Assessing the factors that affected the development of cloud-based accounting education and students' academic performance in Oman

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Abstract

Purpose – This study aims to assesses the factors that affected the development of cloud-based accounting education (DCBAE) and students' academic performance at Oman Universities.

Design/methodology/approach – In this paper a questionnaire was used to collect data for a sample of students. Partial least squares (PLS) were used to assess the hypotheses and model.

Findings – Results indicate that human factors and cultural and social factors have a direct positive effect on the DCBAE and students' academic performance.

Practical implications – This study is carried out after five semesters since the beginning of the COVID-19 pandemic. Thus, it can help universities (accounting education in particular) in the Sultanate of Oman know the factors that affect the development of accounting education and adopt policies and strategies that depend on cloud computing in education operations, even after the COVID-19 pandemic.

Originality/value – The main contribution of this study is to evaluate the factors that affected the DCBAE and the academic performance of students in the Sultanate of Oman from March 15, 2020 to June 2022, a period that witnessed the application of cloud-based education, either in whole or in part using a questionnaire about the opinions of students.

Keywords Cloud-based accounting education, Human factors, Cultural and social factors, Economic and technological factors, Oman

Paper type Research paper

1. Introduction

Teaching creates learning skills that enhance learning (Mayer, 2017). Given the developments in modern technology in various areas of life, the necessity of using and benefiting from them in education is inevitable. Currently, educational technologies strongly support teaching and learning procedures. These technologies can be used in e-learning and regular face-to-face education (Teng, Tan, & Ehsani, 2021). E-learning is one of the ways to bridge the gap between traditional and smart education (Van Biljon & van der Merwe, 2018; Popel & Shyshkina, 2019). One of the most promising education models, e-learning, is a web-based environment that integrates multiple stakeholders with procedures and technology. Cidral, Oliveira, Di Felice, and Aparicio (2018) described e-learning in general as the use of information and communication technology (ICT) in learning using a digital device (Rajabion, Wakil, Badfar, Nazif, & Ehsani, 2019). This device may be electronic, such as a desktop

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computer, laptop, smartphone or tablet (Mayer, 2017; Mwalumbwe & Mtebe, 2017). In this type of learning, students participate in various activities within a virtual environment, including audio-visual interaction and investigation of different topics. Through e-learning, teachers and students can communicate with each other (Al-Rahmi *et al.*, 2019; Haq, Magoulas, Jamal, Majeed, & Sloan, 2018). Internet use in education has led to a complete restructuring of the learning and training model and has affected university education in terms of content and style, resulting in major changes in organisational teaching practices.

In recent years, cloud computing has emerged as an advanced technology (Hajizadeh and Navimipour, 2017; Yoosomboon & Wannapiroon, 2015). Cloud computing relies on transferring the processing and storage space of a computer to the so-called "cloud", a distributed system consisting of a group of interconnected computers dynamically provisioned and presented as one or more vendors based on service level agreements (Chiregi & Navimipour, 2018). Cloud computing is an excellent alternative for academic organisations and institutions to host and run online learning systems (Siddiqui, Alam, Khan, & Gupta, 2019). Cloud computing is rapidly emerging as an education platform given its tremendous benefits for e-learning systems. The foremost-perceived benefit of cloud computing for education is its ability to support various learning processes, including self-learning, peer-to-peer learning, classroom learning, distance learning, virtual labs, assessment systems and counselling for students with special needs (Asadi, Abdekhoda, & Nadrian, 2020). Cloud-based technologies help to produce a new generation of e-learning systems implemented on various devices while maintaining online data (Teng *et al.*, 2021). Most of all, cloud options can offer users and academic institutions cost savings and access to scalable computing power. Attaran, Attaran, and Celik (2017), Al-Samarraie and Saeed (2018) and Siddiqui *et al.* (2019) argue that cloud computing is the basis for the future of e-learning and is an excellent alternative for academic organisations and institutions to host and operate e-learning systems.

