E-Learning 3.0 – An Intelligent Learning System to enhance Students Engagement

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Abstract

Web 3.0 is transforming e-Learning systems using artificial intelligence and machine learning approaches. Such as e-learning 3.0 tend to focus on collaborative intelligent agents to facilitate human learning greatly. This study validates e-learning 3.0 framework in Saudi context. The survey was conducted to empirically test the critical success factors of e-learning 3.0 framework. The findings show that technology, content and stakeholders' collaboration significantly and positively influence students' motivation to engage in e-learning 3.0. The importance-performance map analysis provides further implications for managerial actions.

Key Words: E-Learning 3.0, Intelligent Learning System, Students Engagement

1. Introduction

Learning activities which occur in a virtual environment are referred to as e-Learning, and with the help of the Internet, the users use various learning tools. E-learning has the potential to change the instruction mechanism from teacher-centred to student centred collaborative learning (Miranda et al. 2017). For the establishment and delivery of such an environment, there are particular tools present which would help design and implement. E-learning environments help carry out tasks like descriptions, lecturing and extract learner understanding through an intelligent process**.** At the time of instruction, the students must establish learning initiatives and only extend knowledge which is needed. The content of the subject matter can now help establish coherent domain models and the students understanding would also increase. Furthermore, student's problem-solving abilities would also enhance, increasing the user interactivities. Overall, the human-computer interaction is expected to enhance as e-learning environment would help students when needed (Miranda et al. 2016). The e-learning have been provided with opportunities with the current education developments and the information technology growth. The e-Learning concept was being recognized during the past decade and at present it is known to be a significant development of the information systems sector. In the contemporary world today, academic institutions have extensively adopted e-learning since the inception (Alammari and Chandran, 2017).

E-Learning 1.0 was the first e-Learning version introduced which distributed the education matters online. Since it was an early stage of the internet, the contents were read only. Editing was not allowed for the information and it remained static but available. With the help of e-Learning 1.0, it was possible for the students to shape their learning process at their own space and time. Yet, there was pre-establishment of the learning procedure. Modules and units were established to organize the content. The

administration content process and didactic tools that help develop the learning process were introduced as part of the Learning Management Systems (LMS) (Rubens et al. 2011). Furthermore, as the Web 2.0 became popular and the Web evolved, the e-Learning system became a read and write web which attracted the students in a significant manner. The environment now extended to the students was collaborative in nature. E-Learning 2.0 considers content development, social knowledge, information trade and association as its main features.

E-Learning 2.0 matured at a fast pace and was accepted throughout the world. However, it must also be subjected to further developments. If the future is to be depicted using the past, then the e-Learning 3.0 would be significantly affected by technologies such as Web 3.0. Web 3.0 is referred to as a giant database as it allows the establishment as well as alteration and reuse of the information (Boodoo, 2015). To form connections amongst individuals, the Internet is used by Web 2.0, however, in Web 3.0, the information would be connected through the Internet. Through the linking of the resource databases, the information can be accessed by the user based on his prior knowledge. The Web 3.0 would use the Artificial Intelligence (AI).

The pledge extended by Web 3.0 is to revolutionize e-Learning. This can be done through personalization and using content that is machine readable. The Semantic Web affordances to online learning are at the electronic learning new stage origination, e-Learning 3.0. Through Web 3.0, data can be assigned meaning since it is converted to a format that is machine readable (Alammari and Chandran, 2017). Hence, communication takes place between machines and people in a unique way (Dwivedi & Bawankan, 2013).

For the e-Learning 3.0 system a primary critical success factors framework was brought forward by Miranda et al. (2014,

2017). There were initially five aspects part of the framework which are educational establishments, professors, students, content and technology. The e-Learning 3.0 framework was then reorganized into three aspects which are stakeholders, content and technology (Miranda et al. 2017). This study adopts the (Miranda et al. 2014, 2016, 2017) e-Learning 3.0 framework. The purpose of the study is to test the influence of e-Learning 3.0 critical success factors on the student motivation to engage in e-learning 3.0 system.

