Critical Issues, Challenges and Opportunities for Cloud-based Collaborative Online Course Provision

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Abstract: The number of online courses offered worldwide by higher education institutions has been growing rapidly. There are a number of issues that affect student learning, such as the experience of academic staff and students in online courses, the design of course structures, creation of suitable teaching resources, and the study culture. One possible way to address them is to adopt a cloud-based collaborative environment between universities. This paper presents the results of a study that explores the issues that universities should consider before establishing such an environment. Two surveys were conducted sequentially. In the first survey, 16 heads of online courses at UK universities were interviewed. In the second, two questionnaires were used to gather the perspectives of over 250 academics and students with regard to cloud-based online courses. The research identified a number of issues which were categorised into challenges and opportunities. The challenges relate to education, operation, quality, legal matters and security. The opportunities identify potential benefits from the perspectives of universities and students. The paper also indicates a future plan for the outcome of this research.

Keywords: online courses; online collaborative; collaborative environment; cloud-based collaboration; challenges and opportunities.

1 Introduction

Online course delivery has grown rapidly due to advances in Information Technology (Dumford & Miller 2018). Information and Communication Technologies (ICT) play an important role in the worldwide delivery of learning content by universities (Park 2011). In addition, the number of students enrolled in online courses has steadily increased due to the benefits these courses offer (Murphy & Stewart 2017), including easy access to online materials anytime and anywhere, and the reduced cost of education (Panigrahi et al. 2018).

Online courses provide collaborative learning environments through online student forums that can further develop students' communication and teamwork skills (McAlpin, 2006; Koh & Lim 2012). They enable students to interact with peers and instructors online and to easily access course content and other resources (Redmond & Lock 2006). Discussion boards also provide an additional

communication channel between students and instructors and facilitate the posting of questions (Park 2011).

However, there are a number of issues, that will be raised in this paper, that can affect the delivery of online courses, their design, and the quality of learning, and that consequently affect their popularity among students. They include issues related to academics, students and finance coordinators, and also to the creation of teaching materials. The methods used to deliver online courses are different from the ones used in face-to-face teaching, and further, the role of academics with regard to delivery changes, because it is their role to guide students through the learning process rather than to transfer knowledge directly (Kyei-Blankson & Keengwe 2013). Students' preferred learning styles might be influenced by their cultural background. They may find it difficult to move to an online style of learning because they are used to face-to-face teaching and learning methods (Pisutova 2016). They may also feel uncomfortable joining groups for teamwork and communicating with peers (Damary et al. 2017). Producing teaching resources for online delivery can also be challenging (Kebritchi et al. 2017), and development costs, and those of keeping online teaching resources up to date, are significantly higher than for courses delivered on campus (Hanover Research 2014).

One possible way to address these issues would be to adopt a cloud-based collaborative environment that would encourage and support collaboration between universities. This would provide many benefits to universities, academics and students alike. Online collaborative learning can help students share knowledge which would enable them to improve the depth of their understanding (Damary et al. 2017), and engaging in collaborative tasks could help them to develop and enhance their problem solving and critical thinking skills (Rowe et al. 2013; Wang 2010). These activities could empower students to express their ideas and to learn more effectively while sharing learning with their peers (Du et al. 2015). Collaborative learning can also help students to enhance their self-esteem (Laal et al. 2014), whilst collaborative teaching allows academics to share knowledge and responsibility for the development of curriculum content, the delivery of teaching materials and the assessment of student work (McNair et al. 2016). A collaborative environment might also provide an opportunity for universities to share the development of courses and teaching resources (Stylianou & Savva 2017).

The development of cloud computing technology has facilitated the development of collaborative environments and the sharing of powerful IT resources and services. The accessibility, scalability, flexibility, availability and mobility of cloud computing, coupled with different costing models, has made it an attractive and feasible option for the setting up of these environments, particularly in education (Navimipour et al. 2015; Sultan, 2010). With the services offered by vast computing power and storage resources, cloud computing is able to support online collaborative learning and teaching.

There are many tools that can enhance collaborative learning in higher education (Al-Samarraie & Saeed 2018). For instance, Google Apps, which is provided by a cloud service provider, enables students to share and edit documents and also wikis (Edwards & Baker 2010; Blau & Caspi 2009; Biasutti 2017). Dropbox, another cloud tool for sharing files, can be accessed from anywhere (González-Martínez et al. 2015). Virtual laboratories can be developed using the cloud, thereby reducing the complexity of managing and renewing physical resources. Students can access these laboratories anytime and from anywhere to run their experiments, at a fraction of the cost of using physical resources (Ristov et al. 2014).

Through the use of appropriate tools, cloud computing has made it possible for a personal learning environment to be created which allows students to manage their own learning, communicate with others, share their knowledge and improve their skills (González-Martínez et al. 2015; Al-Zoube 2009). Cloud computing could facilitate a collaborative environment between universities that would encourage and enable team working amongst both academics and students.

