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ROLE OF PERSONAL ATTRIBUTES AND SYSTEM CHARACTERISTICS IN PREDICTING THE EFFECTIVENESS OF ONLINE LEARNING- AN INDIAN PERSPECTIVE

Research paper

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Abstract

Online learning has become a trend in education over the years with the emergence of Web 2.0 and the advancement in Information and Communication Technologies (ICT). As the organisational spending has risen for providing better learning and training, the expectations for outcomes also have increased. Learning effectiveness can be thought of as one of the parameters to assess the success of online learning. A survey was conducted with 377 higher education students from India who have already taken an online learning course. The study used Structural Equation Modelling (SEM) to understand the impact of personal factors (internet self-efficacy), system characteristics (information quality, system quality, service quality), and engagement (behavioural, emotional, cognitive engagement) on learning effectiveness in online learning through an integration of Social Cognitive Theory (SCT), and DeLone and McLean's IS success model. The result shows that internet self-efficacy has a positive impact on all types of engagement whereas, system and service quality have a positive impact on emotional and cognitive engagement, and information quality has an impact on only behavioural engagement. Furthermore, all types of engagement have a positive impact on perceived learning effectiveness. Theoretical contributions and practical implications are discussed.

Keywords: Online learning, Learning effectiveness, Social Cognitive Theory, DeLone and McLean's IS success model.

1 Introduction

Online learning is widely adopted by organisations because of its flexibility and availability at reduced cost. The advantages of online learning are to improve access to education and training, improve the quality of learning, reduce the cost and improve the cost-effectiveness of education (Bates, 1997). The flexibility in learning and the reduced cost has resulted in the popularity of e-learning across industry and academia. The size of the e-learning market was estimated to be over 165 billion USD and is expected to grow at a rate of five percent between the year 2016-23 exceeding 240 billion USD (Elearning Market Trends and Forecast 2017-2021, 2016). Online learning has been successfully applied in academia and industry with a reported increase in quality of teaching and learning, increase in revenue, learning outcomes, and satisfaction (Chang, 2016). The pure online learning, for example, learning through xMOOCs (extended massive open online courses such as Coursera, edX, etc.) also have been

considered to complement the traditional learning and provide people with lifelong learning (Hollands and Tirthali, 2014).

The primary problems in higher education are access, quality, and affordability (Yeld, 2016), and it is addressed by the fourth goal of United Nations Sustainable Development Goals¹ which emphasises on affordable and quality technical, vocational, and tertiary education by 2030. According to UNESCO statistics², 35.64 percent of world's population was enrolled in higher education in 2015. But, the inequalities still exist if they are closely looked into, that is, the enrolment in higher education in developed countries is 74.33 percent whereas the enrolment in developing countries is 30.08 percent. In India, the enrolment in higher education is 26.87 percent. The challenges in Indian higher education include enrolment, quality, infrastructure, faculty shortage, etc. (Sheikh, 2017). These challenges can be addressed by online learning.

Facilitating online learning alone does not guarantee the required learning outcomes. The participation of learners is essential to achieve the required level of outcomes. Unlike traditional classroom education, students require more self-discipline in online learning (Allen and Seaman, 2007). The concept of Self-Directed Learning (SDL) fits the learning process in an online learning environment (Song and Hill, 2007). Here, the individuals regulate the objectives (what) and the means (how) of the learning. Since the system play as an interface between the learning materials and the users in online learning, the quality parameters of the system is critical in achieving satisfaction and use intentions (Delone and McLean, 2003). Engagement of students in a course predicts the learning outcomes (Hu and Hui, 2012). Literature suggests that engagement construct is multidimensional (Fredricks et al., 2004). Although studies, for example, Hu and Hui (2012) have investigated the effect of engagement on perceived learning effectiveness, the effect of different dimensions of engagement is not studied to predict the learning effectiveness. With the advancement of internet technology, organisations spend their resources to adopt online learning; therefore, the expectations for outcomes have also increased. Learning effectiveness is one of the learning outcomes and can be defined as the degree to which the learning outcomes are achieved. The organisations need to understand the factors that measure the learning effectiveness to achieve optimum outcomes. Several studies have investigated learning effectiveness, but they are in terms of pre and post-tests (Broadbent, 2017; Reychav and McHaney, 2017). A few number of studies have identified the factors that affect learning effectiveness, but either has considered the personal factors (Jeno et al. 2017; Shin and Kang 2015), or environmental factors (Chang and Chen, 2014; Damjanovic et al., 2015). According to Social Cognitive Theory, both the personal and environmental factors impact the behaviour of an individual (Bandura, 1986). In spite of the importance of both the factors, little research has examined the role of personal and environmental factors to measure the learning effectiveness of an online learning platform. This study through the social cognitive theory framework (Bandura, 1986) examines the role of personal and environmental factors to understand the behaviour (in our case, engagement in learning) and its effect in predicting the effectiveness of online learning.

