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THE ROLE OF COMPATIBILITY AS A MODERATING VARIABLE IN THE INFORMATION SYSTEM SUCCESS MODEL: THE CONTEXT OF ONLINE LEARNING USAGE

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ABSTRACT

As information and communication technology (ICT) is making the leap to transform all aspects of life, online learning has become widely viewed as the future of education. As one of the least developed countries, Yemen is lagging behind in the adoption of ICT, being faced with many challenges, limited resources, weak infrastructure, and a high student population, the focus of this research will be on Yemeni Institutes of Higher Education and the role of the Yemeni norms and culture that may affect online learning use in Yemen. This conceptual article extends the Delone & Mclean Information System Success Model (DMISM) with compatibility as a moderating variable. The anticipated findings will provide a guideline for both policy makers and university management. The theoretical and practical implications are also discussed.

Keywords: Online Learning; Performance impact; Compatibility; DeLone & McLean; Yemen

1. INTRODUCTION

Information and communication technology can play a vital role within higher education institutions, specifically in teaching and learning processes, but also in supportive and managerial aspects, and both innovation and technology have gained in importance due to increased usage and the availability of a variety of mobile gadgets including laptops, smartphones, and tablets (Lapovsky, 2015). More universities are now incorporating in their learning modes a number of forms of mobile technology such as management learning systems (MLS), and this ongoing information and communication technology (ICT) revolution has not only improved collaboration between students and lecturers, but also the educational organisation's performance as well (Abu-Al-Aish, 2014). The Yemeni higher education sector faces great challenges, dealing with a rapid increase in the higher education student population (Frederick S. Pardee Center for International Futures, 2014), limited resources, a low quality of education delivery and the inefficiency of public organizations (Global Competitiveness Report, 2015; Global Information Technology Report, 2015). All of these indicate that there is a pressing need to establish a plan for the future to counter such challenges. While online learning is seen as being the future of education, and can provide a practical solution to those problems in Yemen.

Many theories and models have been developed and proposed in the information systems (IS) context in order to predict and explain user behaviour with technology. Besides the DeLone and McLean Model of Information Systems Success (DMISM) (Delone & Mclean, 1992; Delone & Mclean, 2003), other well-known theories and models exist including: Technology Acceptance Model (TAM) (Davis, 1989), Diffusion of Innovation Theory (DOI) (Rogers, 1995), Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980), Theory of Planned Behavior (TPB), (Ajzen, 1985), Model of PC Utilization (MPCU) Chang and Cheung (2001), and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003). There are also empirical studies which have comprehensively examined the adoption and use of new technologies (Al-Busaidi, 2013; Islam, 2015; and Šumak, Hericko, & Pušnik, 2011). However, these have neglected an evaluation of IT usage (Islam, 2013), while DMISM evaluates IT usage by examining the effect of overall quality (system, information, and service

quality) on user satisfaction and actual usage, both of which in turn influence performance impact DMISM has therefore become widely used to measure the success of IS (Montesdioca & Maçada, 2015).

There are, however, some contradictory results regarding DMISM. Jung et al. (2015), Ramirez-Correa et al. (2017) and Tam & Oliveira (2016) found that overall quality significantly affects user satisfaction and actual usage and other researchers reported the insignificance of such relationships (Aparicio et al., 2017; Chiu et al., 2016; Dokhan & Akkoyunlu, 2016). The contradictory results may be explained by a moderating variable that strengthens or dampens the relationship between variables. Hofstede et al. (2010) also categorized Yemen as a country with low individualism traits (where social influence and strong relationships are high), indicating that in order for new technology to be adopted and used it has to be compatible with user values, beliefs and social norms. This issue is highlighted by Shih, Feng, & Tsai (2008), as some studies are skeptical of the notion that online learning can actually improve student performance, while Islam (2013) reported that online learning has a weak effect on student performance and this could be due to other factors such as compatibility. This conceptual paper will therefore propose an explanation for the contradictory result by extending DMISM with compatibility as a moderating variable, which to the best of our knowledge will be the first study to do so in the context of online learning in Yemen.