The COVID-19 pandemic greatly contributed to the increased use of e-learning and pushed it to the fore. The pandemic has caused the largest disruption in the history of education, with near-global effects on students and teachers worldwide. This pandemic has affected all sectors worldwide, including education. With all on-campus activities cancelled until further notice, various universities have shifted the teaching medium from traditional (face-to-face) to online learning (Patra & Sahu, 2020). The education of nearly one billion students worldwide has been affected by COVID-19 (Shahzad, Hassan, Aremu, Hussain, & Lodhi, 2021). In the Sultanate of Oman, the Supreme Committee for Dealing with the COVID-19 pandemic decided on March 15, 2020 to stop simultaneous (face-to-face) education in all universities and schools to reduce the chances of the virus spreading. Consequently, the universities found themselves at a crossroads to stop education, cancel the academic year or move towards electronic education. Rather than cancelling the school year, the Omani Ministry of Higher Education decided to move to distance and e-learning using education management systems, such as Microsoft Teams, Zoom and Big Blue Button. All universities in the Sultanate provided learning management systems, enabling them to move from traditional to online learning fully. Most universities used e-learning through programs such as Moodle, which was used to download educational materials for students and assignments. Online exams were held for several subjects (Bensaid & Brahimi, 2020). The ministry's decision received mixed reactions from teachers and students. Several students were not convinced of its benefits and their ability to handle online learning system applications in all educational institutions, including accounting, as a long-discussed alternative to the need to integrate education. The COVID-19 pandemic has largely proven that crises are an important factor in accelerating and expanding the adoption of cloud services and in continuing to drive the transformation to cloud-centric

(www.idc.com/getdoc.jsp?containerId=prUS46934120). During the academic year 2021/2022, the Ministry of Higher Education allowed the continuation of e-learning for several academic courses, not exceeding 20%–30% of the total.

Despite the notable advances in e-learning, Bashirian, Jalilian, Barati, and Ghafari (2014) and McConnell's (2018) find that e-learning has not reached a high level of user adoption, particularly in traditional learning environments. Many obstacles face online learning systems, such as their high-cost implementation. Furthermore, the e-learning system requires a high level of coordination between students and teachers. Accreditation bodies do not support online education systems in traditional university settings (Moore & Greenland, 2017; Perera & Richardson, 2010). E-learning faces heavy criticism from advocates of traditional education systems. E-learning does not cover all aspects of teaching, nor does it support all the features of learning (Abdekhoda, Dehnad, Mirsaeed, & Gavgani, 2016). Furthermore, teachers and learners are unfamiliar with e-learning principles and theoretical foundations and are unwilling to use e-learning.

The present study aims to assess the factors that affect cloud accounting education and its reflection on the academic performance of students in Oman in light of the COVID-19 pandemic. The importance of the study stems from the fact that it can identify the factors influencing the development of cloud accounting education, which promotes the successful use of online learning systems during and after the COVID-19 pandemic. Furthermore, this study provides practical insights into the adoption and use of online learning systems in developing countries such as Oman. The research question is as follows: Are there factors that affect the use of cloud accounting education and the academic performance of students in the Sultanate of Oman? The study adds value to the existing literature on the adoption of an online learning system in the context of accounting education during and after the COVID-19 pandemic. The main contribution of this study is to evaluate the factors that affected the development of cloud-based accounting education (DCBAE) and the academic performance of students in the Sultanate of Oman from March 15, 2020 to June 2022, a period that witnessed the application of cloud-based education. The contribution of this study extends to policy makers in universities who can gain insights and deeper understanding of the acceptance of e-learning technology, leading to a better developed e-learning policy. This study also opens a new field of accounting education research in light of crises.

2. Literature review and hypothesis development

Accounting education is defined as all concepts, courses and standards provided by programs and disciplines for students to practice the professions of accounting and auditing (Alshurafat, Al Shbail, Masadeh, Dahmash, & Al-Msiedeen, 2021). The importance of accounting education comes from the importance of its field and the benefits it can provide to the society in which it operates. Given that the needs of society are diverse and multiple, preparing academic and professional cadres that are capable of meeting these needs is essential. This preparation is carried out through accounting education, providing the labour market needs of qualified accountants. Before the COVID-19 pandemic, the use of technology in accounting education was a personal choice and thus mainly unequal. The COVID-19 pandemic and its effects and the accompanying suspension of traditional education lead to the focus on e-learning as one of the most important pillars of sustainable education (Fogarty, 2020). Cloud computing is one of the most important and latest technological means that can be used for university accounting education, where cloud-based methods represent the future of accounting e-learning (Gerholz, Liszt, & Klingsieck, 2018).