The following section provides theoretical background regarding e-learning and the Miranda et al. (2017) e-learning 3.0 framework. Then the hypotheses are developed in section 3 followed by research method is established in section 4. Section 5 presents the data analysis results. Finally, the discussion is provided.

2. Theoretical Background

2.1 E-Learning

Kingdom of Saudi Arabia is developing at a fast pace. The industries are advancing quickly, and the technologies are developing to help Saudi from oil-based economy to knowledge-based economy (Al. Othman and Sohaib, 2016). One of the aims of the Saudi 2030 vision is to enhance its knowledge, innovation and creativity further by developing education system. This would positively contribute towards the education system by including a leaning environment that is driven through technology and integrates e-learning. Libraries, universities, and colleges all make use of e-learning in Saudi. Usually, the universities implement their own e-learning systems where they offered degree programs that are Internet based and all materials are also provided online. To further develop collaboration, information exchange and knowledge sharing, there are various conferences, seminars and workshops that have been held.

Content is not available online with the help of Web 1.0. It is considered a vital development as information cannot be easily accessed for reading or viewing. Web 1.0 is also referred to as the read-only Web since it maintains a functionality limitation (Richardson, 2005). The new technology was adopted by E-Learning 1.0 as it maintained focus upon establishing and managing content for online screening. The learning object was later created to make sure the read only content was of high quality and relevant in nature. Web 2.0 is also referred to as the read-write web since it allows the user to read as well as write or save the content (Richardson, 2005). With the help of these developments, it has been possible to create the e-Learning 2.0 after including learning theory social variables (Anderson, 2007; Mondahl et al. 2009).

According to Wheeler (2011), the Web 3.0 would be a "Read/Write/Collaborate" web. For the E-Learning 3.0, there would be four key aspects which are 3D visualization and interaction, collaborative intelligent filtering, extended smart mobile technology and distributed computing. The users would attain the advantage of anytime and anyplace learning with the help of distributive computing integrated with smart mobile technology. Content organization, documentation management and web searching would also be extended with intelligent solution. Hence, e-learning 3.0 would not only be intelligent but also collaborative (Goroshko and Samoilenko, 2011). The human thinking would be facilitated significantly through intelligent agents. Tools such as Twitter enhance collaboration since it attains various conceptual communication features. The knowledge sharing then also influence the organization performance (Attar et al. 2019; Alharthy et al. 2018).

The Semantic Web and data web are two words used to refer to the new Web 3.0 (Harris, 2008). The collective intelligence is integrated and is considered to be personalized (Harris, 2008). The features include various source learning,

interaction through several kinds of web content, intelligent agent, search result personalization through ad filtering, natural language search and personalized learning. With the help of Web 3.0, the e-learning 3.0 would be developed and to make sure the learning process for the students is efficient and effective the artificial intelligence would be integrated (Rubens et al., 2011). Through communication cooperation and collaboration, e-learning is attained using Pedagogy. It would also help attain the conditional learning procedures (Beetham and Sharpe, 2007). Connectivism and pragmatism are the e-learning 3.0 learning theories (Sofiadin, 2014). When knowledge is disseminated within a network, it is referred to as connectivism. The advantages of E-learning 3.0 include enhanced support for mobile technology and distance learning, efficient student management, flexible and personalized technology, smart search and effective collaboration.

2.2 E-Learning 3.0 Framework

Several e-learning frameworks are available. Such as the theoretical framework (Georgouli et al., 2008), Theoretical Framework for Blended Learning for Adults (Fang et al., 2012), Information Quality Framework for e-Learning System (Alkhattabi et al., 2010), End-User Training Framework (Ramakrisnan et al., 2012), and Conceptual e-learning framework (Glancy and Isenberg, 2011). These frameworks involve the use of activity and training mechanisms, evaluation, implementation, information quality, content, community and e-learning administration management. Administrators, learners and teachers assess the frameworks with the help of the current e-learning software and provide e-learning standards and mechanisms.