To summarise the above, there are a number of issues related to students, academics and universities that can affect the provision and use of online courses. As previously mentioned, one possible way to address these issues would be to establish a cloud-based collaborative environment between universities. This paper presents and discusses the results of our research which aims to identify the challenges, issues and opportunities associated with the delivery of online courses in a cloud-based collaborative environment. A number of themes, including cultural issues, management/administration related issues, the development of teaching resources, the collaborative Virtual Learning Environment (VLE), operational issues, rights, and technical issues, have emerged and are discussed in this paper. A range of challenges and opportunities related to security, finance, course quality, and student support, amongst others, were also identified.

The paper is structured as follows. Section 2 discusses the literature review which looked at issues with online courses and the benefits of cloud computing, then Section 3 explains the research methods used in the study. Section 4 provides details of the investigation and methods adopted for data gathering. Section 5 discusses the results and is followed by Section 6 that sets out the implications for research and practise. Section 7 identifies the limitations of the study, and Section 8 presents the conclusions and plans for future work.

2 Literature review

Online course delivery has grown rapidly due to advances in Information Technology (Dumford & Miller 2018). However, there are a number of issues that may affect online course delivery, design and quality of learning.

2.1 Issues with online courses

The review of the literature revealed a number of important issues associated with online courses that can be summarised as: the learning and teaching culture, students' experience and expectations, academics' experience in online course delivery, creating teaching materials for a module, and financial aspects. These are discussed below.

- **The learning and teaching culture:** A student's learning style might be affected by their cultural background (Pisutova 2016). For example, international students who come from a culture with a teacher-centred (face-to-face) learning environment tend to regard the teacher as the source of all knowledge and information. Some may be used to face-to-face learning environments, but this does not apply to all (Damary et al. 2017). Students may also find it difficult to move to an online style of learning because they are familiar with their own learning methods (Pisutova 2016). International students may find that the assessment styles used in online courses are different from those in their home countries (Liu et al. 2010), while others may submit their assignments late and not appreciate the significance of assignment deadlines (Kyei-Blankson and Keengwe 2013). It is

suggested that academics reduce these inappropriate expectations by making their rules and policies clear at the beginning of the course (Kebritchi et al. 2017).

Lecturers will have their own teaching methods, informed by their culture, and may find it difficult to adapt to online teaching styles (Pisutova 2016), thus those who come from teacher-centred backgrounds may not have the experience and skill to teach online courses effectively (Kebritchi et al. 2017). Lecturers' roles in online courses are very different from those in face-to-face courses, which can make it difficult for international students to understand that role (Damary et al. 2017).

- **Issues related to students:** Students need to be self-directed, self-motivated and to have good time management skills to participate in online courses, and this can be challenging (Kebritchi et al. 2017), so instructors must be ready to support those who lack the required learning skills (Kebritchi et al. 2017). Learners can encounter problems with the international language used in online courses (Pisutova 2016), and may have to use translations, especially when they want to interact with peers and express their opinion in discussions (Al-Arimi 2014; Kim et al. 2005). They may also encounter issues with plagiarism, and especially with paraphrasing and acknowledging sources (Kirsch & Bradley 2012).

  Students can be reluctant to collaborate online with their peers if the universities do not provide the necessary support (Osipov & Ziyatdinova 2015), and as a result, may not realise that the collaborative activities are part of the learning process. They may feel uncomfortable moving from a traditional classroom to online teaching which may include shared activities for learning (Damary et al. 2017). Instructors should recognise this and support the nature of students' online participation (Kebritchi et al. 2017). There is a requirement for more global cases to be provided in online course content; online courses delivered from the United States, for example, typically focus on United States cases and situations and may not provide a global perspective (Liu et al. 2010). Users may not understand the content or context when asked to apply concepts relevant to another part of the world to situations in their own country (Liu et al. 2010).
- **Issues related to academics:** Changing the nature and environment of course delivery from face-to-face to online can be challenging for some lecturers. The method of delivery for online courses is different from that of traditional face-to-face as the role of the lecturer changes from a static transferor of knowledge to that of a subject expert who guides students through the learning process. Some lecturers find a variety of teaching methods that are used in online courses challenging and may feel uncomfortable with them (Kebritchi et al. 2017; Kyei-Blankson & Keengwe 2013). Also, the design and preparation of online course materials may take more time than that required for face-to-face courses (Kyei-Blankson & Keengwe 2013).
- **Issues related to creating teaching materials for a module:** Typically, it is the lecturer who is responsible for designing and preparing the teaching materials for online courses (Kyei-Blankson & Keengwe 2013). However, producing these materials and moving from traditional face-to-face delivery to an online courses can be challenging (Kebritchi et al. 2017). Some lecturers are reluctant to change their teaching approaches and methods to suit the new approach (Kyei-Blankson & Keengwe 2013). There has been a shortage of training courses to support lecturers as they move from a face-to-face teaching style to an online teaching method, and they often cannot use the same materials for their online courses (Kebritchi et al. 2017).

- **Issues related to finance:** The overall cost of an online course can include the costs of development, delivery, and administration. The development costs are significantly higher than for face-to-face courses and include expenditures on production of materials, staff, and equipment (Hanover Research 2014). The administrative costs for online courses are also much higher than for on-campus courses and include marketing expenses (Hanover Research 2014). In addition, universities are reluctant to pay for lecturers to learn how to design and deliver online courses and this has led to a lack of training programmes (Hanover Research 2014; Sjogren & Fay 2002).