In this section, the researchers will present the most important set of factors that influence the DCBAE and its reflection on student academic performance as follows:

2.1 Human factors

Learner skills and knowledge are the most important and influential elements in the success of e-learning systems. Therefore, students have an enormous need for knowledge to be developed, expanded, shared and validated through the intellectual and collaborative processes of individuals. Information storage is an essential part of knowledge management (Asadi *et al.*, 2020). For the student to benefit from the cloud-based accounting education system, the student must have educational and research skills and the skills necessary to solve the problems he faces during education (such as that students possess skills and knowledge about the conditions and requirements of new technologies and consulting skills), which differ radically from the problems of traditional education. All students have smart mobile phones year before the COVID-19 pandemic; therefore, all students have skills to deal with modern technology. The use of cloud-based education made studying easier and helped to acquire the skill of self-learning, organising and managing time for some students. Education using cloud computing helped students to co-operate, collaborate and work within a team or groups through panel discussions and holding meetings. Cheng (2020) found that human factors influence the intent to continue cloud-based e-learning systems (CBES). Teng *et al.* (2021) found that skills and knowledge positively affect the CBES. Increasing students' learning from the course, their satisfaction and academic success can help enhance the internal efficiency of an e-learning program and lead to its success. Therefore, the following hypothesis can be derived:

H1. Human factors have a positive effect on DCBAE.

Academic performance is a measure of a student's abilities, which express what the student has learned during the formative process (Affuso *et al.*, 2022). Students with good academic performance are those who obtain positive grades in the examinations they undergo during education. In e-learning, students' academic performance is evaluated through several indicators: attendance of online lectures on time, internal course marks, mid-term marks and end-of-year exam marks (Khawar, Munawar, & Naveed, 2020). In the Sultanate of Oman, students are evaluated based on three indicators: assignment, midterm exam and final exam. The adoption of cloud computing in accounting education contributes greatly to the development of skills of students, thus enhancing the students' academic performance (Adnan & Anwar, 2020) especially that e-learning was used over five semesters, either in whole or in part. Therefore, the following hypothesis can be derived:

H2. Human factors have a positive effect on the student academic performance.

2.2 Economic and technological factors

Economic factors comprise one of the important influences when making any new decisions. For a company, the main objective when making a good decision is to reduce the costs of new systems (Wang & Yang, 2007). The company aims for the decision to adopt the cloud option to be economically feasible, meaning that the benefits are greater than the costs. Cloud computing helps companies efficiently and economically use IT infrastructure applications through a "use what you need, pay as you want" model given its flexibility, scalability and pay-as-you-go feature (Hajizadeh & Navimipour, 2017; Assante, Castro, Hamburg, & Martin, 2016; Caldarelli, Ferri, & Maffei, 2017). Cheng (2020) found that organisational and economic factors influence the continuity intent of CBES. Teng *et al.* (2021) also found that economic factors positively affect CBES. The adoption of cloud services in accounting education should positively affect students' academic performance. During the COVID-19 pandemic, education relied entirely on electronic systems. Moreover, public and private universities agreed with Ministry of Communications in the Sultanate of Oman to provide free Internet to students during lectures and exams and use various educational programs. Furthermore, universities

in Oman provide high-level technical support to students during lectures and exams. Thus, the following hypothesis can be derived:

H3. Economic and technological factors have a positive effect on DCBAE.

The results of several studies (Devi, Ratnoo, & Bajaj, 2022; Njuguna, 2021) show that students' economic variables, such as social class, residence and father's occupation, affect their academic performance. Omer & Mahmood (2018) found a positive effect of technology and the use of blended learning on students' performance in Saudi universities. König, Jäger-Biela, and Glutsch (2020) and Robles, Guerrero, LLinas, and Montero (2019) showed that students prefer virtual teaching over traditional learning because of technical support during the COVID-19 pandemic, and this specialised assistance for students improved their academic performance. Thus, the following hypothesis can be derived:

H4. Economic and technological factors have a positive effect on students' academic performance

2.3 Cultural and social factors

In the field of e-learning, one of the factors affecting its success is the interest in learning social and cultural elements. Therefore, the cultural and social background of technology adopters must be considered in the innovation process (Guan & Liao, 2014). Aljumah, Nuseir, and Alshurideh (2021) and Razak *et al.* (2019) found that the influence of friends and classmates is stronger than that of family on being the same age and in the same environment for long periods. Previous studies highlight the importance of social and cultural elements and values in adopting technology in different social systems (Alsaif, 2013), showing their effect on the success of innovative information systems (Jackson, 2011). Mukred *et al.* (2017) claimed that the absence of an information culture is one of the main challenges facing the development of organisational information systems. The cloud-based accounting education system must encourage students to learn and consider users' attitudes towards information technology. It must develop their identity when designing accounting education systems. The system must also consider shared beliefs, values, customs and traditions (Alshurafat *et al.*, 2021; Seo and Gibbons, 2021). Teng *et al.* (2021) argued that the cultural context of learners influences e-learning and that culture is an integral component when designing any educational system.