2. LITERATURE REVIEW

2.1 Overall Quality

Due to growing challenges and sophistication in the information systems field, both scholars and practitioners are keen to improve the quality and functionality of new systems to tap into its growth potential (Wang & Lai, 2014). Overall quality has been studied as a second order construct that includes system quality, information quality and service quality (Ho et al.,2010; Isaac et al., 2017). The results unanimously find that a positive relationship exists between quality and each of satisfaction and actual usage (Flack, 2016). According to Sun et al. (2008), overall quality influences user satisfaction, while Wang & Liao (2008) stated that quality in the context of technology affects actual usage. Moreover, Petter & McLean (2009) define system quality as the degree to which system users believe that a system is easy to use, user-friendly, easy to learn, easy to connect, and enjoyable to use, while Cheng, Liu, Qian & Song (2013) consider it a key antecedent for technology usage and user satisfaction alike, Hossain (2016) says that system quality significantly affects user satisfaction and Abrego-Almazán et al. (2017) report that it affects actual usage. Information quality is defined as the degree to which system users think that online learning information is up-to-date, accurate, relevant, comprehensive, and organized (Halonen et al., 2009). It is one of the critical factors that determines satisfaction and actual usage (Aparicio et al., 2017), and researchers have described its significant impact on user satisfaction (Jung et al., 2015) and actual usage (Ramirez-Correa et al., 2017). Service quality is referred to through these attributes: tangibles, reliability, responsiveness, assurance, functionality, interactivity, and empathy (Delone & McLean, 2003; Lin, Fofanah, & Liang, 2011; Pituch & Lee, 2006) and it significantly influences satisfaction (Oktal, Alpu, & Yazici, 2016) and actual usage (Chiu et al., 2016). Consequently, the following two hypotheses are proposed:

H1. Overall quality has a positive effect on user satisfaction.
H2. Overall quality has a positive effect on actual usage.

2.2 User Satisfaction

As user satisfaction is considered one of the main indicators when assessing the success of new system adoption, it has been widely used as a measure in the field of IS (William H. DeLone & McLean, 2016; Montesdioca & Maçada, 2015). According to Xinli (2015), user satisfaction refers to the extent to which a user perceives a system to be useful and wants to use it again. While Lin and Wang (2012) defined it as system user's satisfaction with regard to system speed, number of functions, quality and format. It has also been defined as the degree to which students using online learning are satisfied with their decision to use it and how well it meets their expectations (Roca et al., 2006; Wang, 2008; Wang & Liao, 2008). A number of studies have shown that user satisfaction impacts performance in numerous contexts and technology applications. For instance, Isaac et al. (2017) reported that user satisfaction significantly influenced performance impact, and Culibrk et al. (2016) found the same significant relationship between user satisfaction and net benefits. However, Daud et al. (2011) reported that there was no significant relationship between user satisfaction and performance impact. Consequently, the following hypothesis is proposed:

H3. User satisfaction has a positive effect on actual usage.
H4. User satisfaction has a positive effect on performance impact.

2.3 Actual Usage

According to DeLone & McLean (2016) actual usage is the degree to which an individual uses the capabilities of an information system in terms of frequency, nature and duration of use. In online learning, actual usage also reflects the frequency and duration of use (Kim et al., 2007). DeLone & McLean (2016) also indicated that among the most important directions in technology usage is to the need to assess the impact of system usage on IS success factors like performance. Several studies have examined the influence of actual usage on performance and satisfaction (Hou, 2012; Son et al., 2012). Despite a mixed bag of results, it was determined that there is a significant relationship between actual usage and each of satisfaction and performance (D'Ambra, Wilson, & Akter, 2013; Isaac, Abdullah, Ramayah, & Mutahar, 2017b; Makokha & Ochieng, 2014; Ramirez-Correa et al., 2017). However, there are other studies which reported the insignificance of this relationship (Cho et al., 2015; Wu & Wang, 2006). While other studies examined the effect of satisfaction on actual usage (Jafari, Ali, Sambasivan, & Said, 2011), this study examines the effect of actual usage on satisfaction as recommended by Isaac et al. (2017a, 2017b) Consequently, the following hypotheses are proposed:

H5. Actual usage has a positive effect on performance impact.