2.2 Cloud computing in education

Higher Education Institutions (HEIs) can gain many benefits from cloud computing. Thus, some universities around the world, in search of efficiency and convenience, have decided to migrate their IT infrastructure to enable academics to access the SaaS and PaaS cloud services that providers offer (Sultan 2010). Cloud computing offers support to e-learning systems which can be dynamically adapted by offering a scalable system for the changing needs of the computer resources over time (Fernández et al. 2014). It also provides a number of benefits, such as cost saving, because it offers hardware on demand and a 'Pay-as-you-go' pricing model (González-Martínez et al. 2015; Zhang et al. 2010), and because cloud tools, including Google Docs, Dropbox, and YouTube, can be provided for free (González-Martínez et al. 2015; Sultan 2010). Availability is improved because services and applications are available online 24/7 (González-Martínez et al. 2015). Cloud computing provides flexibility to users as they can access their files at home, or indeed anywhere (Sultan 2010), and scalability makes it easier for an organisation that depends on accurate information to scale up or scale down their service requirements according to their clients' needs (Marston et al. 2011). Organisations that deploy cloud computing do not need to purchase software licenses, hardware or implementation services, so it is easy to adopt (Craig et al. 2009). Finally, since cloud computing involves many virtual servers operating on a physical server, it provides more consistency to the IT infrastructure (Cunsolo et al. 2010).

Masud and Huang (2012) proposed a cloud-based e-learning system as an improvement to the traditional approach adopted by local HEIs. The purpose of the proposal was to increase the availability and flexibility of the existing e-learning system, and the aim of using cloud computing was to reduce IT infrastructure costs and to facilitate the delivery of educational services (Masud & Huang 2012). Liao et al. (2014) suggested that student related issues due to online courses that were inadequately supported by instructors could be tackled by using cloud based collaborative learning environments.

3 Methods

3.1 Research design

This project used exploratory sequential mixed research methods (Creswell 2014) to investigate the needs for, and benefits of, a cloud-based collaborative environment for online course provision. The research consisted of two phases: in the first phase, academic and administrative staff who had been involved with online courses were interviewed. This was followed in the second phase by surveys using two separate questionnaries, one for academics and one for students. In the first survey, qualitative data was gathered to identify the issues that have to be considered by universities when

proposing cloud-based collaborative online course provision between universities from the academic and administrative points of view. Subsequently, quantitative data was obtained to further investigate, generalise and test the issues that emerged from the first phase and to identify the challenges that have to be overcome and the opportunities that will potentially benefit the parties involved.

3.2 Participants and procedures

In the first phase, 16 heads of online courses within universities in the UK were interviewed. The interviews were conducted by the researcher face-to-face, over the phone, or via the internet using Skype. Each interview lasted around 30 minutes and was recorded in an audio file. The recorded interviews were then transcribed manually, involving a long process of repeated listening, analysis and categorisation of the issues.

In the second phase, 128 academic members of staff who had experience of delivering online courses and 130 students who had registered for online courses were surveyed using two different questionnaires. Table 1 illustrates the demographic information for the academic members and students. The questions were developed based on the outcome of the interviews to provide a more focused and in-depth investigation. Participants from different universities in the UK were invited to take part. The survey was administered using the SmartSurvey web-based tool (SmartSurvey 2018) and was distributed to the target participants via email and social network websites (Twitter and Facebook).

Table 1 Demographic information for academics and students

Academics		Students	
Gender	Number	Gender	Number
Female	66	Female	67
Male	62	Male	63
Age		Age	
25-40	33	18-30	49
41-50	38	31-40	61
51-60	30	41-50	15
61 or older	27	51-60	3
		61 or older	2

3.3 Data collection and analysis

The qualitative data gathered during the interviews covered multiple viewpoints concerning the issues associated with the provision of cloud-based collaborative online courses. Thematic analysis (Braun & Clark, 2008) was used to analyse the interview responses. Seven themes emerged from the analysis, as shown in Figure 1.

Based on the results of the interviews, two questionnaires were designed to further investigate the issues. New issues were identified from the results of these questionnaires which were recognised as challenges and opportunities that a collaborative environment could possibly address for universities.

4 Outcome of the surveys

4.1 Phase one: Qualitative findings

Seven themes emerged from the analysis of the interviews in phase one. These were named: culture; management and administration; technical issues; development of teaching resources; collaborative VLE; operational; and rights. Each theme was divided into sub-themes as shown in Figure 1. This figure was published previously by the authors and was updated by incorporating additional features which have subsequently emerged. The previously published figure included ownership as a theme with legal, copyright and awarding body as subthemes, but this figure adds rights as a theme with ownership, legal, copyright and awarding body as four subthemes.

Figure 1 Issues associated with a cloud-based collaborative environment for online course provision; themes and sub-themes

The rights theme includes ownership, awarding body, copyright and legal agreement as subthemes. Ownership is a key issue that can affect collaboration between universities. The participants indicated that, unless agreements between the universities are reached, ownership can strongly influence a university's decisions concerning course provision within a collaborative partnership. With regard to this, one of the interviewees said: "…as long as you are clear who owns the content, whose the students are … Which university do they belong to, or is it both? Where do they matriculate? Where did they graduate from?"

