Fit-Viability Approach for E-Learning Based Cloud Computing Adoption in Higher Education Institutions: A Conceptual Model

Qasim AlAjmi, Mohammed A. Al-Sharafi, and Godwin John Chellathurai

Abstract   Today, exists an innovative thinking amongst the educators and learners in the use of e-learning method in the Higher Education Institutions (HEIs) worldwide. Be that as it may, the E-learning framework requires immense up-front infrastructure with many establishments which isn’t anything but difficult to be overseen. Cloud computing accompanies another advancement stage to overcome e-learning issues in a simple and cost-proficient way that HEIs can embrace to improve the nature of their scholarly services toward the end with the thought of an instructive innovation of educational technology. The fundamental point of this explorative study is to develop a conceptual model to examine the factors laid down by Information technology (IT) adoption theory that influencing the E-Learning Based Cloud Computing (ELBCC) by integrating fit-viability theory with the diffusion of innovations (DOI) theory’s factors. The findings of this study demonstrated that the used scale measurement has met the criteria of reliability and validity. Further this study conveyed an integrated model for investigating Cloud Computing adoption for E-Learning in HEIs in Omani context in the Sultanate of Oman, and it provides the foundation for coming studies due to its infancy, and deep insight for cloud computing development, this is a hypothetical commitment. Moreover, this study builds up an empirical mechanism to explore influencing adoption features for the Omani HEIs perspective. In Composing, this is the first kind of an empirical study in Omani HEIs setting. At long last, the outcome will help the Omani HEIs to make sense of their preparation for E-Learning

Q. AlAjmi (✉)
Department of Education, College of Arts and Humanities, A’Sharqiyyah University, Ibra, Sultanate of Oman
e-mail: Alajmi.qasim@gmail.com

M. A. Al-Sharafi
Institute For Artificial Intelligence & Big Data, Universiti Malaysia Kelantan, City Campus, Pengkalan Chepa, 16100 Kota Bharu, Kelantan, Malaysia
e-mail: alsharafi@ieee.org

G. J. Chellathurai
Department of Humanities, College of Arts and Humanities, A’Sharqiyyah University, Ibra, Sultanate of Oman
e-mail: godwinjohnk@gmail.com

© Springer Nature Switzerland AG 2021
M. Al-Emran and K. Shaalan (eds.), Recent Advances in Technology Acceptance Models and Theories, Studies in Systems, Decision and Control 335, https://doi.org/10.1007/978-3-030-64987-6_19
Based Cloud Computing, and what are the critical elements decision makers ought to consider prior to implementation.

**Keywords** E-learning based cloud computing · Cloud computing adoption · Fit-viability model · Diffusion of innovation · Educational technology

1 Introduction

The advancement of a society relies upon education by and large. Online or web based learning is considered as one of the best methods of education-for-all in the current age [1, 2]. E-learning alludes to ‘all channels that empower electronic learning and teaching, which are practical nature and expect to influence the development and improvement of comprehension with respect to individual experience, implementation, capacities, and knowledge of educators [3]. For ensuring a fruitful learning procedure, communication and knowledge systems, regardless of whether electronic or not, we have to use some specific channels [4]. Of late, various individuals in scholastics, especially those having a place in the pedagogy field, have built-up an extraordinary enthusiasm in Electronic based learning with most part with respect to cloud computing (CC) [5]. The development and improvement of social orders in communities and nations are extraordinarily impacted by Higher education institutions (HEIs) quality. Various Universities and Colleges have deserted past strategies utilized for teaching and received online or web based learning as new innovation has emerged [6]. These universities currently execute information and communication technology (ICT) which is called educational technology [7]. To ensure an effective online education delivery, Universities must have adequate IT infrastructure and make the correct ventures as these activities are hard to achieve during some significant breakdown, like SARS-CoV-2. In reality, there are some institutions which discover it extremely difficult to offer totally diverse kind of Information Technology (IT) facilities and hence students are then associated with users who are not directly connected with the institution [8]. At present, cloud computing technology offers a plan for educational institutions, an effective solution to the complexities concerning minimized IT costs are offered [9]. Presently, the HEIs are progressively executing cloud-based online learning, for example Cloud Zoom application. A recently directed exploration on E-Learning Based Cloud Computing (ELBCC) indicated that ELBCC technology has been actualized by forty-three HEIs in 2012. The results of the study show the tenth increase from research conducted in 2011, and it’s evaluated that numbers will continue expanding over the years [9].

Today web is continually utilized by students, and they discover appropriate information through it [10]. These students are already the users of platforms based CC technologies as they use different social media applications and programs such as the Instagram, Twitter, Face book, Gmail, etc. [4, 11]. Subsequently, it has been demonstrated that solutions offered by ELBCC have a huge impact in the process of online
learning and these solutions are implemented and are concerned with the social theories of education, mainly in educational institutions [5]. Accordingly, HEIs directors, universally, are utilizing technologists to use ELBCC strategy. Henceforth, the significant goal of higher education institutions involves the adoption and implementation of online learning with special emphasis on cloud computing. Cloud computing has few advantages over the recently used technologies which are: quality retention, increased effectiveness, improved accessibility [8], economics, increased output, measurability, and diffusion of information worldwide [12]. Besides, the significant goals for online learning delivery are predominantly dependent on cloud computing adopting emergent IT infrastructures in HEIs and improving the accessibility of university’s workers and students to guarantee better quality of education and valuable use of its assets [13]. Therefore, this study intends to examine this situation of the viewpoints associated with online education primarily dependent on cloud computing among the higher educational institutions. This paper will elaborate and present limitations and problems faced by the previously held researches on this subject. Moreover, the paper means to propose areas that require further exploration with the goal that education sector could be further enhanced. The investigations might end up being exceptionally helpful for specialists who are about to explore cloud computing based online learning within tertiary educational institutions. In addition, the study shows the deficiencies within the utilized methods of data for the better advancement in the teaching and learning sector. These gaps introduced critical areas that required to be highlighted in the upcoming analysis and results concerning the execution of cloud computing based online learning in advanced education sectors.