Various factors must be reunited to make sure the e-learning 3.0 is successfully implemented. These factors are transversal to the various e-Learning domains (Devedžić, 2006). The category outline is formed using the e-Learning critical success factors by

Selim (2007). These factors are divided into four areas which are institutional support, information technology, learner and teacher. The CSF framework is reorganized which is proposed for e-learning 3.0 systems by Miranda et al. (2014). Hence, the e-learning 3.0 includes critical success factors part of the framework which are stakeholders, content and technology (Miranda et al. 2014, 2016, 2017) (see Figure 1). Table 1 explain the e-learning 3.0 critical success factors.

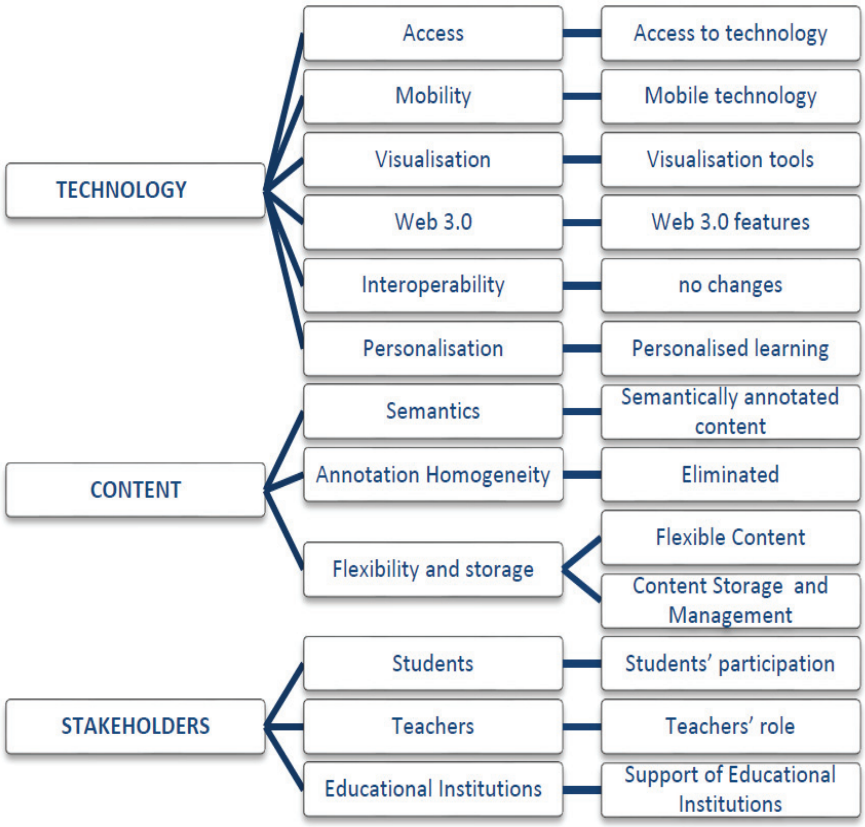

Figure 1: e-Learning 3.0 framework by Miranda et al. (2017)

Table 1: e-Learning 3.0 critical success factors
(Miranda et al. 2014, 2016, 2017)