One of the main points raised by the interview participants was that of legal issues. A legal contract should be specified and agreed between the universities involved. Amongst other things, legal issues can include legal rights of ownership, who the students belong to, and which universities are responsible for enrolment. Therefore, no collaboration should be set up without identifying legal responsibilities. One of the interviewees stressed: "… With the collaboration, we need to set out the contract very clearly; we need to have a clear agreement with the partnership ..."

It is essential for universities to identify who would be the qualification awarding body. One of the interviewees asked for clarification: "Where did they matriculate? Where did they graduate from ...?"

Participants also expressed concern about how to protect the copyright of academics' original works when shared in a collaborative environment. For example: "One of the challenges we would have would be with our academic staff, concerned about intellectual property and the course materials that may be taken by the other institutions and restructured and reused. I think that would always be challenged."

With respect to culture, three issues emerged from the interviews: teaching culture, delivery culture and assessment culture. The participants indicated that academics may find collaborative teaching with colleagues from different universities challenging. One of them said: "…the single largest issue we will face is the culture, I mean our academic culture and what academic teaching [we are] used to. So, we have people here who have been in teaching for a very long time, and been lecturers a very long time, and in most cases are extremely good at it, and what we are asking them to do is teach in a completely different way…"

In addition, for some academics, the collaborative delivery of online courses for the first time, without prior experience could be challenging, and something to which they need to become accustomed. One of the interviewees talked about: "… just being aware there is a different way of delivering when we first launch the undergraduate online courses, and the first time doing it, and just understanding the different ways of delivery ..."

In terms of sharing assessments, collaborative assessment design and marking would be an issue because some academics may be reluctant to share their exam papers and marking sheets. As one of the interviewees indicated: "…some academics are not willing to share their exam papers with others ..."

Student support, enrolment, and promotion and marketing were raised as issues connected with the management and administration theme. One of the main issues of collaboration is enrolment. The participants agreed that the universities involved in collaboration should share the role of enrolment. While the majority of the participants agreed that enrolment should be the responsibility of only one of the universities. One of the interviewees commented: "There has to be some control, so a student would enrol in the host university."

Students who enrol in online courses may require different levels of support to those studying on campus. The participants indicated that student support in collaborative courses would be an issue. One of the interviewees mentioned the following concerns: “I think the key here is really accurately making sure the students who are studying at a distance get the same sort of level of support as face-to-face students if they are studying here.”

With regard to marketing, collaboration between universities can have a positive influence on recruitment. However, universities must be agreed on how to manage marketing before setting up the collaboration. One of the interviewees asserted: “I think that would be a good way to do it, and sharing student experiences would be good, but I think we have to be very careful about the commercial aspect of what we do.”

Security and authentication were two issues associated with the technical theme. In terms of authentication, the participants commented on how to make sure that the students being assessed were the same students who registered on the course. It was remarked that lecturers could not normally develop the same relationships with students on online courses as with students they regularly meet in face-to-face sessions. One of the interviewees said: “Some people are worried about validation, in other words, knowing the person that you are teaching or assessing is the person you think they are because you do not see them.”

Adopting a cloud based collaborative environment for online courses might raise security risks because users would not know where their data was stored on a cloud server. One of the interviewees affirmed: “I know that the system goes to a cloud server anywhere in the world, and in fact, as we increase our student population, in different parts of the world.”

With regard to course development and delivery, sharing of the development of course design and teaching resources will be an issue. Some academics may have no experience of designing online courses. In addition, online courses require teaching resources which are very different from those of the traditional face-to-face mode of delivery. One of the interviewees said: “…it is not easy, … whether you’re looking at HE or secondary schools or trainers standing up in the training room … people are generally given a brief: ‘This is your audience, this the subject you’re going to teach, this is the level you need to be teaching at. Go away and put together a plan or presentation or whatever’, and that’s almost always done individually…”

Management of the course VLE was raised as another issue and four of the participants questioned which university would assume that responsibility and which university’s VLE would be used for the collaborative environment. One of the interviewees asked: “How is VLE going to be used? Are you going to use X University’s VLE or Y University’s VLE?”

In terms of the operational theme, the participants indicated that universities are keen to share costs and an appropriate agreement that apportions the costs between them is therefore crucial. One of the interviewees stated: “I think that it is all down to the nature of the agreement that the institutions make.”

4.2 Phase two: Quantitative results

Two separate questionnaires were distributed, one to academics and the other to students, to examine the issues identified in the interviews in more detail. This helped to determine challenges and opportunities associated with online course provision in a cloud-based collaborative environment. A

descriptive statistical analysis (Boone & Boone, 2012) was used to analyse and summarise the views of the academics and students.

4.2.1 Views of academic staff

In total 128 academics who were involved in teaching online courses at universities participated in this survey. A questionnaire consisting of 20 statement was used to obtain the views of the academics. A text box was also included for additional comments. The reliability test for the academic staff survey was 0.794, which means the reliability of this study is good (Sekaran & Bougie 2016). Table 2 shows the analysis of the responses.