Through ELBCC, users are allowed to animatedly rescale or scale down their utilization of services which fulfill their needs by using a metering technique in which subscribers are only charged for real utilization [14]. Because of various hurdles, under-developed nations have commonly been deserted in the race of technology dissemination, its acceptance and application. These disruptive aspects to technology acceptance involve infrastructure, decision makers willingness, costs, governmental strategies, education, user unwillingness, and safety related issues [15]. The apparent gap between the economic conditions of developed and developing nations is mainly due to the inconsistency in technological development between the two as companies operating in under-developed countries neglect to embrace appropriate innovations [16]. Critical thoughts are being paid to ELBCC by international and national IT stakeholders, international companies and national governments along with cloud computer organizations such as IBM creating cloud centers functioning in various nations like South Korea, Vietnam, Brazil and India [17]. Cloud computing centers are firmly being built-up in under-developed nations by some other global cloud service suppliers like Amazon, Sales force, Dell, Microsoft and Parallels [17]. Under-developed nations could pave the way to success by progressively demonstrating enthusiasm in embarking cloud computing and they can also enjoy low beginning charges and flexible facilities offered by cloud [18]. Additionally, under-developed
nations can become as effective as the developed ones, as clouding is present everywhere and could be accomplished through the similar computing infrastructures, data centers and applications.

2 E-Learning-Based Cloud Computing and Academic Services Quality

E learning based cloud computing (ELBCC) offers the following benefits [19]:

1. Effective Computing and Sufficient Storage Space: A colossal measure of distributed computers and servers are utilized in cloud based e-learning with the end goal of computation and data storage, the presence of a number of clouds in a computer offered the capacity to do the computation effectively and to store enormous information and students can get to these cloud benefits through internet [20].

2. High storage space: By offering high storage space and high efficiency of computing, a remarkable help can be offered by this framework for cloud computing [21]. The node failure and uninterrupted connection can be automatically identified and analyzed by cloud computing system. Besides, the framework can also exclude an uninterrupted connection without disturbing the usual functioning of the system and servers.

3. Highly Secured Data: Data is stored with more security as it involves one or more data center and servers and the combined data is handled by the manager with actual shape and size, resources are assigned, load is balanced, software and servers are arranged, safety is managed, and consistent real time observation is carried out, this in turn guarantees the security of users’ data to an incredible degree [22].

4. Virtualization Platform: Virtualization is considered as the foremost crucial and unique feature of cloud computing. Each application development which is surrounded by physical platform isn’t connected with it. Data is handled, transferred and stored via virtualization. To develop a resource shared environment according to the demands, fundamental hardware is positioned with the servers, storage service and networking apparatus system of broad virtualization [23].

5. Classic Electronic Learning Services for Cloud Computing: Instructive exercises were doled out by the Instructors. In addition, customary addresses were moreover conveyed for enhancing the capacities of students. The course was taken by researchers to memorize from the sessions endorsing independent as well as collective learning [24], or they made the assignments given by the instructors by including their recommendations in them, in spite of the fact that agreeing to the arranged plan instructors responded to the questions inquired by the scholars at a time and also offered important education for imperative and troublesome questions. Moreover, multimedia system computing device may be utilized by Instructors and students may evaluate their claim learning, utilized
strategies and critical learning approaches. Free online learning is carried out by the students after considering each division, they consult the internet and calculate their scores a short time later [25]. Instructors persuade all students to work whereas participating with each other to create the method of learning much easier and simpler. Collective learning not fair guarantees effective learning but too diminishes students’ fear for group work and coordination. Besides, communication aptitudes are upgraded and abilities to legitimately express the views are also moving forward. Consequently, nowadays interactive sessions between Instructors and students are considered exceptionally critical. Figure 1 shows the interactive mode of the suggested plan [26] for ELBCC.

3 Theoretical and Conceptual Background

The economic conditions of a society are improved when people are more progressively open to grasp technology. However, the acceptance rate differs from territory to region because of different social concerns and cultural impediments. These concerns are commonly overlooked during the dissemination process of a new technology adoption. The dimensional character of technology implementation and improvement dissemination includes a distinction, in speed at which technology is accepted by various people and these distinctions can’t be just connected with economic and technological aspects; social and cultural perspectives are likewise involved [27]. Current social and cultural conditions of the adopters should also be considered.
during improvement dissemination and adoption as the ultimate success or failure of the technology adoption strategy may get influenced by these components [28]. There is a colossal contrast between the socio-cultural and economic condition of adopters of cloud computing in developed nations and those in under-developed nations.