Universities in the Sultanate of Oman have adopted a gradual approach to student education by relying on cloud computing as follows:

(1) In the first semester of study under the COVID-19 pandemic, universities were lenient in the attendance of online lectures and extended exam duration for as long as possible to ensure all students could take exams.

(2) In the academic year 2020–2021, accounting education was mainly based on cloud computing, and learners should be more disciplined in attending lectures and exams at specified times.

(3) In the academic year 2021–2022, the Ministry of Higher Education in Oman allowed that only 20% of education programs should be facilitated through e-learning and the rest through face-to-face. From the next year, education will be entirely traditional and face-to-face.

Thus, the following hypothesis can be formulated.

H5. Cultural and social factors have a positive effect on DCBAE

Social interaction has three types: the first learner and the learner, the second learner and the content and the teacher and the learner. More interaction occurs between students and

teachers and between students, improving students' performance. Universities in Oman have used interactive educational programs such as Microsoft Teams and Moodle, which allow interaction between the student and the teacher. Furthermore, teachers have created personal accounts and groups on various social networking sites, such as WhatsApp, Facebook, Twitter and Instagram, for continuous communication and interaction with students, increasing students' satisfaction with education using cloud computing and improving students' performance from one semester to another. Thus, the following hypothesis can be derived.

H6. Cultural and social factors have a positive effect on student academic performance.

3. Research methodology

3.1 Research model

Figure 1 shows the proposed model, which includes innovation, human factors (skills and knowledge), economic and technological factors and cultural and social factors. DCBAE and student academic performance are examined.

3.2 Questionnaire development

To examine the theoretical model, we utilise a survey with two sections. The first section contains demographic questions regarding the users while the second includes questions measuring the models' structures. Each item corresponding to the structure is measured using a 5-point Likert scale (see Table 1).

3.3 Sample plan and data collection

In this study, a paper and electronic questionnaire tool was used for students of accounting departments in the universities of the Sultanate of Oman, and 351 students participated in the questionnaire. The researchers conducted a questionnaire on five public and private universities in the Sultanate of Oman, and approximately 70 students from each university were randomly selected. The questionnaires completed by users were evaluated and completed and after removing problematic forms, the final sample consisted of 329 questionnaires.