2.4 Compatibility (CMP)

In the IS field, compatibility is considered as one of the fundamental antecedents to user adoption of new technology or application (Mutahar, Daud, Ramayah, Putit, & Isaac, 2017; Cheng, 2015; Ozturk et al., 2016), and Premkumar (2003) suggested that it was found to be an important determinant of IS innovation adoption. Rogers (1995) defines compatibility as the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters. However, the literature in the internet and education field has yet to pay significance attention to this variable (Kit, Cheung, & Lai, 2005). In another technology application, Wu &Wang (2005) found that high compatibility leads to preferable adoption of mobile systems. In this study, compatibility is defined as the degree to which online learning technology fits the values, beliefs, and lifestyle of students (Ozturk et al., 2016). Empirically, Islam & Azad (2015) found that compatibility significantly influences satisfaction, while Cheng (2015) reported a significant relationship between compatibility and usage in the context of mobile learning in Taiwan. Besides, compatibility was exanined as a moderating role in the context of e-learning (Islam, 2015). Consequently, the following hypotheses are proposed:

H6. Compatibility moderats the relationship between overall quality and user satisfaction.
H7. Compatibility moderats the relationship between overall quality and actual usage.

2.5 Performance Impact

IS scholars have used the intention to use or actual usage as the dependent variable when examining factors affecting the adoption of certain technology system (Cheng et al., 2015; Cheung & Vogel, 2013; Iqbal & Qureshi, 2012). However, with rapidly changing technology and the introduction of many new systems, the focus is currently directed towards the outcome of system usage in terms of performance enhancement to evaluate and measure system success (Isaac, Abdullah, Ramayah, & Mutahar, 2017; Isaac, Abdullah, Ramayah, Mutahar, & Alrajawy, 2017; Chen, 2013; Montesdioca & Maçada, 2015). Performance impact is defined as the extent to which system usage increases the quality of work by helping to complete the task quickly, allow control over work, improve job performance, eliminate errors, and boost effectiveness on the job (Isaac, Abdullah, Ramayah, Mutahar, & Alrajawy, 2016; Norzaidi et al., 2007). In this study, performance impact is defined as the degree that online learning impacts student performance in terms of resource savings, productivity, competence, and knowledge acquisition (Isaac et al., 2017).

3. RESEARCH METHOD

Overview of the Proposed Research Model

For this study, the hypothesized variables and their relationships in the model have been derived from the available literature of the models and theories that have been prescribed in the literature mentioned above. The proposed extended model can be seen in Figure 1 below. While examining the proposed model, it can be seen that overall quality (containing system quality, information quality and service quality) affects user satisfaction and actual usage constructs, which both predict performance impact. These relationships are derived from Delone & McLean (2003), whereas compatibility is taken from (Y. Cheng, 2015;

Islam, 2015). The proposed extended model examines the relationship between overall quality as antecedent variable and compatibility as a moderating variable to user satisfaction and actual usage, which in turn explains performance impact as an output variable among students who used or are still using online learning in nine public universities in Yemen. The proposed model has seven hypotheses to test.