Table 2 Analysis of the responses received from the academics

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am very keen to share my teaching materials with colleagues in other universities	N=21	N=43	N=31	N=22	N=11
Working with academic colleagues in other universities is very exciting	N=49	N=51	N=24	N=2	N=2
Working with academic colleagues in other universities can be challenging	N=20	N=77	N=26	N=5	N=0
Joint development of assessment materials between universities can enrich the quality of assessment	N=25	N=55	N=39	N=6	N=3
Joint development of assessment materials for online courses can provide an opportunity to examine students' knowledge more accurately and effectively	N=17	N=46	N=52	N=11	N=2
I am very interested in sharing my assessment materials with academic colleagues in other universities	N=19	N=41	N=41	N=21	N=6
Joint design and development of assessment materials between universities is often challenging	N=19	N=41	N=41	N=21	N=6
Discussion boards are very helpful to students for exchange of knowledge and experience	N=27	N=57	N=25	N=15	N=4
It is more efficient and effective to share the management of online courses between collaborating universities	N=10	N=22	N=57	N=34	N=5
Sharing the task of updating and maintenance of teaching resources between collaborative universities is a good and effective approach	N=9	N=46	N=54	N=16	N=3
Sharing the development of course structure between universities will be problematic	N=28	N=53	N=26	N=19	N=2
Collaborative development and delivery of online courses is more cost effective	N=5	N=32	N=64	N=21	N=6
Collaborative course provision by a group of universities can enrich student support and experience due to complementary knowledge which may be available	N=16	N=62	N=33	N=14	N=3
For improved reliability, more than one university in a collaborative team should set up the enrolment and administrative system	N=8	N=19	N=58	N=29	N=14
For collaborative course provision, it is more effective if all the universities involved use their own student admission	N=11	N=43	N=52	N=18	N=4

system					
Ownership is a major issue between collaborative universities, and it must be agreed at the start of collaboration	N=70	N=47	N=7	N=1	N=3
Copyright issues can deter collaboration between universities for online course provision	N=49	N=47	N=24	N=4	N=4
Legal agreements for collaborative course provision between universities are not necessary since universities are responsible for educating the public	N=10	N=12	N=18	N=48	N=40
It is not necessary to designate one university to update and maintain the Virtual Learning Environment (VLE) tools for a collaborative environment for online course provision. This should be shared by the universities involved in collaboration	N=10	N=38	N=32	N=39	N=9
Academic staff may be anxious about security issues regarding student assessment and teaching resources, if the courses are accessed via the cloud	N=25	N=69	N=21	N=11	N=2

Table 2 clearly indicates that there is interest in the potential for collaborative activities between universities. Overall, half of the participants had no objection to sharing their teaching materials with colleagues in other universities. Approximately 78% agreed or strongly agreed that working with academic colleagues in other universities was exciting, which could provide opportunities for an exchange of experience and knowledge and for skills improvement, although nearly three-quarters indicated that this can be challenging.

Overall, 63% of participants agreed or strongly agreed that joint development of assessment materials between universities can enrich the quality of assessment. In total, half agreed or strongly agreed that sharing the development of assessment could provide an opportunity to examine students' knowledge more accurately and effectively, whereas nearly 40% responded 'neutral' to this statement. It is clear that the majority of participants responded positively to sharing their assessment materials with academic colleagues in other universities. However, 70% agreed or strongly agreed that joint design and development of assessments between academics from different universities can present problems. In total, 73% had concerns about security issues with respect to student assessments and teaching resources accessed via the cloud.

More than half of the participants agreed or strongly agreed that discussion boards in online courses are a helpful means of encouraging students to exchange their knowledge and experience.

The joint management of online courses between universities was another of the issues considered, and 45% of participants responded 'neutral' when asked whether it was more efficient and effective to share the management of online courses with collaborating universities.

In total, 42% of academics 'neutral' when asked whether it was a good thing to share the updating and maintenance of teaching resources between universities.

The majority of the participants agreed or strongly agreed that the joint development of course structure between universities can be problematic. In total, half responded 'neutral' when asked whether collaborative development and delivery of online courses would be more cost effective. In addition, more than half of participants showed that they agreed or strongly agreed that a collaborative environment can enrich student experience due to the complementary knowledge that may be available.

It is interesting to note that 45% of participants responded ‘neutral’ to the statement that more than one university in a collaborative team should manage the enrolment and administration system for improved reliability. Overall, 41% responded ‘neutral’ to the statement that it is more effective for the collaborative course if the universities involved use their own student admission system.

In total, 91% of academics agreed or strongly agreed that ownership must be unanimously agreed at the start of the collaboration. Approximately three-quarters agreed or strongly agreed that copyright issues could deter collaboration between universities. With regard to legal agreements, 69% agreed or strongly agreed that contracts between universities must be agreed and signed prior to the commencement of collaboration. Only 38% agreed or strongly agreed that universities should share the maintenance responsibility for VLEs.