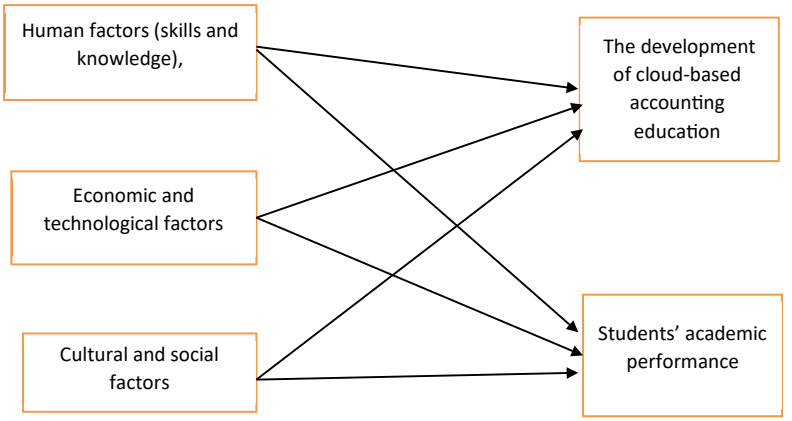

Figure 1.
The proposed model

No	Questions	Source
	Human factors	
HF1	Make the right use of the cloud-based accounting education system and have the skills to solve the problems that face me	Adapted from Teng *et al.* (2021), Alshurafat *et al.* (2021) and Raza and Khan (2021), With modifications from the researchers
HF2	I have leadership and management skills, which are one of the pillars of the success of cloud-based accounting education systems	
HF3	I have the skill of consulting and working with other users, which is one of the important factors to achieve satisfaction with the cloud-based educational system	
HF4	I have research and educational skills that facilitate the use of cloud-based accounting education systems	
HF5	I have the skills and knowledge about the terms and requirements of new technologies (cloud computing)	
	Economic and technological factors	
ETF1	Providing effective IT infrastructure and technical support helped develop cloud-based accounting education systems	Adapted from Teng *et al.* (2021), Raza and Khan (2021), Thavi *et al.* (2021) and Alshurafat *et al.* (2021) With modifications from the researchers
ETF2	Internet access helped use cloud-based accounting education systems	
ETF3	The impact of the economic situation of the family on access to accounting education based on cloud computing	
ETF4	The spread of students' use of smartphones has helped the use of cloud-based accounting education systems	
ETF5	Providing sufficient funding for the advanced electronic infrastructure, qualification and training of human resources helped develop the accounting education system based on cloud computing	
	Cultural and social factors	
CSF1	Group/individual skills influence the use of cloud-based accounting education systems	Adapted from Teng *et al.* (2021) and Alshurafat *et al.* (2021) With modifications from the researchers
CSF2	My fellow students around me and the people I value my opinion have encouraged me to use the cloud-based accounting education system	
CSF3	Policies and cultural trends regarding COVID-19 have affected the success of the cloud-based accounting education system	
CSF4	Users' attitudes towards information technology and the development of their identity were taken into account when designing cloud-based accounting education systems	
CSF5	Shared beliefs, values, customs and traditions have been taken into account in the cloud-based accounting education system	

(*continued*)

Table 1.
Questionnaire list

No	Questions	Source
	The development of cloud-based accounting education	
DCBAE1	The cloud-based accounting education system has evolved from one semester to another to be more effective in exchanging communications between students and teachers, facilitating communication, communicating instructions and providing information on various facilities	Adapted from Rajabion *et al.* (2019), Teng *et al.* (2021), Öztürk (2021), Raza and Khan (2021), Cheng (2020) and Thavi *et al.* (2021) With modifications from the researchers
DCBAE2	The development of the accounting education system based on cloud computing from one semester to another in terms of the ability to identify students' needs, appropriate lecture dates for students and use methods that fit with students' desires and skills	
DCBAE3	The development of the accounting education system based on cloud computing from one semester to another in terms of electronic programs used in education to be more suitable for lectures and exams, ease of access and ease of inquiring about services	
DCBAE4	The impact of information security, high capabilities in information storage, ease of dissemination and ease of maintenance on the development of the accounting education system based on cloud computing from one semester to another	
DCBAE5	Using cloud-based accounting education systems is more cost-, quality- and time-efficient	
	Students' academic performance	
SAP1	The ability to prepare homework and school assignments has improved during the period of applying computing education based on cloud computing from one academic term to another	Adapted from Bonaci, Mustaţă, Muţiu, and Strouhal (2014), Cheng (2020), Khawar *et al.* (2020), Raza and Khan (2021), Öztürk (2021) and Thavi *et al.* (2021) With modifications from the researchers
SAP2	The cloud-based accounting education system contributes to increasing the academic interaction between students and between them and their teachers, which increases academic productivity	
SAP3	The cloud-based accounting education system makes it easy to study the content of the courses, which improves my educational performance	
SAP4	Mid-semester grades improved during the period of applying computing education based on cloud computing from one semester to another	
SAP5	The end-of-semester grades improved during the period of applying computing education based on cloud computing from one semester to another	

Table 1.

3.4 Data analysis

The SMART PLS program is used to estimate the paths' coefficients, representing the assumed relationships that connect the variables within the model. Bootstrapping is then used to test the different research hypotheses and the PLS method is used in the tested integrated theories, concepts and models by estimating complex relationships between specific variables (Chin, 2010; Robins, 2012). The PLS method allows for the development and

refinement of concepts and theories and is considered to be variance-based path modelling similar to multiple regression analysis (Hair, Ringle, & Sarstedt, 2011) as follows:

(1) The relaxed distributional assumptions of data may not need to conform to the law of normal distribution.

(2) The ability to use a smaller sample size; while achieving high levels of statistical predictive power (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). Since the sample size for this study is relatively small

(3) The ability to formally measure constructs (Hair *et al.*, 2014).

(4) Many independent variables can be addressed even if multi-collinearity exists (Hair, Hult, Ringle, & Sarstedt, 2017).

3.5 Fitting the measurement model

In this stage (evaluation of measurement model) the ability of the measures used for the variables under study is evaluated through the reliability and validity test of the model. This evaluation is carried out by using several tests in Table 2.