All around the globe, different educational institutions refusing to fund allotments due to the existing universal economic decline. Along these lines, various organizations are focusing on methods that reduce their expenses to make progress in their errands [29]. Compelling cost-cutting techniques are offered by cloud computing and its flexible functional model which are required by the educational institutions. Because of these measures, the performance and effectiveness of educational institutions are not affected. Besides, new institutions as well as cash-strapped instructional institutions that are as yet experiencing the period of advancement can inspect the benefits and significance of measurability and furthermore impacts the price structure that enables HEIs to pay at their choice within the cloud computing model [29]. Due to the increasing costs of ICT foundation, setup and support, instructional system institutions are developing interest in the broad nature of cloud computing model, which may just require a trouble-free association between educational institutions and students at any time and at any place as compared to the existing system where the model can be accessed only by those who are present within campus. Higher education institutions as well as the academic leaders contribute more to the technological advancement and its rapid adoption globally. Though, educational institutions also develop such societies that involve people belonging to various social, cultural, and historic backgrounds. Socio-cultural variables that can affect cloud-computing adoption among the HEIs systems likewise to be figured out how to additionally upgrade the social orders present in HEIs [30, 31].

There are different hypotheses, for example the Technological-Organizational-Environment framework (TOE) [32] which involved additional variables for generating Diffusion of Innovations (DOI) [33]. Diffusion of Innovation (DOI) [33] as well as Technology Acceptance Model (TAM) [32] are concentrating on creating client activity models pat-terns towards an innovation adoption in a diversity of capacities and information systems. In the diffusion of innovation theory, it is stated that innovation reaches the public through bound communication channels over a specific time period and among a preferred system. Some concepts fail to study the activity factors that can influence the inclination of people to adopt an innovation, however this model closely focuses on concerns related to innovativeness. Hence, the need to triangulate this theory with another theory is felt. Although theories such as the theory of Planned Behavior (TPB) [34], TAM, and theory of Reasoned Action (TRA) are all purpose-related theories originated from psychological science, TAM was particularly modified in the light of TRA to be employed in the domain of information system. According to TAM, a user’s willingness to utilize a system may depend on apparent utility and how simple it is to use [35]. Observed benefit has been described as the level to which someone who is using a system would enhance efficiency. Although efficiency will be enhanced by using a system, it is also vital to identify the complexities associated with the system. Subsequently, observed easy use is the degree to which someone believes that it will be easier to use a certain system and
it is important to determine this perceived ease of use as it will help people identify whether a system should be adopted or not [32, 36–38]. It was considered that TAM alone cannot be used for modeling cloud computing adoption and as it is not sufficient and lacks numerous options related to current technology acceptance as the concept was presented long ago in 1985 and we all acknowledged how technology has embraced various developments and changes till date. Davis initially designed the Technology Acceptance Model (TAM) in 1986, which is considered a popular model regarding the adoption of models and is concerned with the acceptance of the technology. The basic concept behind TAM is to generate a theoretical foundation for describing behavior related intents toward the utility of a system, effects of external variables, internal convictions and hence the use of real system [39]. TAM is an expanded version of the Theory of Reasoned Action (TRA). DOI is a model related to user adoption of technology by getting familiar with TRA [32, 36]. DOI uses this behavioral related intention relationship and also claims that perceived easy use and perceived utility are two major aspects that encourage a user to adopt a new technology [40]. TAM supported that actual and intention-based usages are impacted by external aspects via mediated impacts on observed easy use and observed usefulness [32]. Pragmatic easy use indicates the extent to which user believes that using a particular system would be trouble-free and easy to use, on the other hand, observed utility signifies the extent to which a user presumes that a particular system will help improve their efficiency [32]. In addition, an observed utility is affected by pragmatic ease of use, which in turn influences approach and intent and further willingness of a user to adopt an innovation.

### 3.1 Fit-Viability Model

Fit-Viability model (FVM) has been employed principally to control the adoption of another innovation [41]. Task—Technology Fit (TTF) model presented by Goodhue and Thompson [42] was utilized as an upgrade to build up a Fit-Viability Model. Fit-Viability hypothesis emerged in 2001 for assessing overall adoption (e-commerce) in various organizations. Fit assesses ‘the degree to which a new technology is compatible with essential skills, structure, ethics, and traditions of an organization [41]. Then again, viability assesses ‘the degree of the additional capacity of recent applications, requirements of human resources, capital wishes and so on’ [41]. Match criteria is evaluated through innovation highlights evaluated through Department of the Interior theory [43, 44], while distinctive major measures for viability are economic, IT and company infrastructure standards.
3.2 Diffusion of Innovation Theory

Diffusion of Innovation Theory (DOI) founded by Rogers [43] first emerged in his book called ‘Diffusion of Innovation’ in which around 508 articles on diffusion analysis were presented for portraying the procedure of an innovation adoption among individuals and organizations. As per Rogers [43], there are four significant components which influence the spread of an innovation i.e. innovation, communication channels, time taken and a social system. Moreover, an organization or an Individual decides to either embrace or reject a new technology by relying on DOI model which involves five basic factors of innovations: relative advantage, compatibility, complexity, trialability, and observability impact. While carrying out this analysis, we picked three most significant attributes which ensure a constant adoption of innovation (Relative advantage, Compatibility, Complexity), as stated by Tornatzky and Klein [45] to evaluate what impacts these factors have on CBEL in HEIs in the country Oman, notwithstanding Fit-Viability (FVM) model towards further development.

This research intends to build up a model to embrace the methodology of ELBCC in Omani HEIs, towards the Quality of educational segments/administrations. The approach adopted during this research has empowered to recognize the internal structure aspects that will play a significant role in increasing the adoption rate of ELBCC and quality of educational facilities in HEIs. This analysis shows the development of the Fit-Viability Model that causes an increased execution of ELBCC while impacting the quality of educational facilities. Fit-Viability Model [46], Diffusion of Innovation theory [43] (as demonstrated in Fig. 1) were utilized while creating the proposed analysis model.