Technology	
Access	It refers to technology availability and its reliability to access e-learning. The technology consists of hardware/software, user interface usability with a fast internet connection.
Mobility	Mobility refers to mobile technology, in the form of mobile apps and smart mobile technology.
Visualisation	Visualisation offers different tools in e-learning 3.0 in variety of formats such as 3D visualisation and interaction.
Web 3.0	Web 3.0 is a platform for e-learning 3.0, which provides intelligent tools such as search engine, ontologies and semantic features.
Interoperability	Interoperability refers to the integration of different applications required for web-based systems.
Personalisation	Personalisation denotes user profiling, Artificial Intelligence and intelligent e-Learning systems.
Content	
Semantics	Semantics involves big data management, metadata, semantic web ready content, machine-understandable learning material, and semantic mark-up for a greater access to significant content.
Annotation homogeneity	Annotation homogeneity refers to the exchange of understanding of data between different systems with the help of semantic homogeneity and an ontology structure.
Flexibility and storage	Flexibility and storage refer to the need for a dynamic content and effective storage with the help of cloud computing and open data etc.
Stakeholders	
Students	The students' engagement in collaboration, active participation and their personal and technical skills in e-learning 3.0 platform.

Teachers	The teachers are the creators of meaning and to have the required technology training.
Educational institutions	The educational institutions provide the resources for the e-learning 3.0 availability, such as the infrastructures development, training for e-learning the inter-connectedness among institutions etc.

3. Hypotheses development

Motivation is the fundamental principle for effective education (Kim and Frick, 2011). When a learner actively participates and desire to acquire from an activity is the 'motivation to learn' (Harandi, 2015). Motivation can be related to attitude in terms of theory of planned behavior (Ajzen, 2012). Attitude is a significant predictor of intention to engage in e-participation (Alharbi et al. 2016). Intrinsic motivation and extrinsic motivation are the two categories of student motivation (Harandi, 2015). When a student is motivated from inside to learn and execute a task, this is referred to as the Intrinsic motivation: Intrinsically driven students get them happily engaged in finding out the unique things, carefully executing a task to accomplish their milestones and finally they appear satisfied. These students willingly accept the challenging tasks, where they could showcase their potential to uplift their learning curve and to achieve the desired results. While, extrinsically motivated students are reluctant to put energy and enthusiasm while performing a task (Afzal et al., 2010).

Technology: The future education is impossible without mobility. For learning analytics, the mobile technology is significant as it helps attain vital information from all over. Mobile technology offers personalized solutions. The students can daily and continuously access the world and the teachers are also provided with a broad technology scope. Technology's unavailability can have a negative effect on student e-Learning's acceptance. Technology readiness has significant positive effect on students learning (Dolmark et al. 2019).

H1: Technology has a significant positive effect on student motivation to engage in e-learning 3.0.

Content: Students are significantly empowered by e-learning as their learning becomes personalized. The content is well understood, and social associations are enhanced. Through material reorganization and various methods of indexing, it is possible for individuals to reorganize themselves (Miranda et al. 2014, 2016, 2017).

H2: Content has a significant positive effect on student motivation to engage in e-learning 3.0.

Stakeholders: The stakeholders are students, teachers and educational institutions. The e-learning 3.0 would thrive if the students increase interaction, innovate, conduct problem solving, collaboration, learning at any place or any time, technology interest to incorporate learning, content generation and be literate in terms of technology (Miranda et al. 2014, 2016, 2017).

H3: Stakeholders collaboration has a significant positive effect on student motivation to engage in e-learning 3.0.