The results of the validity and reliability tests of the model are shown in Table 3:

The results of the discrimination validity tests of the standard model using fornell-larcker are in Table 4.

By comparing the results of the validity and reliability tests of the model are shown in Table 3 with the standard measures in Table 2 that the traditional model has high validity and reliability, and therefore it can be relied upon.

3.6 Analysis of the structural model

The structural evaluation of the model aims at this stage we aim to test the extent of the relationship and interdependence between the variables to each other, and *R* Square for the different paths can be shown in Table 5 (see Figure 2).

3.7 Methodology for hypothesis testing

Before testing the hypotheses, clarifying the method to use in testing the direct relationships is necessary. As follows:

(1) The direct effect should have a significant effect.

(2) The path coefficient for the direct effect is within the confidence interval.

Validity test	Test instrument	Acceptable values
Internal consistency	Cronbach alpha	Test values preferably FOV 0.7
reliability	Composite reliability	Test values are preferably Fov 0.7
Unidimensioality	outer loadings	The values shall not be less than 0.4
Convergent validity	Average variance extracted (AVE)	Test values should not be less than 0.5
Discriminant validity	Fornell- larcker	When the variable with itself has a higher value than any value of the variable with another variable, meaning that the squared islands of the mean variance extract must have a higher correlation for that latent variable than any other variables

Source(s): Chin (2010), Hair *et al.* (2014), Oyewobi, Windapo, and Rotimi (2017)

Table 2. Indicator assessment tests

Construct	Items	Outer loadings	VIF	Cronbach alpha	Composite reliability	(AVE)
Human factors	HF1	0.827	2.069	0.843	0.887	0.612
	HF2	0.718	1.825			
	HF3	0.716	1.864			
	HF4	0.699	1.668			
	HF5	0.832	1.909			
Economic and technological factors	ETF1	0.844	2.253	0.879	0.911	0.673
	ETF2	0.843	2.342			
	ETF3	0.801	2.258			
	ETF4	0.780	1.961			
	ETF5	0.661	2.199			
Cultural and social factors	CSF1	0.622	1.399	0.805	0.825	0.517
	CSF2	0.707	1.534			
	CSF3	0.858	2.006			
	CSF4	0.606	1.324			
	CSF5	0.699	1.541			
The development of cloud-based accounting education	DCBAE1	0.495	1.408	0.813	0.837	0.509
	DCBAE2	0.490	1.775			
	DCBAE3	0.761	1.798			
	DCBAE4	0.790	1.304			
	DCBAE5	0.810	1.273			
Students' academic performance	SAP1	0.394	1.267	0.821	0.701	0.502
	SAP2	0.503	1.269			
	SAP3	0.722	1.251			
	SAP4	0.709	1.270			
	SAP5	0.699	1.230			

Table 3. Results of model validity and reliability tests

Note(s): HF = Human factors, ETF = Economic and technological factors, CSF = Cultural and social factors, DCBAE = The development of cloud-based accounting education and SAP = Students' academic performance

	HF	ETF	CSF	DCBAE	SAP
HF	0.810				
ETF	0.782	0.820			
CSF	0.641	0.702	0.746		
DCBAE	0.609	0.556	0.588	0.713	
SAP	0.601	0.543	0.654	0.531	0.660

Table 4. Results of discrimination validity tests for standard model using Fornell-Larcker

Dependent variable	*R* square	Adjusted *R* square
DCBAE	0.677	0.667
SAP	0.531	0.516

Table 5. *R* Square for the different paths

Note(s): The independent variables (Human factors, economic and technological factors, and cultural and social factors) explain 66.7% of the dependent variable DCBAE while they explain 51.6% of the dependent variable (students' academic performance)

The confidence interval does not include 0, for example, if the confidence interval is (−0.0268, −0.093), then the relationship is accepted. If the confidence interval contains zero, for example (−0.11, 0.14) then the relationship does not exist even if the values are significant (Zhao, Lynch, & Chen, 2010; Hayes, 2009; Shrout & Bolger, 2002).