The questionnaire for the academics also provided space for additional comments. Two of the participants commented that quality assurance and quality of courses are important issues in a collaborative environment between universities. Another said that the compatibility between the regulations of universities from different countries should be considered. One of the participants suggested that confidentiality is an issue related to security that should be taken into account, and furthermore, students’ rights across universities involved in the collaboration should be considered.

The results clearly show that academics are keen to engage in collaboration and are of the opinion that the development of course materials and assessment procedures would benefit from collaboration. However, there is an awareness that joint development would be challenging, and there are strong concerns with respect to security. Additionally, the legal agreements between universities, including that of ownership, were identified as highly important.

4.2.2 Views of students

The views of students were also collected using a separate questionnaire. In total, 130 students who were studying online courses participated. The reliability test result for the student survey in this study was 0.773. This means the reliability of this study is acceptable. Table 3 shows the statements and responses.

Table 3 Analysis of the responses received from students

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am familiar with using online learning materials and approaches	N=54	N=54	N=16	N=5	N=1
I am familiar with online course assessments	N=37	N=52	N=28	N=11	N=2
An online course which is delivered by more than one university can provide an enriched education	N=26	N=56	N=42	N=6	N=0
I am very keen to exchange my knowledge and experience with other students who are on an online course with me	N=27	N=61	N=32	N=9	N=1
I prefer to use discussion boards to improve my ability to express myself and to share my ideas with other students	N=24	N=52	N=30	N=20	N=4
Communication between students from different cultures and backgrounds will encourage them to participate in group discussions and student forums	N=35	N=60	N=26	N=7	N=2

Using VLE tools to communicate in English with other students will improve my language and technical skills	N=32	N=54	N=34	N=6	N=4
I am interested in participating in live group discussions even during unsociable hours	N=13	N=43	N=44	N=21	N=9
Collaboration between universities for online course provision could positively affect my decision to enrol on the course	N=21	N=53	N=45	N=8	N=3
Student support in a collaborative environment will be more effective since there is an opportunity for more than one university to provide a response	N=19	N=65	N=39	N=5	N=2
Tuition fees are not an influencing factor, as long as an online course is delivered by a group of collaborative universities	N=7	N=25	N=37	N=44	N=17

As shown in Table 3, 83% of the student participants agreed or strongly agreed that they were familiar with using online learning materials. More than half indicated that they were familiar with online assessments. The majority were keen to register for online courses provided by collaborating universities. In addition, 68% agreed or strongly agreed that they would exchange their experiences and knowledge with other students on online courses.

Discussion boards can be used to support student communication with peers and academics in order to improve their understanding. More than half of the students agreed or strongly agreed that they preferred to use discussion boards with other students to improve their ability to share ideas and express themselves. Further, 75% of the participants agreed or strongly agreed that interaction with students from different cultures and backgrounds would encourage group discussions.

In total, 66% of the students agreed or strongly agreed that VLE environments that use communication tools enable them to improve their English language. However, 39% responded ‘neutral’ to the statement about participating in live group discussions during unsociable hours. This may be due to their culture or different time zones.

Overall, more than half of the participants agreed or strongly agreed that collaboration between universities could positively affect students’ decisions to enrol in online courses. Also, more than half agreed or strongly agreed that student support would be more effective between universities.

Regarding finance, 47% of students agreed or strongly agreed that tuition fees are an influencing factor, as long as an online course is delivered by a group of collaborative universities.

The findings clearly show that the majority of the students questioned were enthusiastic about online courses, but tuition fees are more of a deciding factor for students than collaboration between universities. Furthermore, communication between students from different backgrounds is seen as a very encouraging factor, while students being in different time zones is not considered to be a problem.

5 Discussion of results

Figure 1 showed the issues identified in phase one as a result of the initial interviews. However, subsequent to the analysis of the two surveys in phase two and the literature review, new issues emerged which could be classified as challenges or opportunities. These are highlighted in Table 4.

Table 4 Challenges and opportunities perceived by academics and students.

Theme	Categories	Challenges and opportunities
Education	Teaching	Strategies
		Culture
		Methods
	Learning	Culture
		Methods
		Style
	Assessment	Culture
		Methods
		Process
		Authentication
Quality	Academic standards	Quality assurance
		Quality of course
		Quality of teaching
		Quality of assessment
		Student feedback
		Compatibility of regulations between universities
		Accreditation
Operational	Staff development	
	Course development & review	Design
		Structure
		Teaching resources
	Course delivery	
	Enrolment	
	Student support	
	Technical support	
	Management	Managing VLE
		Teaching resources
		Management of IT resources
	Course administration	
	Promotional marketing	Promoting course
	Finance	Cost sharing
		Tuition fees
		Development & maintenance of courses
		Development & maintenance of teaching resources
Legal	Ownership	Courses
		Copyright
		Awarding body
		Students
	Rights	Student rights
	Contract agreement	Legal contract between participant universities
		Compatibility of the law in different countries
Security	Technical aspect & access	System security
		Authentication
		Student and staff access
		Confidentiality

The issues relating to Education were viewed from the perspective of culture in phase one, but it has emerged as a major theme in phase two associated with teaching and learning strategies and style, as well as assessment. The Operation theme identified in phase one (see Figure 1) was predominantly

concerned with cost sharing, while phase two has identified a more comprehensive set of issues which are categorised as challenges or opportunities, as seen in Table 3. Also, themes that were identified in phase one, such as Operational, Management/Administration, Development of teaching resources, and Collaborative VLE, have been incorporated into the Operation theme, as shown in Table 4.

