2.363	p=0.018	H4-YES
BI→UB	0.904***	14.492	p<0.001	H5-YES
UB→US	0.552***	5.189	p<0.001	H6-YES
SYQ→PU	0.589***	5.718	p<0.001	H7-YES
SYQ→IQ	0.702***	5.689	P<0.001	H8-YES
R^2(BI)	0.61	[Note: CR: Critical Ratio, p: Significance: *p<0.05, ***p<0.001]		
R^2(UB)	0.82			
R^2(US)	0.90			
R^2(PU)	0.35			
R^2(IQ)	0.49			

All eight hypotheses are supported. For example, perceived usefulness and information quality significantly influenced behavioral intention (i.e., H1 and H2) and user satisfaction (i.e., H3 and H4). Moreover, behavioral intention positively influenced use behavior (i.e., H5), which in turn, significantly determined user satisfaction (i.e., H6). Also, system quality was found to significantly determine perceived useful (i.e., H7) and information quality (i.e., H8). The results also highlighted that all the path coefficients between a pair of variables are very strong and highly significant at the level of $p<0.001$ except relationships of information quality with behavioral intention ($\beta=0.192$, $p<0.05$) and user satisfaction ($\beta=0.163$, $p<0.05$).

Figure 2 shows the validated research model with path coefficients and significance of each relationship. It also demonstrates the variance of the model shown on each of the three dependent variables (i.e., behavioral intention, use behavior, and user satisfaction). A relatively high variance shown by the model in BI (i.e., 61%), UB (i.e., 82%), and US (i.e., 90%) indicates that the fundamental combination of variables used in the research model is particularly significant and determines a large proportion of variables for the model. Also, the variance explained in PU (i.e., 35%) and IQ (i.e., 49%) is adequately enough to indicate that the overall combination of constructs make the proposed model a highly performing model.

6 Discussion

As more and more educational institutions assimilate clickers into their learning systems to improve the overall teaching and learning process, it becomes increasingly essential to have a comprehensive understanding of the mechanisms behind the use of clickers in the educational setting. (Blasco-Arcas *et al*, 2013). In this study, our primary objective is to identify and understand the use of clickers in the student learning process and explore student's perceptions about it. The results of our empirical study provided strong support for the proposed model.

Our findings suggest that perceived usefulness significantly influenced students' behavioral intention. This may suggest that students are relatively "pragmatic" and tend to focus on the usefulness of the technology itself. Therefore, for the clicker technology to be accepted by the students, it would be necessary to demonstrate its ability to fulfil the needs of individual students, who tend to treat clickers as tools, acceptable only when desired values in their practices have been proven. In this connection, proper user training is essential in directing and solidifying the

students' perceptions of the usefulness of the technology (Hu *et al*, 1999). The significant impact of perceived usefulness on user satisfaction indicates that effectiveness and usefulness of clickers in the classroom has successfully fulfilled student's needs to interact with the lectures and met their expectations and overall satisfaction in the classroom. The significance of this relationship is consistent with the prior research (e.g., Rai *et al*, 2002; Seddon, 1997) on IS success.