Information technology revolutions have diversely been leagued with Fit-feasibility theory by multiple studies. The acknowledgement of remote system technology helps the Fit-Viability structure expressed for instance, Liang [47], the characteristics reflecting the cloud aggregating acceptance and progression as an area of public division substitutes to apply e-government services were analyzed in the second exploration alongside the development of a research mode dummy laid on Fit-Viability model and dispersal of revolution [48]. The conclusion of the research declared the need to focus on factors linking the two dimensions; Fit and Viability, in making a proper decision to adopt cloud computing in an e-government sector. After the findings from ELBCC and technological and revolutionary traits, the model has been shaped in the two dimensions.

The Fit is termed as the commencing category of the plotted abstract structure summary because ELBCC is in desperate need of advanced education centers. To check if the new application is in accordance with profound potential, framework, merit, and intellect of the institution are totally monitored by Fit [44]. The DOI aspects obtained from Roger are applied in measuring and identifying the concussions of ELBCC [46]. DOI structure complexity, relative advantage, and compatibility factors proportional merits refer to the level of development that appears elevated than the best of its predecessors [49]. Humongous storage scope and the place of insight alongside easy access to any application from desired location or broadband
connection, by means of any suitable device, are the facilities ELBCC offers to cutting edge training focuses. Complexity could be defined as the degree of obstructions in achieving promotion [16, 50]. Unpredictability highlight of ELBCC enables to limit deterrents for scholarly focus and supremacy of IT and makes a technology fit for implementation ensuring imminent quality education services. The substitute debate obtained from DOI theory is compatibility, which identifies with the scope of a steady development recognized with the current values and associated to unification and experiences of prospect and educational adopters [16]. The propounded model depicts the compatibility of technology to transfer the diversified interfaces and information to the cloud and offer this technology fit for the HEIs.

The next factor applied for the utilization of the additional capacities of the requirements of advanced applications to its apex is viability [44]. As it is hugely powerful for mandatory conclusions and handles reduction in its price and their adjustment of readiness for IT, it builds various component for enhancing ELBCC technology of higher educational institutions. One of the crucial elements of suitability is decision making which determines the behavior of officials in supporting and executing the new technology. The development in decision making was reflected by viability before the adoption of ELBCC in the higher educational institutions. The number of financial and labor resources to implement and administrate cloud computing is termed as price reduction [47]. It’s an additional significant issue reasonable for encouraging ELBCC in modern academic centers and furthermore displays the minimization of cost in internet access and the preservation of large information by availing the cloud.

The proposed model represents the viability of HEIs and management with ELBCC and explains their willingness before applying the cloud computing technology for untroubled adoption (Fig. 2).

E-learning despite everything relies upon the mentoring and investigation sectors of administration in an instructing perspective that is structured by a social order. The resourceful characteristics of modern technology have exerted an impact on capable adopters of the innovation factor. The logical foundation for the directive systems framework compiles law that is adopted in the organization mentoring culture and trade and academic surroundings. This foundation originates from the behaviorist outlook but emphasizes on task interpretation. The expansion of innovation findings has highlighted the value of Task, Relative advantage, compatibility, and complexity in configuring the inclination of administration to adopt advanced technology [51, 52]. Subsequently, we assumed that that:

H1: The HEIs-related tasks requirements emphatically impact positively influence ELBCC adoption.

H2: The fitness wellness of ELBCC impacts has a positive influence on HEIs’ decision to receive adopt it.

H3: Relative advantage favorable position positively influences on the fitness of ELBCC to a HEIs’ computing requirement needs for reception. adoption.
H4: Compatibility positively influences emphatically effects on the fitness of ELBCC to a HEIs’ computing needs for adoption.

In the process of this study, the fit identifies with accessing the breaking point to the advanced applications that are in accordance with the profound potential, framework, value, and tradition of the administration. It is determined by the differentiating and examining the influence of ELBCC by DOI characteristics originated from Rogers [43]. The fit debate is that the initial component of the planned and presumed form is summarized because the limit to that CBEL is according to the exact demands of higher academic centers and education departments. DOI structures the relative advantage, complexity and compatibility and presumes that:

H5: The fit of ELBCC to the HEIs task characteristics positively influences HEI’s decision to adopt it.

Information technology’s delicate nature has persistently been a priority to customers over the years in sectors like e-commerce and currently net banking [53]. A portion of the technological issues that have compelled problems pertaining adoption and innovation of cloud computing are information safety, knowledge gap and IT willingness. Since cloud computing technology lays its foundation on internet technologies, persistent security issues hurdle its adoption. However, price minimization and modern safety algorithms with information technologies (IT) willingness hired in cloud computing are termed as major distinguishing factors of cloud computing [54] which will influence its adoption. Likewise, the advertisers are prepared to
screen and manage utilitarian practices with the implementation and utilization of cloud information. To brighten the outcome with quality management, those ranges are very essential for key arrangement and to sort out multiple cloud-based trading arguments. we have a scope to presume that:

**H6**: Top management support positively influences on the fitness of ELBCC to a HEIs’ computing needs for adoption.

**H7**: Cost reduction positively influences on the fitness of ELBCC to a HEIs’ computing needs for adoption.

**H8**: IT readiness positively influences on the fitness of ELBCC to a HEIs’ computing needs for adoption.

Viability model is exclusively being utilized to cater and has been inclined to the implementation to management for successful cost diminishing for a substitute to technology for cloud computing and in obtaining right call and decision-maker to adopt cloud computing in an e-government sector and it is propelled by economic, managerial and groundwork factors for example decision-maker’s assistance, reduction in price and IT willingness factors.