The organisation of the paper is as follows: Section 2 builds the theoretical background on Social Cognitive Theory and IS success model. Section 3 formulates the hypotheses and theorises a research model for validation. Section 4 presents the methodology used in the study followed by data analysis and results in section 5. Section 6 discusses the results and implications followed by and conclusion and limitations in section 7.

¹ United Nations Sustainable Development Goals: <http://www.un.org/sustainabledevelopment/education/>

² UNESCO statistics: <http://data.uis.unesco.org/index.aspx?queryid=142&lang=en>

2 Theoretical Background

The advancement in technology has provided the advantage of learning anytime, anywhere around the globe. Students learn in a face-to-face, blended, or pure online learning environment. The blended learning is a combination of online and face-to-face learning method. Pure online learning provides the flexibility of learning anytime and from anywhere. The effectiveness of e-learning is important for the stakeholders such as e-learning providing organisation and the learners because, for organisations, they incur an initial cost for setup, training, etc. while for learners, they put effort and time to learn. Learning effectiveness can be defined as the degree to which the learning outcomes are achieved. Several studies have investigated learning effectiveness, but they are in terms of pre and post-tests (Broadbent, 2017; Reychav and McHaney, 2017). The factors affecting learning effectiveness are interesting because once these factors are identified, and a relationship is established, it would be easier for the stakeholders to control the factors to achieve an optimum level of effectiveness given any resource constraints.

Engagement is found to be a crucial antecedent for learning outcomes (Hu and Hui, 2012). Academic engagement refers to the quality of efforts students make to perform well and achieve desired outcomes (Hu and Kuh, 2002). It is found that active users and high levels of interaction (forums, video lectures/course) predict the grades (Sinha and Cassell, 2015; Pérez-Sanagustín et al., 2016). Research has suggested that the nature of engagement is multifaceted with three dimensions of engagement—behavioural, emotional, and cognitive (Fredricks et al., 2004). A study by Hu and Hui (2012) has found that learning engagement has a positive effect on perceived learning effectiveness. The following sections review the literature on the lenses of social cognitive theory and IS success model to derive the research gap.

2.1 Social Cognitive Theory

Social Cognitive Theory (SCT) draws a triadic relationship among personal, environmental, and behavioural aspects of human beings (Bandura, 1986). The theory is built on the concept that individuals learn by observing others, and the interaction between the personal factors and the environment contribute to the behaviour of an individual. The personal factor which is the internal belief of an individual towards performing the task influences the behaviour. The environmental factors are the external environment of the individual which influence the ability of the individual to complete the task.

Self-efficacy: Self-efficacy is widely used as a personal factor in SCT framework. It is defined as “People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances” (Bandura, 1986). It does not in itself represent the actual skills and capability rather a belief of individuals to perform or execute a skill. Although self-efficacy is commonly confused with motivational constructs such as outcome expectations, self-control, and perceived control, it is distinct in terms of specificity and close association to performance tasks and is a better predictor of academic performance (Zimmerman, 2000). It is a highly effective antecedent for student motivation and learning. A meta-analysis by Robbins et al. (2004) has shown that academic self-efficacy is one of the best predictors of performance.