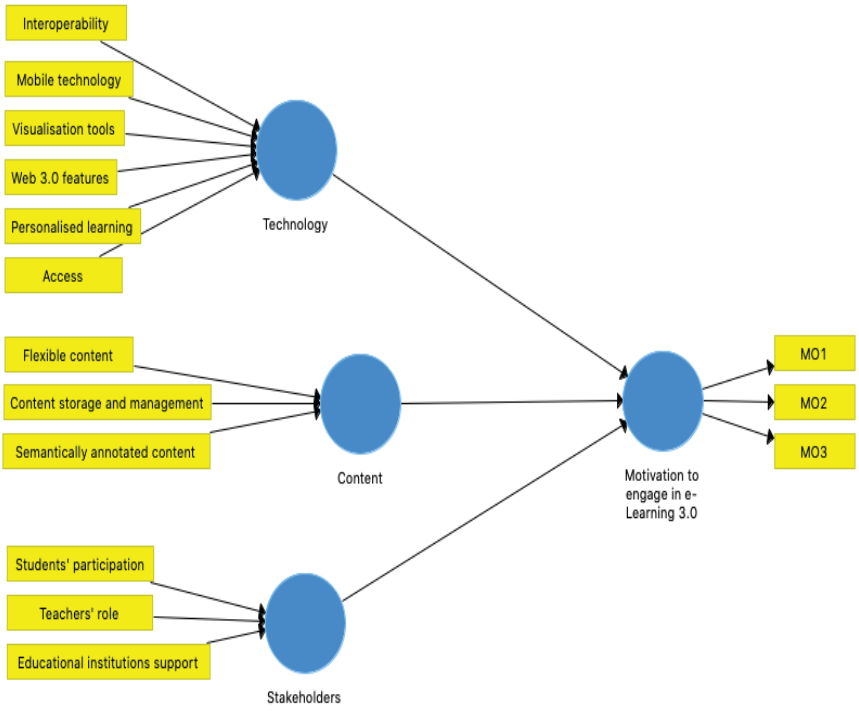

Figure 2: Research Model

4. Methodology

This study used the survey method to collect data. Data were collected from Saudi university students from October 2019 to December 2019. Survey was sent to 500 students and 160 participated in the survey. After removing the incomplete responses, a total of 140 responses were used for data analysis. The research model was tested through variance-based structural equation modeling (SEM) statistical technique, Partial Least Squares (PLS) path modeling using SmartPLS v3. Since Covariance-based SEM techniques only handle reflective variables, they are not fit for some types of research studies (Henseler et al. 2009). In this study, both reflective and formative constructs are included in the research model. Owing to its

various flexibilities, a preferred analysis technique in information systems and business research is none other than the Partial Least Squares (PLS-SEM) approach (Binsawad et al. 2019; Sohaib et al. 2019). For instance, this is compatible with exploratory modeling or prediction-oriented research (Henseler et al. 2011) where normality and a large sample size are not required. Subsequently, it works efficiently with nominal, ordinal and interval-scaled variables and works without distributional assumptions (Haenlein and Kaplan, 2004; Hair et al. 2014). According to researchers, PLS is a suitable choice, since the researchers are enabled to evaluate structural path coefficients and measurement model parameters at the same time. Likewise, it lets both reflective and formative constructs to be investigated at once (Sohaib et al. 2019).

5. Data Analysis and Results

A total of 140 valid responses are used for the analysis. All participant were currently enrolled undergraduate students consisting of 65% male and 35% female. All participants have learning experience in the existing e-learning system.

5.1 Reliability and Validity Assessment

Reliability and validity assessments are conducted by internal consistencies, convergent and discriminant validity. Cronbach's reliability and composite reliability of the reflective variable factor (motivation to learn in e-learning 3.0) has the recommended value of 0.7. AVE exceeds the recommended value of 0.50. Similarly, all correlations and the average variance extracted (AVE) indicate sufficient discriminant validity. Table 2 shows the correlations indicating sufficient discriminant validity. The assessment of formative constructs follows Hair et al. (2014). Technology, Content and Stakeholders are modelled as formative constructs that cannot be analyzed in this process. However, the variance inflation factor (VIF) value less than 5 indicated no multicollinearity to conclude formative indicator reliability.

Table 2: cross-loadings

	Technology	Content	Stakeholders	Motivation to engage in e-Learning 3.0
Technology	-			
Content	0.48	-		
Stakeholders	0.57	0.42	-	
Motivation to engage in e-Learning 3.0	0.52	0.58	0.44	-

5.2 Structural Model Testing

The path coefficients significance was assessed using the bootstrapping technique (Sohaib et al. 2019b). The 5% significance level (p value 0.05) was is taken into account to accept the hypotheses. Table 3 and Figure 3 shows the results. All three hypotheses are accepted. The findings show that technology, content and stakeholders' collaboration significantly and positively influence students' motivation to engage in e-Learning 3.0. The R^2 indicate that 41% of the variance is the student motivation, which shows a satisfactory level of explanation.