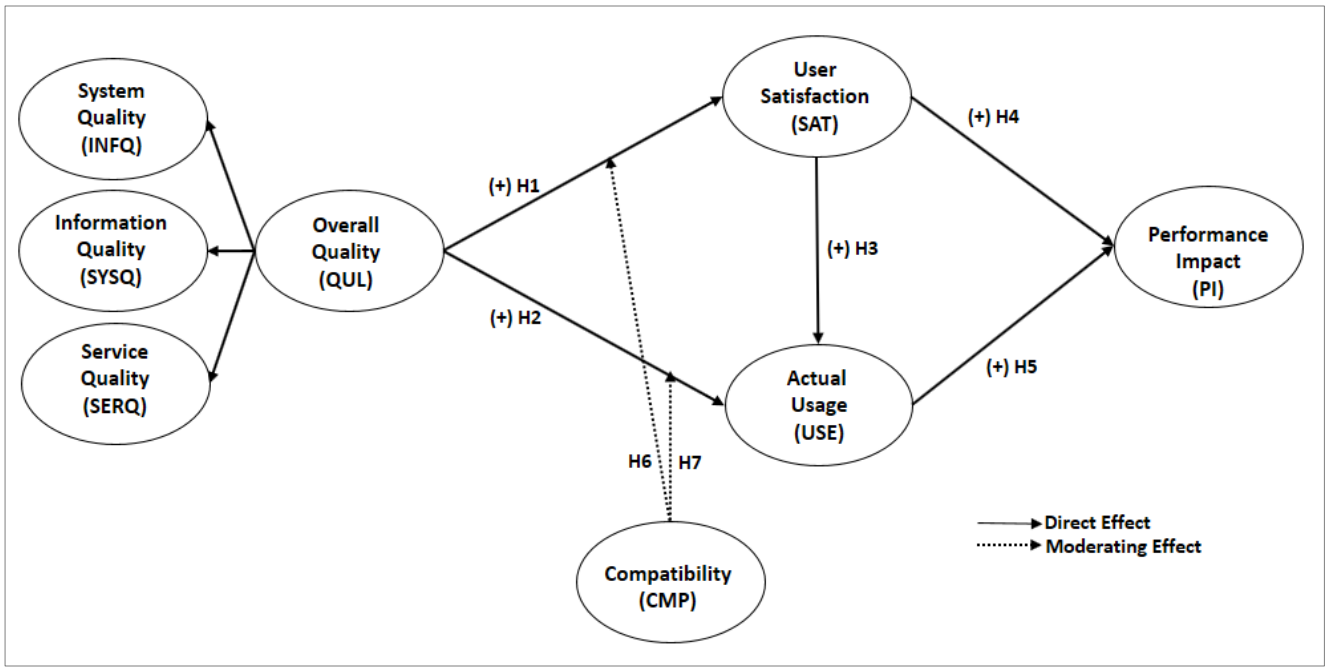

Figure 1: Proposed research model

4. IMPLICATIONS

Since online learning is one of eight pillars of the national strategy of higher education in Yemen, it is anticipated that the data resulting from this study will serve as a guideline for policymakers to develop efficient and effective plans to improve the performance of education institutions. In the public universities context, it will determine the areas where the management must focus on IS tools which will eventually lead to higher student enrolment, address the lack of infrastructure, and improve the quality of education outcomes. It also contributes to the Delone and Mclean Information Systems Success Model by examining and extending it in the context of Yemeni public universities, specifically to enhance organizational performance through the implementation of online learning. This study also contributes to theoretical modelling by modifying the Information Systems adoption theories in relation to a new application area that may be given new insights into the theory. It is also hoped that this study will lead to a successful adoption of online learning supported by new technologies as it discusses factors inhibiting or facilitating this for developing nations in general, and for the Arab countries which share a similar culture, religion and speak the same language in particular (Khasawneh, 2015).

The findings of this study can be used as a guideline for the Yemeni Centre for Information Technology in Higher Education (YCIT-HE) which was established to be an authority to enable the availability of information technology in Yemen universities for students, as well as academic and management staff, by highlighting the important role of compatibility in the unique Yemeni culture and the ability of new technology to solve the many problems facing the country's higher education sector, and thus encourage and support the execution of the higher education master plan at both organisational and national level (Al-Madhagy, 2013). Moreover, according to The Global Competitiveness Report (2017), Yemen comes last in the quality of education system indicator (138 out of 138 countries) and also has one of the lowest GDP per capita in the world ($1302.9). This indicates that Yemen urgently needs a solution that can enhance education quality and maximise cost-efficiency. According to Internet World Stats (2017), the number of Yemeni online users is increasing rapidly, and mobile gadgets subscriptions are on the rise (World Development Indicators, 2017). Thus, online learning can be an effective solution due to its potential to improve the quality of education with the least infrastructure and minimum of resources (V. Chang, 2015; and Shukor, Tasir, & der Meijden, 2015)

5. LIMITATIONS AND SUGGESTIONS FOR FUTURE WORK

This research population is limited to public universities in Yemen and will not include academic and administrative staff. It will be conducted through a survey questionnaire and therefore no qualitative perspective will be taken into account. Given the fact that technology has and will continue to rapidly change, and result in significant technology advancements in the future (Hayati & Hashemy, 2013), the findings of this research will need to be used with care. Investigating how technological changes may influence learner behaviour towards using online learning is a clear avenue for future research.

6. CONCLUSION

The introduction of ICT in institutions of higher education is clearly changing the way in which education is conducted (Kocaleva, Stojanovik, & Zdravev, 2014) and can present a reliable solution for the challenges that are faced by developing countries including Yemen, namely a growing student population, weak infrastructure, low-quality education, and limited resources (Ministry of Higher Education and Scientific Research, 2005). This research will propose an extension to the Delone & Mclean Information Systems Success model by examining the role of compatibility as a moderating variable to predict student performance. The proposed model will try to offer an explanation to the contradictory results in the literature about the effect of overall quality on user satisfaction and actual usage. The findings will be of great benefit to Yemeni policy makers, public universities and institutions and the country as a whole. The implications of this study from the perspective of research and practitioners have been deliberated, limitations have been noted and some directions for future research have been suggested.

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