Many researchers have applied the SCT framework to understand the behaviour of individuals in online learning environments. A study by Jin et al. (2015) has used SCT with other theoretical frameworks and posited that a user's self-presentation, peer recognition, and social learning have a positive impact on online knowledge contribution behaviour. Zhang et al. (2012) have used SCT to understand the intention to continue participation in e-learning systems with self-efficacy as the personal factor, and psychological safety communication climate and perceived responsiveness as environmental factors. With a self-regulated learning view of SCT, Wang and Lin (2007) have suggested that students with higher levels of motivation applied effective strategies and responded appropriately to the environment demands in a web-based learning environment. Chen (2014) has identified critical factors impacting students' stickiness in a web-based learning environment, and they are computer self-efficacy, system characteristics, digital material features, and social interaction. The first three factors

determine the learning outcome expectations. Wan et al. (2012) have used SCT in organisational settings and posited that virtual competence affects cognitive outcomes and skill developments via self-regulated learning.

2.2 IS success model

Delone and McLean IS success model identifies the role of information quality, system quality, and service quality on user satisfaction and usage intentions/use (Delone and McLean, 2003). Building on the work of Shannon and Weaver (1949) on communications, and the work of Mason (1978) on measuring information output, DeLone and McLean (1992) have defined the categories of IS success. Each level of information processing has a measure associated with it, such as the technical level or production of the information is associated with system quality, the semantic level or the product itself is associated with the information quality. With the emergence of end-user computing, the role of the service provider is added to the existing role of the information provider in IS organisations (Delone and McLean 2003). This led to the inclusion of service quality to measure the success of information systems.

IS Success model is used by several researchers for identifying the relationship of quality measures of IS with satisfaction and continuous use of information systems. For instance, the perceived information quality and service quality of a virtual community have positive impact on the user satisfaction and in turn continuation intention to consume and provide information (Zheng et al., 2013), and the knowledge quality is a significant determinant of knowledge adoption in virtual communities (Chou et al., 2015). Dong et al. (2016) have used an integrated model with SCT and IS success to explain the knowledge sharing behaviour in knowledge management systems (KMS). The content quality affects KMS self-efficacy which in turn determines the knowledge sharing intention. The IS success model is also investigated in the context of online learning by researchers. The perceived system quality and computer self-efficacy along with compatibility, perceived usefulness, and perceived ease of use are found to be the critical success factors of students' behavioural intentions to use online learning websites (Chang and Tung, 2008). A study by Mohammadi (2015) on the e-learning users' perspective has found that system quality and information quality are the primary factors for user intention and satisfaction. Almarashdeh (2016) has found that service quality is one of the critical factors for instructor satisfaction in distance learning course. The information quality and system quality have a significant effect on satisfaction in both self-paced tools as well as instructor-student interactive e-learning tools (Hsieh and Cho, 2011). The system quality is found to be the antecedent for greater intention to use in e-learning (Pituch and Lee, 2006). The information quality, system quality, support service quality, and instructor quality have a positive relationship with the user beliefs such as perceived usefulness, confirmation, and flow. These beliefs lead to satisfaction and continuance intention (Cheng, 2014). It is also found that there is a relationship between intention to use and engagement (Hussein & Hassan, 2017).

2.3 Research Gap

From the literature review, we have identified few of the research gaps relating to the learning effectiveness which we try to address in our paper. First, although the social cognitive theory is used to predict the continuation intention, knowledge contribution behaviour, etc. its use to understand the learning effectiveness is limited even though both the personal and environmental factors contribute to the behaviour of an individual. Second, from the literature, it is observed that engagement construct is multidimensional which is studied in education (Fredricks et al., 2004), but their individual effects on learning effectiveness are not studied. Third, many studies have identified that IS quality parameters are important for predicting the continuation intention (Mohammadi, 2015), and there is also a relationship between the continuation intention and engagement (Hussein & Hassan, 2017), but the role of IS quality parameters on engagement is not studied. We have developed our research model and hypotheses in the following section to address these gaps.

3 Research Model

The current study focuses on the learning effectiveness from the interaction of individualistic characteristics (self-efficacy) and system characteristics (IS quality parameters).