Table 3: Path testing

	Path	Path Coefficient mean	St. Dev	t-value	p-value	Supported?
H1	Technology -> Motivation	0.49	0.04	4.36	0.000*	Yes
H2	Content -> Motivation	0.109	0.05	2.61	0.000*	Yes
H3	Stakeholders -> Motivation	0.106	0.06	2.16	0.000*	Yes
* Significant at the 0.001 level						

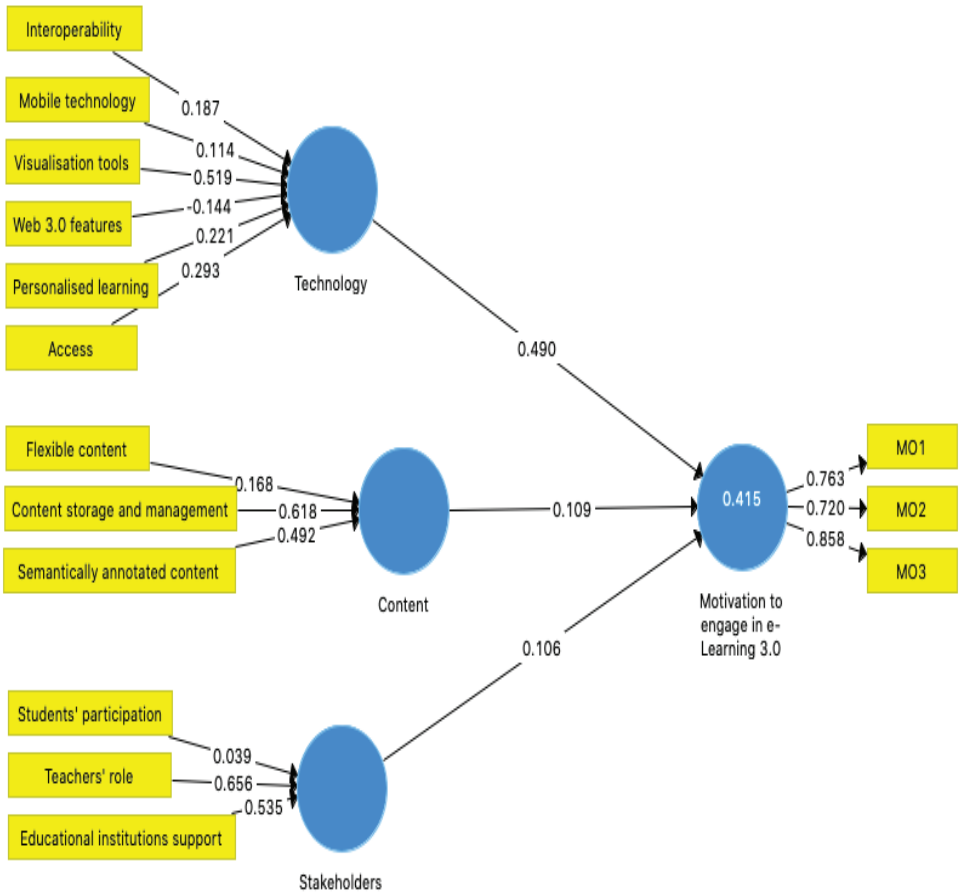

Figure 3: Path testing

To extend the results further by additional findings and conclusions for managerial actions, Importance-Performance Map Analysis (IPMA) was also performance (Ringle and Sarstedt, 2016). In order to prioritize managerial actions, the two dimensions in IPMA (i.e., performance and importance), are important. Performance is measured on a scale from 0 to 100. The target construct is "student motivation to engage in e-Learning 3.0". Figure 4 shows the direct predecessors

(constructs) of the selected target construct. The findings show that "technology" has the most importance (total effects is 0.49) in explaining the target constructs with the performance of 63. "Stakeholders" construct has the most performance of 66. "Content" is the least performing among these constructs with a performance of 58. Increase in performances of these factors would increase the performance of the key target construct. However, the priority is the "content" in this case.