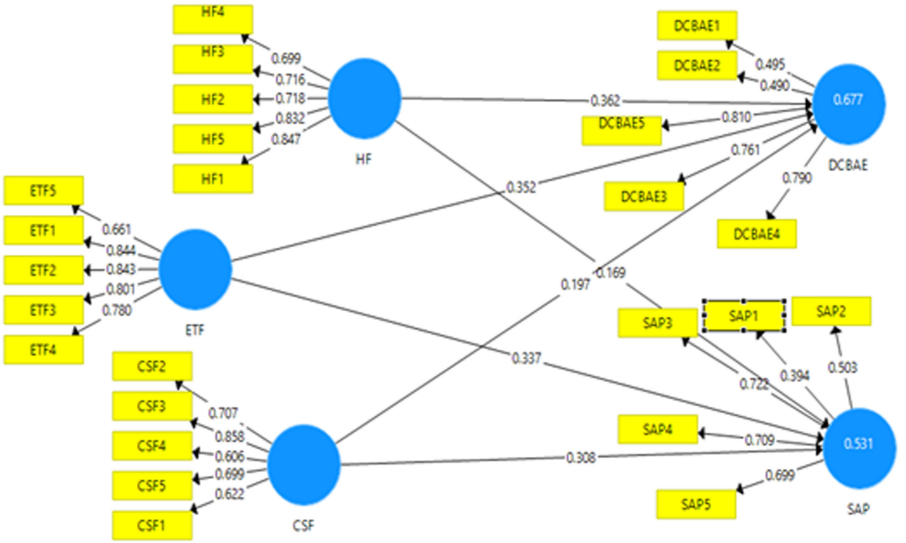

Figure 2.
Shows the different paths in the search form

4. Discussion

The present hypotheses are tested by clarifying the direct and indirect effects of each variable, coupled with the level of significance and confidence limits in Table 6.

The results of the path analysis of the relationships between the search variables are as follows:

A positive relationship exists between human factors and DCBAE at a significant level of less than 1%. The confidence intervals do not contain zero. No doubt that learners with the necessary skills can use the facilities and tools of available technologies, curriculum content, teacher qualifications and interactive facilities. After studying three semesters using cloud-based accounting education, students of accounting departments in Oman have gained the skills and knowledge necessary to deal with the new education system. These results are in agreement with those of previous studies conducted in many countries and on different educational programs (Aparicio, Bacao, & Oliveira, 2016; Vu, Nguyen, & Nquyen, 2019; Hashim, Mukhtar, & Safie, 2019; Cheng, 2020; Teng *et al.*, 2021; Alshurafat *et al.*, 2021; Raza & Khan, 2021).

A positive relationship is found between human factors and student academic performance at a significant level of less than 5%. The confidence intervals do not contain zero. Students and teachers with the necessary skills and experience to use the available

Hypothesis	Regression path	Original sample (O)	*T* statistics (|O/STDEV|)	*p*-value	Confidence intervals		Acceptance and rejection
					Minimum	Maximum	
H1	HF → DCBAE	0.362	3.225	0.001	0.154	0.553	Acceptance
H2	HF → SAP	0.169	2.410	0.035	0.031	0.421	Acceptance
H3	ETF → DCBAE	0.352	0.316	0.001	0.081	0.591	Acceptance
H4	ETF → SAP	0.337	0.297	0.005	0.056	0.574	Acceptance
H5	CSF → DCBAE	0.197	2.625	0.008	0.073	0.367	Acceptance
H6	CSF → SAP	0.308	2.842	0.004	0.096	0.510	Acceptance

Table 6.
Direct effects of each variable

facilities and tools appropriately, such as design logic, techniques, curricular content, qualifications of trainers and interactive facilities, contribute to the internal competence of the student. The facilitation of COVID-19 conditions has ensured the successful implementation of the technologies, thus enhancing the positive experiences and academic performance of students in line with Sun, Tsai, Finger, Chen, and Yeh (2008) and Adnan and Anwar (2020) especially because accounting education based on cloud computing was used over five semesters in Sultanate of Oman.

A positive relationship is found between economic and technological factors and DCBAE at a significant level of less than 1%. The confidence intervals do not contain 0. The results leave no room for doubt regarding the economic conditions and factors of students, their ability to purchase the latest technological products and the capabilities of universities to provide various technological possibilities. Therefore, economic and technological factors influence the success of educational systems based on cloud computing, consistent with the results of previous studies (Teng *et al.*, 2021; Raza & Khan, 2021; Thavi, Narwane, Jhaveri, & Raut, 2021; Alshurafat *et al.*, 2021). Thus, the current results indicate that students of accounting departments in Amman universities view economic and technological factors as affecting the success of cloud-based accounting education. Furthermore, the students under study belong to one of the rich countries, reflected in the high financial income of the students and their families. Universities in Amman also have great financial capabilities through which they can provide the latest educational programs via the Internet and provide technical support to students.