The proposed ideal model establishes its framework on the Fit, viability, and adoption of cloud-based E-learning, which emphasizes the formality, integrity, control, and pro-activeness together with the Fit model of technology factor for knowledge, making the model broadly at risk for the selection of E-learning in universities and high schools. Data integrity refers to the integrity of information, it assures the reliability of data, and it handles mistakes or data safety issues rising due to students’ and personnel’s use of cloud computing technology [55]. The information formality pertains to the deliberate obsession with prescriptive data, instead of the accidental sources that signaled formal management and revitalization of the Data before the adoption of IT technology cloud by higher education institutions. The information form, management of information, information initiative and the integrity of information are the four information attitudes and vitality factors utilized in this study, guiding colleges and universities to adopt e-learning online and subsequently hypothesize that:

**H9**: The feasibility viability of ELBCC has a positive influence on HEIs’ decision to adopt it.

Most universities have figured out the potential advantages of using cloud computing for budgetary reasons and next level advanced academic and data sharing services [56]. The offered optimist model relies on the educational service standard with the ascending use of cloud computing, a few academic institutions are announcing cloud computing technology into their university frameworks prospecting and providing progressively reliable and versatile academic services. Current cloud computing benefits for e-learning are recognized as being frugal with advanced data safety, virtualization, compact Data preservation, and the possibility of supervising data accession.

The benefits of cloud computing for e-learning and the advantages of cloud computing adoption are additionally underscored and discovered that it is efficient
with enriched performance, presents prompt software updates, and enhances the compatibility of record configuration. Besides, it gives numerous benefits to students and professors such as correspondence courses, assessment, projects, forums and e-learning materials, narrations, and resource control in educational services. Along these lines, this study assumes that the implementation of e-learning based cloud computing characteristics of cloud computing progressively influences the plan of higher education center in Oman to ensure standard of educational services.

**H10:** ELBCC adoption has a positive impact on quality of academic services in HEIs.

### 4 Methodology

The application of quantitative knowledge is ceased within the perspective of philosophical hypothesis, which generated confirm outcomes, effect, or result. We intend to utilize this recommendation amidst the study to authorize the kinship in our model among the free-lance variables pertaining to cloud computing adoption, dispersal, fit-viability, and adoption; alongside the subordinate factors of intention to adopt and intent to apply cloud computing advancement recognition. A research proposition that emphasized quantitative information in the study has been gathered for this research as a product. It will empower us to innovatively and responsively measure the reaction of a humongous sample across multiple universities/colleges in the reigns of Oman in an exquisitely proficient and ideal gesture [57]. The researcher [57] proposed that evidence of the interlink amongst variables will solemnly be investigated in an extensively empirical correlation scrutiny format using quantitative knowledge. Prefatory knowledge for examining the suggested model was gathered by means of a survey distributed online through the Survey Monkey tool. Preliminary studies of precedent five years on the dispersal of innovation theory assisted to design a survey tool through supported literature [39, 58] TOE [16] and adoption of ICTs and e-commerce in progressive States [65]. Propositioned definitions were applied to create questionnaire measures for models that lacked suitable measures from the remaining literature such as the quality of academic services material.

The tool comprehends the extensive focus research in concern to cloud computing adoption. It was Distributed into sub-division where each subsection has expertise in questions pertaining to the diversified elements in our suggested analysis model and hence generated the upcoming hypothesis that was backing the proposed conceptual and speculative models. Filtering the survey tools into these unique parts grants for a lucid comprehension of why the queries were being raised and their part in evoking solutions and supportive terms that may assure the validity and reliability of the approaching model to answer our analysis questions. The urge to adopt and apply cloud computing was by inquiry and defect measured in a chunk of the instrument employing a five-point Likert scale (range one = strongly condemn to five = strongly ap-prove).
Explanatory statistics are hired in the aggregate research to inspect info. However, for this study which focused on the development and authorization of the model and instrument, this information wasn’t confined within the study. Tool durability was examined using Cronbach’s Alpha. Alloy reliability tests as Pearson correlation analysis using the SPSS applied mathematics tool authorized the sizing and structural factors of our model. The products from this precedent analysis were applied to validate the indicators mass and Containers for everything employed in our equipment and locate coefficients amidst freelance and contingent factors. The instrument validity was furthermore examined through focused and discriminate validity.

5 Results

5.1 Preliminary Study Results

A pilot survey was assigned amidst academics/decision-makers/IT engineers in an attempt to validate the survey items designed above for the info gathering in HEIS in the Sultanate of Oman. Forty out of One hundred people who were mailed and invited to fill the survey, submitted their response with a percentage of forty. This survey was monitored online and through paper strategies to various higher institution institutions in Oman. Out of 10 people received the survey form at a conference, only a couple of persons filled and re-submitted the form at the end of the conference, response rate resulting 2 out of 100 respondents. This proves that a physical survey would force procrastination and energy for the respondents to fill them and resubmit them to the research team. The benefits of the internet survey were transparently the prompt response of the attendants. The researcher however sent out consecutive email reminders to stimulate the response rate mentioned above. Our remote study reliability data is inclined on thirty-nine concluded questionnaires (N = 39).