Similarly, Figure 5 shows all the predecessors (indicators level) of the selected target construct. The findings show "web 3.0 features" has the most performance of 78. The low performance is "Access" of 55 followed by "content storage and management" of 56. These items should receive highest priority in overall performance improvement of the target construct (student motivation to engage in e-Learning 3.0).

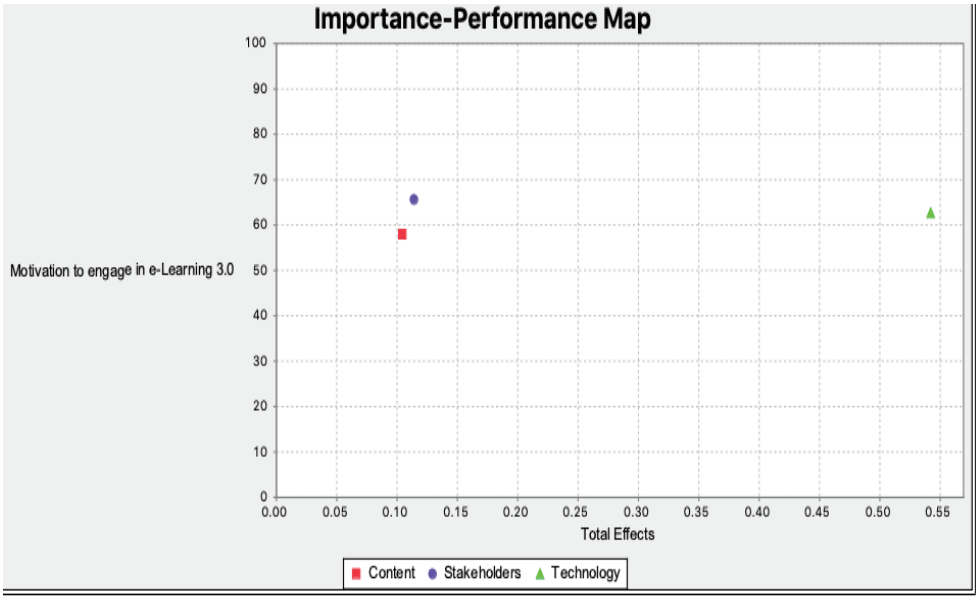

Figure 4: Constructs IPMA

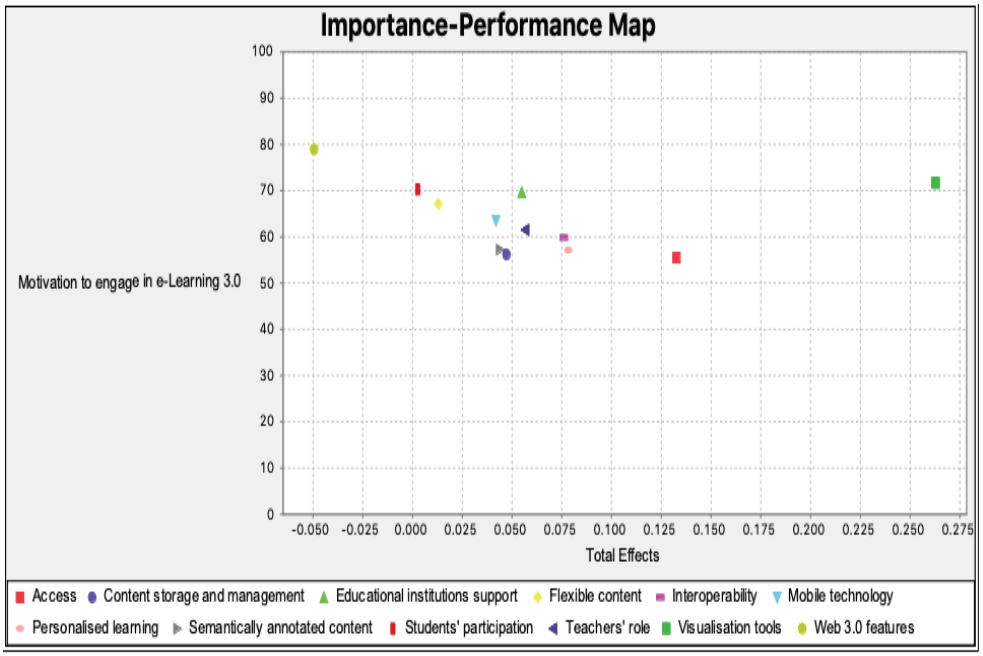

Figure 5: Items IPMA

6. Discussions and Conclusion

The results show that technology, content and stakeholders' collaboration significantly and positively influence students' motivation to engage in e-Learning 3.0 in the Saudi context. The IPMA results concludes the implications for managerial actions that all three constructs technology, content and stakeholders should receive further importance in improving the students' motivation to engage in e-learning 3.0. Hence, students show their keen interests while adopting e-learning. It is well-established that true and internal motivation of students lead to the engagement and successful engagement helps in accomplishment of goals and learning objectives (Kim and Frick, 2011).

The students will be able to efficiently perform their assessments with the implementation of e-learning. The successful implementation of e-learning 3.0 would be ensured

through the actual use of technology. Furthermore, the technology tools for the implementation of e-learning 3.0 should have the capacity to convey the desirable knowledge. World is witnessing technological advancements, which can greatly facilitate the students, such as, the iPad systems can be launched with no heavy textbooks. Regardless of time and place, students connected with internet and having access to an e-learning system can now interact with instructional materials in various formats (pictures, texts, sound, video on demand, and so on). In addition, interaction with teachers and classmates (individually and simultaneously) can be a possible task for student's subject to the availability of video conferencing, functionality of message boards and instant message exchanges. They can also participate in self-paced learning and they can also gain an insight with both the process and the content of their learning.