A positive relationship is also found between economic and technological factors and the student academic performance at a significant level of less than 1%. The confidence intervals do not contain zero because this study was conducted in one of the rich countries (Sultanate of Oman), reflected in the high material income of students. Thus, students have the ability to purchase the latest computers and smart phones, and universities in the Sultanate of Oman have the financial capabilities to provide the various technological capabilities and technical support necessary. These results are consistent with studies (Devi *et al.*, 2022; Njuguna, 2021; König *et al.*, 2020; Robles *et al.*, 2019).

A positive relationship is found between cultural and social factors and DCBAE at a statistical significance of less than 1%. The confidence interval does not contain zero. The interest in the learning culture is that learners with the necessary skills can use the available means and tools, curriculum content, teacher qualifications and interactive facilities. Students of Accounting Departments in Oman have become such learners after studying three semesters using cloud-based accounting education. They have gained the skills and knowledge needed to deal with the new education system, and the results are consistent with those of previous studies conducted in many countries and on different educational programs (Aparicio *et al.*, 2016; Alqaralleh, Alksasbeh, Abukhalil, & Almahafzah, 2019; Vu *et al.*, 2019; Teng *et al.*, 2021).

Cultural and social factors and student academic performance have a positive relationship at a significant level of less than 1%. The confidence intervals do not contain zero. The previous result can be explained by Oman universities' use of interactive educational programs, such as Microsoft Teams and Moodle, which allow interaction between the student and the teacher. The teachers also created personal accounts and groups on various social media sites, such as WhatsApp, Facebook, Twitter and Instagram, to communicate and interact with students. Cloud-based accounting education also allows students to access information via various resources, including social media and web-based courses and teacher and student sharing data. They provide appropriate support, clarify misunderstandings, get students excited and improve their participation and perception of academic performance (Ansari & Khan, 2020; Al-Adwan *et al.*, 2020; Alenezi, 2022), resulting in increased student satisfaction with education using cloud computing and improved student performance from one semester to the next.

5. Conclusion

On March 15, 2020, to deal with the COVID-19 pandemic in the Sultanate of Oman, the Supreme Committee decided to stop simultaneous education in all universities and schools to reduce the chances of the virus spreading. Consequently, universities found themselves at a crossroad, deciding whether to stop the educational process or move towards electronic education. Universities in Oman decided to rely on online learning systems to continue the educational process using management systems, such as Microsoft Teams, Zoom and Big Blue Button. Most universities in the Sultanate have provided learning management systems that enabled them to move smoothly from traditional to online learning. Especially, most universities use e-learning through programs such as Moodle to download educational materials and assignments and contract online exams for several subjects (Bensaid & Brahimi, 2020).

This study identifies the extent to which students at Oman universities accept the use of cloud computing methods in teaching accounting program courses and its effectiveness in the educational process. It studies the effect of external variables, namely, human factors (skills and knowledge) economic and technological factors and cultural and social factors, on the development of cloud accounting education and student academic performance. The researchers used the questionnaire tool for a sample of 329 students studying accounting at the universities of the Sultanate of Oman. The results indicate that human factors, economic and technological factors and cultural and social factors positively impact DCBAE and student academic performance.

The success of cloud-based education and the improvement of students' performance are due to a group of factors, such as the economic and technological capabilities of universities and students together. The continuation of the system for five academic semesters helped students and teachers acquire several skills and experiences, have a state of association and get used to the new system.

Thus, universities in the Sultanate of Oman are recommended to continue to adopt the e-learning strategy, in particular, cloud-based accounting education, in light of the on-going COVID-19 pandemic or at least continue to adopt a comprehensive strategy for hybrid accounting education (traditional education and e-learning) until the academic performance of students improves. This goal can be achieved using the advantages of traditional education and e-learning and not rushing to return completely too traditional education only after the pandemic ends. The establishment of virtual companies to train students on various transactions is also recommended. Continuous training for faculty members, technicians and administrators to use the latest technological advances in education is also emphasised.

This study is limited to a survey of students' opinions in Sultanate of Oman Universities. The survey does not include the opinions of faculty members. Furthermore, this study does not address the obstacles and problems of using cloud computing in accounting education. Thus, future studies can address the issues of using cloud computing in accounting education and assess the factors affecting the DCBAE from the perspective of faculty members. Moreover, comparative studies can be conducted on the quality of accounting education based on cloud computing in private and government universities in the Sultanate of Oman.

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