5.2 Survey Instrument Validity and Reliability

It is mandatory to authorize the survey items to assure that the materials of the questions are transparent and free from doubtfulness. The approach of the study is to impose various insights from multiple experts within the faculty to ensure that the study is practicable, examine the information gathering methods to be used, and ponder over how the information is examined and gathered [66]. Experts authorize the survey items for this research prior to the pilot study that provided ideas for improvement within the framework of numerous questions similarly as the compensation of doubt.

In accordance with the modifications imposed by the advisors and the respondents to the online survey, the material validity of the equipment was formed. It is also
Table 1  Reliability statistics

| Construct                                      | No. of items | Cronbach’s alpha |
|-----------------------------------------------|--------------|------------------|
| Task                                          | 4            | 0.911            |
| Relative advantage                            | 6            | 0.924            |
| Complexity                                    | 5            | 0.897            |
| Compatibility                                 | 6            | 0.815            |
| Fit                                           | 5            | 0.927            |
| Organizational                                | 6            | 0.949            |
| Economical                                    | 5            | 0.960            |
| Infrastructure                                | 6            | 0.932            |
| Viability                                     | 3            | 0.916            |
| Adoption of E learning based cloud computing  | 5            | 0.916            |
| Academic service quality                      | 4            | 0.969            |
| All item                                      | 55           | 0.919            |

prominent that almost the entire questionnaires for the study were based on former studies on Fit-Viability theory, dispersal of innovation theory, and E-learning adoption in progressive countries, practicing the validity and durability of the additionally established things [54, 59].

Cronbach’s alpha reliability observed statistics to identify the durability of our instrument and assuring that the questions used were weighing the qualities of the concept. The Cronbach’s alpha could be regularly in accordance to statistical scaling used for determining the inner reliability of a survey equipment to ensure results from measurements are coherent in generating alike products time to time. Applied the statistical package for the social sciences (SPSS) to inquire the response from our findings.

Table 1 illustrates the Cronbach’s alpha values for each hypothesis and the intervening correlation values when items marked for eradication by the SPSS statistical equipment to stir up the Cronbach’s alpha values were removed [58]. Directed that the major correlation among items for a measurement scale gives information relating the dimensionality of the size. Additionally, it was claimed that the mean intertwined correlation contradicts from a dependent estimate as a consequence it is not affected by scale length and therefore provides a transparent measure of item similarly. A mean correspondence among items of less than 0.3 indicates feeble bond with others in measuring alike construct, whereas inter-item correlation greater than 0.9 warns issue of multi-collinearity. In the meanwhile, a Cronbach’s alpha worth of 0.7 or higher depicts smart infra consistency of items in the scale [60]. In accordance with [60], a Cronbach’s alpha worth higher than 0.9 is great, larger than 0.8 is fine, bigger than 0.7 satisfactory. Greater than 0.6 is questionable, bigger than is 0.5 below average and lesser than 0.5 is unacceptable. A number of inter-item correspondences were observed to be smaller than the proposed worth 0.3 thus they were uninvolved in the study. No items were qualified for elimination due to low equivalency with
the contrary items during the measurement of complexity and produced apparent constructs.

As the evaluated Cranach’s values are higher, we preceded these objects and regulate the durability statistics again in SPSS to encourage higher Cronbach’s alpha values and enhance the reliability of our model equipment (Table 1).

6 Conclusion

The inference arrived during this explorative study leads to an evolutionary and conceptual representation of E-learning due to the acceptance of cloud computing in developed tutoring centers or higher education institutions in the Sultanate of Oman. The research included elaborated theory of revolution and acquaintance and advantage of technology with the origination of students practicing cloud aggregating system. A survey was done among 39 participants in the CBEL and examined by calculable data. Fit-viability theory and the DOI are the two major theories laying the foundation of the research proposed form in the aspect of acceptance of modern technologies along with standards for the theory of educational services. the presented adoption representation consists of 10 hypotheses to display the role of Fit, inspired by the characteristics of technological factors borrowed from the DOI theory, comparably relative benefits, accordance and complication; maintenance is affected by frugal, management and infrastructural components, such as cost minimization, decision-making ability and computer inclination factors from Fit-viability theory. All have an amiable relationship with higher education systems aiming to accept ELBCC targeting the quality of educational services.

The products of global research are likely to play a part in the formation of a reliable specific miniature that can survey the practice of cloud computing and similar technologies, applications, feasibility and educational practice of the education system. The articulation of the research representation is laid on essential approvals of concepts from divergent IT research work committed at multiple administrative scales. Consequently, the verification of the design suggested in this depiction is binding.

The hypotheses of research representation are likely to be embraced by HEIs in Oman willingly. The supplementary intention of this investigation is to compile data for the launch of ELBCC which is inspired by the characteristics of many institutions, pleasant motivation, communal influence and contemplation of conduct. Ultimately the processing research findings are expected to pitch into scholastic exquisite service examples pertaining to the idea of developing States. The most important aspects influencing the adoption of ELBCC among HEIs in Oman should be examined by the proposed model. In under-developed nations, enough research has not been carried out by using FVM and DOI theories for designing and combining constructs to describe the organizational acceptance of cloud computing based online learning and quality of educational facilities. A fresh outlook is presented by the triangulation of two theories along with presenting the effects of background-related and economic
factors; furthermore, understanding of views, dissemination, acceptance, quality, technology, and adoption of cloud computing-based online learning in HEIs in Oman is also provided. This learning was not extended to cover more respondents in order to validate the proposed model, as it focuses on focused group of respondents as initial study. Future research on this same topic would focus on the second stage of this model development.