The Legal concerns that were identified as an issue within the Rights theme in phase one (see Figure 1) along with the issues of ownership, copyright and awarding body have emerged as a separate theme in phase two containing the ownership, rights and contract categories (see Table 4). In addition, as a result of the analysis of the two surveys conducted in phase two the copyright and awarding body issues merged with others within the ownership category.

Security has also emerged as a separate theme in phase two, and it includes technical issues that were originally identified as a theme in phase one. Similarly, Quality emerged as a theme following analysis of the results of the second phase surveys but was not identified as a separate theme in phase one. Universities need to consider the quality issues related to learning, teaching, assessment and courses (Okogbaa 2016). Quality issues in university should also consider accreditation (Hoffman 2013), which aims to ensure quality control, quality enhancement and accountability for online courses and higher education institutions (Anaper 2013; Sanyal & Martin 2007).

5.1 Opportunities

Figure 2 provides a graphical representation of the opportunities, extracted from Table 3, that a cloud-based collaborative environment can provide. The opportunities are divided into two groups: collaboration and improvement.

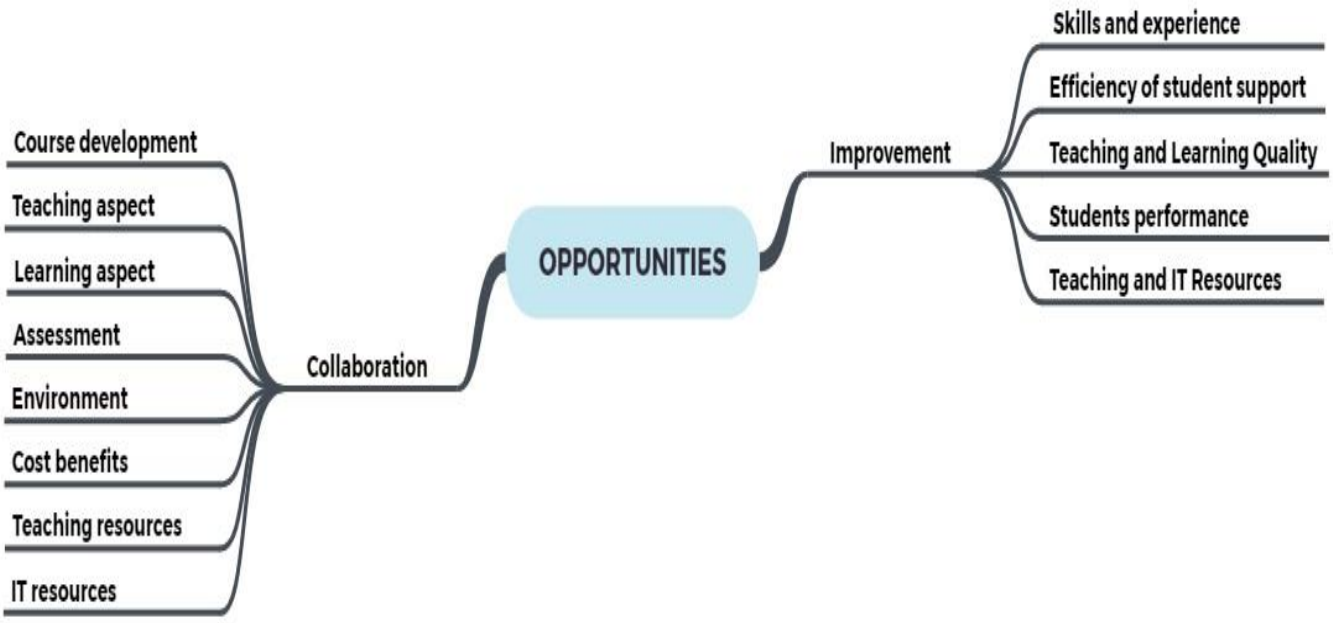

Figure 2 The opportunities of a cloud-based collaborative environment for online course provision

5.1.1 Collaboration

Figure 2 shows the opportunities arising from collaboration as a group that will facilitate a cost effective, efficient and enriched education environment and foster a good student experience. The advancement of technology has made it possible for universities to share IT resources through the use of cloud computing technology, thus reducing their cost. Joint course development between institutions can improve the skills and experiences of the academics involved. In terms of joint teaching, quality can be enhanced and the experience of academics improved, and this may encourage academic staff to change their teaching methods. Moreover, the sharing of assessments between academics could lead to an improvement, both in their skills and in students' performance. They could, for example, share the design of assignments to meet students' needs and to support learning outcomes. Collaborative learning can improve students' understanding, skills and knowledge. Learners could, for example, use discussion boards to share information and ideas with peers from different universities. This would encourage students to change their learning culture and also improve their performance and understanding. Collaborative environments can facilitate the sharing of teaching resources between academics which will save time. The collaboration opportunities have been grouped to show what the collaborative environment offers to the universities and which aspects would be shared, providing efficiencies.