3.1 Self-efficacy

Numerous studies have identified self-efficacy as one of the predominant indicators of student motivation, learning, and performance (Robbins et al., 2004; Zimmerman, 2000). Pellas (2014) has identified the predictors such as self-efficacy, metacognitive self-regulation, and self-esteem for engagement (behavioural, emotional, cognitive) factors in virtual world scenarios. Studies for example Ouweneel et al. (2013) have also shown that self-efficacy leads to engagement in a particular task among university students. The perceived self-efficacy and perceived playfulness (intrinsic motivation) affect the intention to use blogs (Ifinedo, 2017). Research shows how self-efficacy leads to different types of engagement (Linnenbrink and Pintrich, 2003). Computer self-efficacy has a significant effect on perceived ease of use and behavioural intention to use (Hsia et al., 2014). Computer self-efficacy also determines the learning engagement which further leads to learning performance (Chen, 2017). It is also observed that learning engagement fully mediates the relationship between computer self-efficacy and learning performance. On the contrary, Sun and Rueda (2012) have posited that computer self-efficacy is found not to be related with any of the engagement variables in distance learning context. Internet self-efficacy is defined as “the belief in one’s capability to organize and execute Internet actions required to produce given attainments” (Eastin and LaRose, 2000, p. 1). Internet self-efficacy determines the internet use (Eastin and LaRose, 2000). Thus, the following hypotheses are proposed.

H1a, b, c: Internet self-efficacy is positively related to behavioural, emotional, and cognitive engagement.

3.2 IS quality parameters

The design or environmental dimensions of a virtual learning environment are learning model, technology, learner control, content, and interaction (Piccoli et al., 2001). The technology, educational content, motivation, and attitude significantly influenced employee’s e-learning satisfaction (Navimipour and Zareie 2015). The information quality, system quality, and service quality are found to be antecedents for continuation intention and satisfaction for online learning users (Chang and Tung, 2008; Mohammadi, 2015; Pituch and Lee, 2006; Cheng, 2014; Almarashdeh, 2016; Hsieh and Cho, 2011). There is also a relationship between intention to use and engagement (Hussein & Hassan, 2017). Therefore, a positive relationship is established between IS quality factors and engagement.

H2a, b, c: Information quality is positively related to behavioural, emotional, and cognitive engagement.

H3a, b, c: System quality is positively related to behavioural, emotional, and cognitive engagement.

H4a, b, c: Service quality is positively related to behavioural, emotional, and cognitive engagement.

3.3 Engagements

The engagement construct is found to be multifaceted with behavioural, emotional, and cognitive dimensions (Fredricks et al., 2004). Behavioural engagement encompasses the behavioural norms such as attendance and involvement; emotional engagement comprises of affective reactions such as interest, enjoyment, sense of belongingness; and cognitive engagement includes motivation, effort, and strategy use. The engagement types have different roles in achieving learning outcomes. Regularity is related to performance. First, regular students follow the structure of the course and therefore attain higher achievement. Second, having high regularity is related to certain factors internal to the students, i.e., motivation, commitment or learning strategies (Boroujeni et al., 2016). A study by Hu and Hui (2012) has found that learning engagement has a positive effect on perceived learning effectiveness.

Students' homework self-efficacy had a significant direct effect on homework achievement (Hong et al., 2015). Hence, we hypothesise that engagements are positively related to learning effectiveness.

H5a, b, c: Behavioural, emotional, and cognitive engagements are positively related to perceived learning effectiveness.

4 Research Method

4.1 Participants and procedure

A total of 377 Indian students participated in the survey. The students were selected on the basis of two things. First, they were pursuing higher education. Second, they already have used an online medium which provides contents online over the internet for their coursework. The requirement for the online medium was it should have an online platform, provide content in the multimedia format, and should have a support service team to help the students. The sample contained 64.7 percent males and 35.3 percent females with age group of 21-22 years. The participants were asked to fill the survey questionnaire with the assurance of treating the responses confidentially. The responses were fed to SPSS for an exploratory factor analysis followed by confirmatory factor analysis and structural model in AMOS.