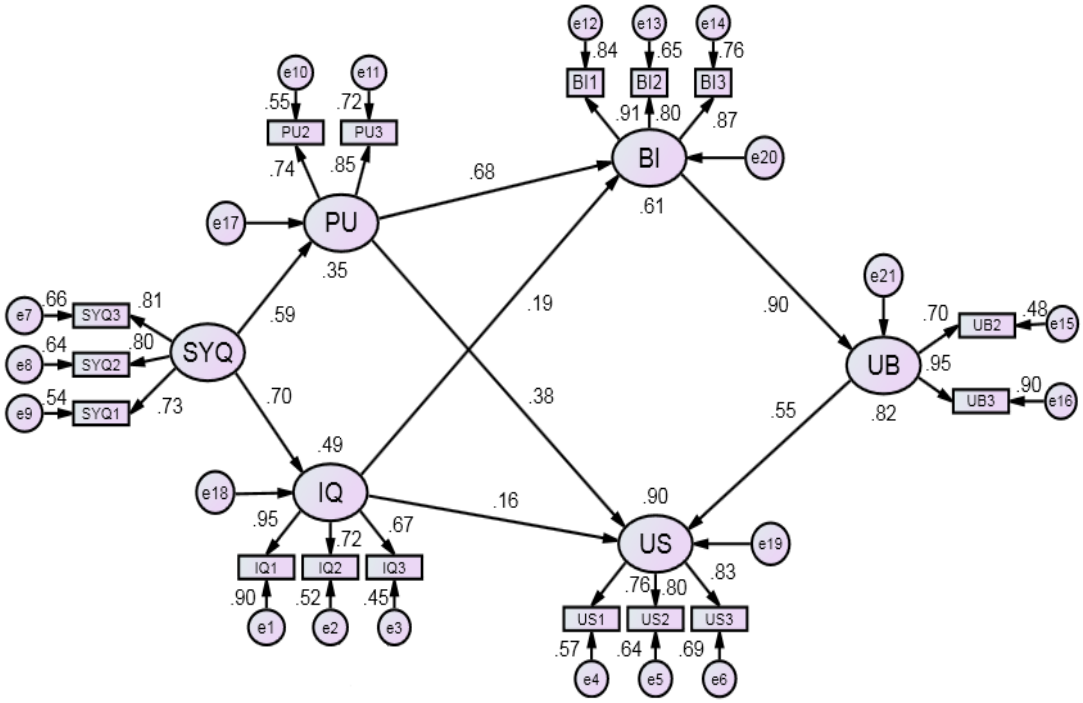

Figure 2: Validated Research Model

The significant influence of information quality on behavioral intentions and user satisfaction indicates that higher levels of outputs offered by clickers in terms of its accuracy, precision, currency, timeliness, adequacy, understandability, and conciseness (Petter *et al*, 2013) lead students to use and feel satisfied with it in terms of overall information quality demonstrated by this system. The relatively low path

coefficients of information quality on behavioral intention and user satisfaction indicate that designers need to work out more on how to make the information related to operation of the device in relatively easier fashion. For example, students are often found to query that they don't know which channel the device should be tuned to synchronise with the displayed TurningPoint application on the screen. Although the mechanism for setting the clickers to the certain channel is available in the device, it is not by default displayed on the computer screen with the TurningPoint application on.

The positive impact of students' behavioral intentions on use behavior indicates that students' intentions to use clickers very closely determine their behavior to use the technology in the future learning processes as well. Many studies (e.g., Davis et al, 1989; Kaeomanee et al., 2014; Venkatesh and Davis, 2000) on technology adoption have endorsed a strong causal relationship between these variables. Subsequently, the higher actual use behavior leads students to greater overall satisfaction with the clickers system (Bojinova and Oigara, 2013). The continuous use of clickers fulfils student needs for constructively interacting and engaging with lectures, which eventually leads to individual satisfaction. The information systems success model (DeLone and McLean, 1992) has also endorsed the relationship of these variables.

The strong and significant impact of system quality on perceived usefulness indicates that -the qualities of clickers (such as its user friendliness, ease of use of handling) could be deciding factors toward enhancing student's learning experience and its usefulness during the lecture. The results also indicate positive and significant relationship between system quality and information quality. This indicates that improvement in system quality can support deliver easy-to-understand

information outputs (in terms of content and format) and timely reports (Gorla *et al*, 2010).

6.1 Implications for Theory

This is a first study of its type, which has empirically tested the combined model of the various IS success models (DeLone and McLean, 1992; Seddon, 1997) to have a good understanding of students' use of clickers and the overall success of this technology in the digital marketing module. This research lays a foundation for validating this combined model through which the further research on clickers use and satisfaction can be developed and empirically tested. This study has highlighted some critically important relationships (such as system quality to information quality, behavioral intention to use behavior, and use behavior to user satisfaction) as far as the student's perception about clickers use in a large business class is concerned. The researchers can use these findings to implement it in any future study relating to clickers use.