References

1. Al-Samarraie, H., Saeed, N.: A systematic review of cloud computing tools for collaborative learning: opportunities and challenges to the blended-learning environment. Comput. Educ. 124(May), 77–91 (2018)
2. AlAjmi, Q., Arshah, R.A., Kamaludin, A., Sadiq, A.S., Al-Sharafi, M.A.: A conceptual model of e-learning based on cloud computing adoption in higher education institutions. 1–6
3. Patel, H., Patel, A., Shah, P: Impact of e-learning in the development of student life. Int. J. Res. Eng. Technol. 2(4), 233–238 (2014)
4. Tavangarian, D., Leypold, M.E., Nölting, K., Röser, M., Voigt, D.: Is e-learning the solution for individual learning? Electron. J. E-learning 2(2), 273–280 (2004)
5. Alshwaier, A., Youssef, A., Emam, A.: A new trend for e-learning in KSA using educational clouds. Adv. Comput. Int. J. 3(1), 81 (2012)
6. Salloum, S.A., Alhamad, A.Q.M., Al-Emran, M., Monem, A.A., Shaalan, K.: Exploring students’ acceptance of e-learning through the development of a comprehensive technology acceptance model. IEEE Access 7, 128445–128462 (2019)
7. Alajmi, Q., Sadiq, A., Kamaludin, A., Al-Sharafi, M.A.: E-Learning models: the effectiveness of the cloud-based e-learning model over the traditional e-learning model
8. Alharthia, A., Alassafia, M.O., Alzahraria, A.I., Waltersa, R.J., Willsa, G.B.: Critical success factors for cloud migration in higher education institutions: a conceptual framework. Int. J. Intell. Comput. Res. 8(1), 817–825 (2017)
9. Lee, C.: Handbook of research on cloud-based STEM education for improved learning outcomes. IGI Global (2016)
10. Al-Qaysi, N., Mohamad-Nordin, N., Al-Emran, M., Al-Sharafi, M.A.: Understanding the differences in students’ attitudes towards social media use: a case study from Oman. 176–179
11. Salloum, S.A., Al-Emran, M., Habes, M., Alghizzawi, M., Ghani, M.A., Shaalan, K.: Understanding the impact of social media practices on e-learning systems acceptance. 360–369
12. Ashtari, S., Eydgahi, A.: Student perceptions of cloud applications effectiveness in higher education. J. Comput. Sci. 23, 173–180 (2017)
13. Pardeshi, V.H.: Cloud computing for higher education institutes: architecture, strategy and recommendations for effective adaptation. Procedia Econ. Finan. 11, pp. 589–599, // (2014)
14. Mell, P., Grance, T.: The NIST definition of cloud computing. 20–23 (2011)
15. Svanessson, D., Clarke, R.: Privacy and consumer risks in cloud computing. Comput. Law Secur. Rev. 26(4), 391–397, 7// (2010)
16. Moodley, S.: Whither business-to-business electronic commerce in developing economies? The case of the South African manufacturing sector. Inf. Technol. Dev. 10(1), 25–40 (2003)
17. Sabi, H.M., Uzoka, F.-M.E., Langmia, K., Njeh, F.N., Tsuma, C.K.: A cross-country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa. Inf. Syst. Front. 1–24 (2017)
18. Kshetri, N.: Privacy and security issues in cloud computing: the role of institutions and institutional evolution. Telecommun. Policy 37(4–5), 372–386 (2013)
19. Al-Sharafi, M.A., Arshah, R.A., Herzallah, F.A., Alajmi, Q.: The effect of perceived ease of use and usefulness on customers intention to use online banking services: the mediating role of perceived trust. Int. J. Innov. Comput. 7(1), 9–14 (2017)
20. Arpaci, I.: Understanding and predicting students’ intention to use mobile cloud storage services. Comput. Hum. Behav. 58, 150–157 (2016)
21. Chang, Y.S., Chen, S.Y., Yu, K.C., Chu, Y.H., Chien, Y.H.: Effects of cloud-based m-learning on student creative performance in engineering design. Br. J. Educ. Technol. 48(1), 101–112 (2017)
22. Fernandes, D.A.B., Soares, L.F.B., Gomes, J.V., Freire, M.M., Inacio, P.R.M.: Security issues in cloud environments: a survey. Int. J. Inf. Secur. 13(2), 113–170 (2014)
23. Hemanth, G.S., Mahammad, S.N.: An efficient virtualization server infrastructure for e-schools of India. Inf. Syst. Des. Intell. Appl. 89–99 (2016). Springer
24. Jayasena, K., Song, H.: Private cloud with e-learning for resources sharing in university environment. 169–180
25. Al Musawi A.S., Abdelraheem, A.Y.: E-learning at sultan qaboos university: status and future. Br. J. Educ. Techn. 35(3), 363–367 (2004)
26. Almazroi, A.A., Shen, H., Teoh, K.-K., Babar, M.A.: Cloud for e-learning: determinants of its adoption by university students in a developing country. 71–78
27. Guan, B., Wu, J., Wang, Y., Khan, S.U.: CIVSched: a communication-aware inter-VM scheduling technique for decreased network latency between co-located VMs. IEEE Trans. Cloud Comput. 2(3), 320–332 (2014)
28. Herbig, P., Dunphy, S.: Culture and innovation. Cross Cult. Manag. Int. J. 5(4), 13–21 (1998)
29. Sultan, N.: Cloud computing for education: A new dawn? Int. J. Inf. Manag. 30(2), 109–116, 4// (2010)