4.2 Measures

To measure the latent constructs in our model, scales are adopted from the literature. The Internet Self-efficacy (ISE) scale is adopted from Eastintg and LaRose (2000) which has eight items. Here, the individual's self-efficacy for using the internet is measured because students used the internet to study online courses. The scale consists of items which focus on whether the individuals are confident in understanding the hardware and software, troubleshooting, gathering the data on the internet, carrying out online discussions, etc. The IS quality parameters (Information, System, and Service Quality) scale is adopted from Cheng (2014). The information quality subscale has four items which focus on the quality of the information or learning content presented online to the students. The items include whether the e-learning system provides new, updated, relevant, and sufficient learning content, the level of difficulty of the content, etc. The system quality subscale consists of four items which focus on the quality of the information system used to deliver the content. The items include whether the e-learning system allows the user to control his/her learning activity, provide the material in multimedia and readable format, enable interactive communication between instructors and learners and whether the e-learning system is fast, consistent, and reliable. The service quality subscale consists of three items which focus on whether users can acquire adequate support from help-desk, service administrators, etc. In order to measure various types of engagement, the engagement scale is adopted from Fredricks, Blumenfeld and Paris (2004). The behavioural engagement subscale consists of five items focusing on the engagement of students in terms of behavioural norms such as paying attention, completing homework, following rules, etc. The emotional engagement subscale consists of six items which focus on the affective aspects of the engagement such as whether the student like the online class, feel interested, happy, etc. in the class. The cognitive engagement subscale consists of eight items which focus on the engagement of the students at a cognitive level to achieve the desired outcome. This comprises of revising the course, studying extra materials, engaging in discussion with people about the course, etc. The Perceived Learning Effectiveness (PLE) scale is adopted from Wan, Wang and Haggerty (2008) which measures the individual learning effectiveness with five items. The items capture the perception of students about learning the factual material, identifying the central issue of the course, ability to communicate about the subject, etc.

5 Data analysis and results

The data collected from the survey questionnaire was first checked with IBM SPSS Statistics 24 software for Exploratory Factor Analysis (EFA). The data was checked for adequacy, reliability, conver-

gent validity, and discriminant validity before proceeding to CFA (Confirmatory Factor Analysis) and structural model in IBM SPSS AMOS 24 software. For data adequacy in EFA, the KMO measure is checked in SPSS. We obtained a KMO value of 0.908 indicating adequate data for the model. The reliability is checked with Cronbach's Alpha. We obtained Cronbach's Alpha of 0.927 for internet self-efficacy, 0.883 for information quality, 0.796 for system quality, 0.871 for service quality, 0.834 for behavioural engagement, 0.905 for emotional engagement, 0.951 for cognitive engagement, and 0.889 for perceived learning effectiveness. A total of eight-factor loadings were obtained which explained 63.138% of the variance of data. For reliability check, we obtained a Cronbach's Alpha of 0.922 for 43 items. The convergent validity is achieved with no cross-loadings in the pattern matrix, and the discriminant validity is achieved as we obtained a correlation matrix with no value greater than 0.7.

After satisfying results from EFA, we moved to CFA in AMOS 24. We obtained a good model fit ($\chi^2 = 1281.401$, $df = 829$, $\chi^2/df = 1.546$, $RMR = 0.025$, $TLI = 0.954$, $CFI = 0.958$, $RMSEA = 0.038$) after adjusting the modification indices. The validity and reliability are achieved for the data as shown in Table 1. The structural path testing for the hypotheses is performed in AMOS post confirmatory factor analysis. Out of 15 hypotheses proposed, 11 are supported by the data. The hypothesis test results are presented in Table 2 and Figure 1. Internet self-efficacy positively impacts behavioural, emotional, and cognitive engagement supporting hypotheses H1a, H1b, and H1c. The information quality has a positive effect on behavioural engagement but does not have a significant effect on emotional and cognitive engagement. This supports hypothesis H2a but not H2b and H2c. System quality positively impacts emotional and cognitive engagement but not behavioural engagement supporting hypotheses H3b and H3c but not H3a. Service quality has a positive effect on both emotional and cognitive engagement but not on the behavioural engagement. Therefore, hypothesis H4a is not supported while H4b and H4c are supported. The behavioural, emotional, and cognitive engagements positively impact on perceived learning effectiveness. This supports hypotheses H5a, H5b, and H5c.