E-learning 3.0 gives different benefits, for instance, efficient search, better partnership, better support distance learning, flexible and more personalized technology, enhanced student engagement and excellent support for mobile technology. The needs of students ease of information, collaboration and solution will be fulfilled by the educators through proposed sustainable e-learning 3.0 framework. Moreover, it can support resources (facilitators, learners, content), globally establish innovative academic stakeholders and can create awareness about the likely harms caused by technology besides avoiding waste. The data accessible from e-learning 3.0 can greatly contributed in discovering the social aspects of learning. Since the collaborative behaviours external to formal educational institutions and classrooms can be discovered through collaborative tools, they are hence often used in self-driven and an informal manner; which was earlier an extremely difficult task. The collaborative behaviours can be understood through numerous techniques and methodologies.

Web 3.0 will take advantage of artificial intelligence to help the learners and to gain a deeper understanding of the process. The e-learning 3.0 technology is easily accessible to students and it ensures the technical support, because of which, investments must be made by the institutions to implement this technology. An official responsibility valid both for students and teachers is the provision of training for e-learning 3.0. Furthermore, the platform, such as: Web 3.0 is presenting an opportunity of multiple application integration across institutions, which should be welcomed by the universities.

Like any other research, this study has limitations. First, the data were collected only from students in selected university, future work should include staff and administrators etc to generalize the findings. Second, this study is conducted using the survey method, qualitative methods would provide additional findings. A multi-criteria decision-making method (Sohaib et al. 2018; Sohaib and Naderpour, 2017) would provide deeper understanding of the e-learning 3.0 activities.

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