30. Alajmi, Q., Al-Sharafi, M.A., Abuali, A.: Smart learning gateways for Omani HEIs towards educational technology: benefits, challenges and solutions. Int. J. Inf. Technol. Lang. Stud. 4(1), (2020)
31. AlAjmi, Q., Arshah, R.A., Kamaludin, A., Sadiq, A.S., Al-Sharafi, M.A.: A conceptual model of e-learning based on cloud computing adoption in higher education institutions. 1–7
32. Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. pp. 319–340 (1989)
33. Rogers, E.M.: Diffusion of Innovations, 4th. edn. Free Press, New York (2003)
34. Ajzen, I.: The theory of planned behavior. Organ. Behav. Hum. Decis. Process. 50(2), 179–211 (1991)
35. Alajmi, Q., Sadiq, A.S., Kamaludin, A., Al-Sharafi, M.A.: Cloud computing delivery and delivery models: opportunity and challenges. Adv. Sci. Lett. 24(6), 4040–4044 (2018)
36. Bagozzi, R.P.: The legacy of the technology acceptance model and a proposal for a paradigm shift. J. Assoc. Inf. Syst. 8(4), 243–254 (2007)
37. Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D.: User acceptance of information technology: toward a unified view. MIS Q. 27(3), 425–478 (2003)
38. Cohen, L., Manion, L., Morrison, K.: Research Methods in Education, 5th edn, Routledge Falmer, Abingdon (2000)
39. Legris, P., Ingham, J., Collerette, P.: Why do people use information technology? A critical review of the technology acceptance model. Inf. Manag. 40(3), 191–204 (2003)
40. Zhao, Y., Zhu, Q.: Influence factors of technology acceptance model in mobile learning, pp. 542–545
41. Tjan, A.K.: Finally, a way to put your Internet portfolio in order. Harv. Bus. Rev. 79(2), 76–85, 156 (2001)
42. Goodhue, D.L., Thompson, D.L.: Task-technology fit and individual performance. MIS Q. 213–236 (1995)
43. Rogers, E.M.: Diffusion of Innovations. Free Press, New York, pp. 551 (2003)
44. Al-Balushi, F.M., Bahari, M., Rahman, A.A.: Technology, organizational and environmental (TOE) factors influencing enterprise application integration (EAI) implementation in Omani government organizations. Indian J. Sci. Technol. 9(46), 1–5 (2016)
45. Tornatzky, L.G., Fleischer, M., Chakrabarti, A.K.: Processes of Technological Innovation: Lexington books (1990)
46. Liang, T.-P., Huang, C.-W., Yeh, Y.-H., Lin, B.: Adoption of mobile technology in business: a fit-viability model. Ind. Manag Data Syst. 107(8), 1154–1169 (2007)
47. Liang, T.P., Wei, C.P.: Introduction to the special issue: mobile commerce applications. Int. J. Electron. Commer. 8(3), 7–17 (2014)
48. Lin, A., Chen, N.C.: Cloud computing as an innovation: Perception, attitude, and adoption. Int. J. Inf. Manage. 32(6), 533–540 (2012)
49. Latif, R., Abbas, H., Assar, S., Ali, Q.: Cloud computing risk assessment: a systematic literature review. Future Inf. Technol. 285–295 (2014). Springer
50. Zhang, J.W.: Technology-supported learning innovation in cultural contexts. Etr & D-Educ. Technol. Res. Dev. 58(2), 229–243 (2010)
51. Faqih, K.M.: Which is more important in e-learning adoption, perceived value or perceived usefulness? Examining the moderating influence of perceived compatibility
52. Qasim Alajmi, R.A.A., Kamaludin, A., Al-Sharafi, M.A.: Current state of cloud-based e-learning adoption: results from gulf cooperation council’s higher education institutions. In: 2018 IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), Canada, pp. 569–575 (2019)
53. Al-Sharafi, A., Arshah, R.A., Alajmi, Q., Herzallah, A., Qasem, Y.A.: The influence of perceived trust on understanding banks’ customers behavior to accept internet banking services. (2018)
54. Hassan, H., Nasir, M.H.M., Khairudin, N., Adon, I.: Factors influencing cloud computing adoption in small and medium enterprises. J Inf. Commun. Technol. Malaysia 16(1), 21–41 (2017)
55. Ali, M., Khan, S.U., Vasilakos, A.V.: Security in cloud computing: opportunities and challenges. Inf. Sci. 305, 357–383 (2015)
56. Anshari, M., Alas, Y., Guan, L.S.: Developing online learning resources: big data, social networks, and cloud computing to support pervasive knowledge. Educ. Inf. Technol. 21(6), 1663–1677 (2016)
57. Alajmi, Q.A., Kamaludin, A., Arshah, R.A., Al-Sharafi, M.A.: The effectiveness of cloud-based e-learning towards quality of academic services: an Omani’s expert view. Int. J. Adv. Comput. Sci. Appl. 9(4), 158–164 (2018)
58. Abbas, A., Bilal, K., Zhang, L.M., Khan, S.U.: A cloud based health insurance plan recommendation system: a user centered approach. Future Gener. Comput. Syst. Int. J. Escience 43–44(1), 99–109 (2015)
59. Goodhue, D.L., Thompson, R.L.: Task-technology fit and individual-performance. MIS Q. 19(2), 213–236 (1995)
60. Gliem, J.A., Gliem, R.R.: Calculating, interpreting, and reporting Cronbach’s alpha reliability coefficient for likert-type scales