	CR	AVE	MSV	MaxR(H)	CEng	ISR	SysQ	InfQ	SerQ	BEng	EEng	PLE
CEng	0.951	0.710	0.278	0.956	0.843							
ISR	0.924	0.608	0.154	0.975	0.337	0.780						
SysQ	0.799	0.501	0.286	0.977	0.119	-0.031	0.708					
InfQ	0.883	0.655	0.286	0.981	0.011	0.007	0.535	0.809				
SerQ	0.874	0.698	0.154	0.983	0.267	0.392	0.116	0.083	0.836			
BEng	0.835	0.504	0.162	0.984	0.188	0.313	0.228	0.340	0.229	0.710		
EEng	0.908	0.624	0.152	0.987	0.389	0.387	0.264	0.175	0.390	0.145	0.790	
PLE	0.887	0.615	0.278	0.988	0.527	0.280	0.113	-0.019	0.269	0.402	0.364	0.784

Table 1. Validity and Reliability Check

Figure 1 represents the research model with ISE (Internet Self-efficacy), InfQ (Information Quality), SysQ (System Quality), SerQ (service Quality), BEng (Behavioural Engagement), EEng (Emotional Engagement), CEng (Cognitive Engagement), and PLE (Perceived Learning Effectiveness). The dashed lines represent non-significant paths, and the solid lines represent the significant paths. For the significant paths, the standardised estimates or the regression weights are mentioned with significance levels. *** represents a significance level of .001, ** represents a significance level of .01, and * represents the significance level of .05.

Hypothesis	Path			Hypothesis testing
H1a, H1b, H1c	BEng, EEng, CEng	←	ISE	All Supported
H2a, H2b, H2c	BEng, EEng, CEng	←	InfQ	Supported, Not Supported, Not Supported
H3a, H3b, H3c	BEng, EEng, CEng	←	SysQ	Not Supported, Supported, Supported
H4a, H4b, H4c	BEng, EEng, CEng	←	SerQ	Not Supported, Supported, Supported
H5a, H5b, H5c	PLE	←	BEng, EEng, CEng	All Supported

Table 2. Hypothesis test results

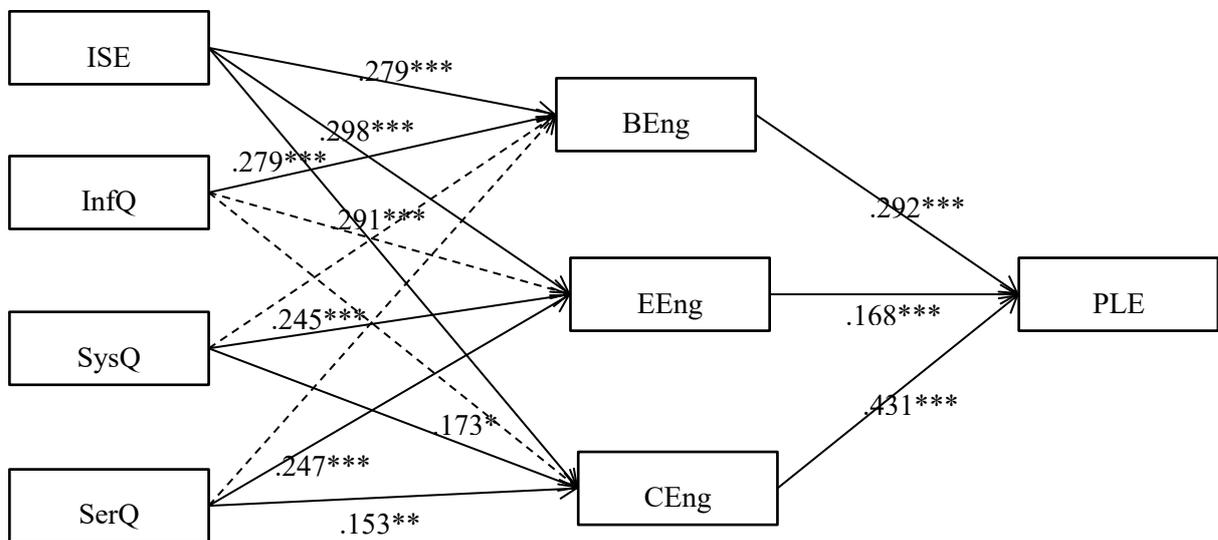


Figure 1. Path analysis (with a sample size of 377) with standardized estimates. Dashed arrows indicate non-significant paths. *** $p < .001$, ** $p < .01$, and * $p < .05$

6 Discussion and implications

A model of 8 latent constructs with four independent constructs and four dependent constructs is built by using structural equation modelling. The internet self-efficacy which is a personal attribute combined with the system characteristics (environmental factors) such as information, system, and service quality leads to the behavioural intention. This study has used Social Cognitive Theory, and DeLone and McLean IS model for building the model to predict the learning effectiveness in an online learning environment.