6.2 Implications for Practice

In addition to the theoretical contribution, the outcomes from the validated research model suggest important implications for practice on clickers use and satisfaction in educational setting. The relatively weak though significant path coefficients of information quality with behavioral intention and user satisfaction indicate that the providers of this technology need to work more toward improving the accuracy, timeliness, and relevance of information produced by clickers. Also, there should be a proper training provided to students to be well aware of all different information options. For example, the training should make students aware about how to use this device beyond merely selecting one out of given number of options to choose the correct answer. As each clicking button of this device is embedded with a number of characters, the

students must be educated to use them under different situations. The teachers should also be –given proper training to make an optimal use of the information provided by clickers to enhance the students' learning and engagement process. This is important as students' reflective engagement about their learning and use of technology establishes a critical aspect of effective learning and developing learning independence among students.

Similarly, the findings also indicate that system quality also needs to be enhanced to improve the information quality and usefulness of the system. The designer needs to consider some technical glitches experienced by students experience while handling the device. For example, sometimes the device either stops working or it does not register the student's response even if it is functional. The maintainability of the quality of clickers is very important so far as the students' positive experience relating to this device is concerned. The teachers should also take initiatives to use clickers more effectively to achieve transformative learning (i.e., learning that is an outcome of student's interactions with classmates, resources, and teacher) so that students find it useful and intend to use it in the future as well.

7 Conclusions

This research is a timely response to the lack of empirical research on the use of clickers in the business discipline. As there has not been any such empirical research undertaken on clickers use and student satisfaction with this system in business discipline, the current study fulfils this research gap by developing and validating a research model based on the strong basic foundations of the various IS success models (DeLone and McLean, 1992; Seddon, 1997). The research found significant relationships between all six constructs. The results from this study are expected to be helpful in improving and enhancing student learning

experience. The unique contribution of this research is to propose a conceptual model based on the existing models of IS/IT adoption and success and validate it to find that hypothesised relationships are found significant in the context of the current setting. This study also adds particular value to the research on clickers, as the models of IS/IT adoption and success have not been used together to understand students' use of and satisfaction with the clickers before.

7.1 Limitations and future research

First, our sample consists only of students who have used clickers for the learning of different modules including Digital Marketing. The future researchers can test the proposed research model across two different student groups i.e., clicker users and non-users. Secondly, the sample size gathered to analyse the data was relatively small as this research was mainly focused on the use of clickers in the digital marketing module. The future researchers can test the model using large and mixed (i.e., collected from other business modules) sample. Thirdly, although the variance explained by the model on behavioral intention (i.e., 61%) was reasonably high, it is worth testing the model with some more specific learning-oriented factors including learning experience, engagement, interactivity etc. Finally, the findings of this research are only limited to responses obtained from second year undergraduate students of digital marketing module of a British university, the future researchers should be little cautious to apply it in other situation.

Acknowledgements

The authors would like to acknowledge the valuable contributions of the reviewers and editor who have provided constructive comments to improve the quality of the paper.

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Appendix [A]:

The following questions were asked to respondents on Likert scale [1-7] where [1]=Extremely Disagree and [7]=Extremely Agree: [Legend: BI: Behavioral Intention [Venkatesh et al. (2003)]; IQ: Information Quality [Seddon and Kiew (1996)], PU: Perceived Usefulness [Davis (1989), Davis et al. (1989)]; SYQ: System Quality [Moore and Benbasat (1991)]; UB: Use Behavior [Venkatesh et al. (2003)]; US: User Satisfaction [Seddon and Kiew (1996)]]

PU2. Using clickers improves my learning experience in the lectures
PU3. I find clickers useful in my lectures
SYQ1. I find it easier to get clickers to do what I want it to do
SYQ2. The clickers are easy to use
SYQ3. The clickers are user friendly
IQ1. I am satisfied with the accuracy of feedback provided by clickers
IQ2. Information (feedback of question/correct answer) provided by clickers is reliable
IQ3. Information (feedback of questions/No. of correct answers) provided by clickers is accurate
BI1. I intend to use clickers in my lectures
BI2. I predict that I would use clickers in my lectures
BI3. I plan to use clickers in lectures in near future

UB2. I prefer clickers to the traditional/manual question answering process
UB3. I will continue using clickers to in my lectures
US1. The clickers has met my expectations in lectures
US2. The clickers effectively fulfilling my needs of interacting with lectures
US3. Overall, I am satisfied with the use of clickers in lectures