It is observed from the structural path testing that the personal factor, internet self-efficacy affects all the dimensions of engagement (behavioural, emotional, and cognitive) supporting hypotheses H1a, H1b, and H1c. This indicates that internet self-efficacy is an important factor for all types of engagement. This supports the findings of Linnenbrink and Pintrich (2003) which posits that self-efficacy affects different types of engagement.

The information quality (quality of the content) affects only the behavioural dimension of engagement indicating that the quality of the information is crucial for behavioural engagement such as attendance and involvement in an online class. The system quality, for example, the presentation of content and

features of the online learning system affects both emotional (such as interest and enjoyment) and cognitive (such as motivation and strategy use) dimensions of engagement. The system quality affects the emotional dimension more than the cognitive dimension. Similarly, the service quality (support received) also affects the emotional and cognitive dimensions of engagement. This indicates that all the system characteristics are vital for the engagement to occur. While the quality of the information leads to behavioural norms, the quality of system and support leads to the enjoyment and involvement in an online learning system.

The results indicate that engagement affects perceived learning effectiveness which is similar to the findings of Hu and Hui (2012). Our study extends the findings of Hu and Hui (2012) by investigating the role of different dimensions of engagement (behavioural, emotional, and cognitive) on perceived learning effectiveness (PLE) to identify which dimension is the predominant indicator of PLE. In this study, all the dimensions of engagement are important for the PLE, but the cognitive dimension of engagement is a good indicator of PLE and contributes it more than the other dimensions of engagement. This can be attributed to the fact that students get involved at a cognitive level and are motivated, put effort, and use various strategies to learn.

The study has several theoretical implications. First, this study has built a model using personal and environmental factors to predict learning effectiveness according to social cognitive theory. Second, our paper has extended the work of Hu and Hui (2012) where they have studied the role of engagement on perceived learning effectiveness; this study has investigated the role of various kinds of engagements on learning effectiveness. Third, although many studies have investigated the role of IS quality parameters on continuation intention (Almarashdeh, 2016; Mohammadi, 2015), and a relationship between continuation intention and engagement (Hussein, and Hassan, 2017), the study of the relationship between IS quality parameters on engagement is limited. Our study establishes a positive relationship between the IS quality parameters and engagement in online learning.

The results of this study can have several implications for the e-learning provider organisation and the students. The result suggested that cognitive engagement is the predominant predictor and behavioural engagement is the second most important predictor of perceived learning effectiveness. Therefore, if the primary goal of the e-learning provider organisation is to increase the perceived learning effectiveness with a budget constraint, they should focus on the students' cognitive and behavioural engagement. Tracing backwards to the factors affecting various kinds of engagement, we can conclude that system quality is the predominant antecedent of cognitive engagement while information quality is the predominant or only significant antecedent of behavioural engagement. Therefore, the team should focus on system quality and information quality if they focus on cognitive and behavioural engagement respectively when facing a budget constraint. Since the findings of the results show that internet self-efficacy is a significant predictor and somewhat equally contributes to all the dimensions of engagement, it should be high for the students to achieve a good level of perceived learning effectiveness. Since enactive mastery (previous success in a task) is the primary source of self-efficacy (van Dinther et al., 2011), students should put effort and focus on the success in using the internet to achieve higher perceived learning effectiveness.

7 Conclusion and Limitations

Understanding the antecedents of learning effectiveness is imperative to ensure the success of online learning systems. This paper through the integration of SCT and IS success model hypothesised the antecedents of learning effectiveness and empirically validated them. The theoretical and practical implications are discussed.

This study has few limitations which can be addressed in future research. First, in the environmental factors, only system characteristics with quality parameters are taken into account. Future studies can examine the peer interactions on the engagement. Second, the collaboration and communication factors of technology dimension (Aparicio et al., 2016) can be studied along with the IS quality param-

ters. Third, as the survey is conducted on Indian students with higher education qualification who have used online learning for their coursework, the generalisation of the results needs careful consideration.

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