5.1.2 Improvements

There are some areas of collaborative online course provision which will result in improvements, as shown in Figure 2. The advancement of technology has made it possible for students to carry out their experiments using virtual laboratories, and this will certainly improve student learning and performance (Potkonjak et al. 2016). Due to the online nature of these courses, face-to-face meeting with academics and students may not be feasible; therefore, the student support required is very different from that given to students on campus. In a collaborative environment, universities have complementary roles, sharing responsibilities for the efficient support of their students. Moreover, the collaborative environment can facilitate and encourage students to communicate with their peers through online discussion forums which may lead to an improvement in their learning and performance in assessment.

The collaborative environment has made it possible for academics to improve their skills and experiences by sharing course development (Stylianou & Savva 2017; Xu & Morris 2007). Furthermore, aspects of collaborative teaching, such as sharing teaching methods and culture, can improve the quality of teaching.

The advancement of cloud computing technology has provided access to remote IT resources such as storage and servers (Zhang et al. 2010). Thus, collaboration between universities can make it easier to share the maintenance and updating of IT resources such as virtual laboratories (Ristov et al. 2014).

5.2 Challenges

Figure 3 provides a graphical representation of the challenges which were extracted from Table 4. They are grouped together based on their related themes, as discussed in Sections 4.1 and 4.2, and are associated with Legal, Education, Operation, Security and Quality issues.

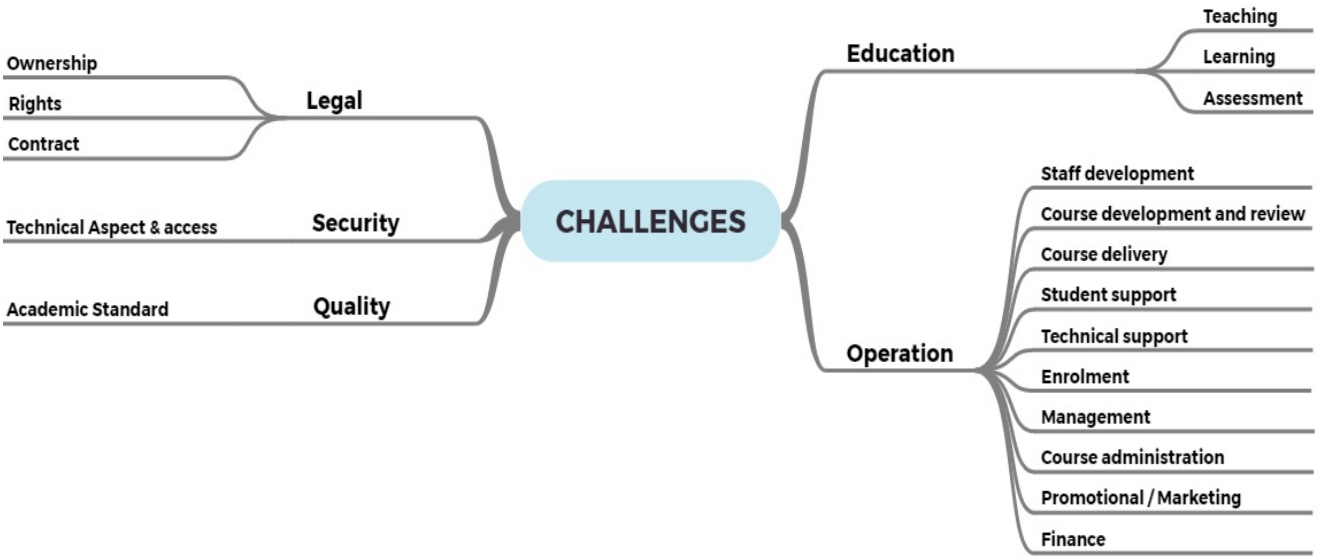

Figure 3 Challenges for cloud-based collaborative online course provision

The following challenges should be taken into consideration prior to adopting a cloud-based collaborative environment between universities.

5.2.1 Legal

Legal challenges relating to ownership, rights and contracts are grouped together, as shown in Figure 3. Handling ownership within the Legal theme is one of the biggest challenges for universities. Ownership involves course content, students, academic copyright of artefacts such as teaching resources, and the awarding body, so universities need to agree, for example, who owns the course and students and which university will award the qualification. The contract will be one of the greatest challenges as the legal contract between universities must be negotiated and agreed upon. In addition, compatibility between the laws of the countries in which the different universities are located needs to be addressed.

The other challenges in Education, Operation, Security and Quality also relate to the Legal theme. For example, the universities involved in the environment will need to decide how to share the costs. This can be addressed in the contract after initial discussions.

5.2.2 Education

Teaching, learning and assessments are grouped together as they are associated with the Education theme, as shown in Figure 3. In terms of teaching, academics may have difficulties with the sharing of teaching resources, the teaching culture, and the style of delivery.

With respect to learning, students may face challenges associated with using resources developed jointly by different academics, possibly from different cultures, and introducing a new joint learning style. For example, students who come from different learning backgrounds and adaptive collaborative environments may experience problems communicating with their peers and sharing information.

Due to the nature of online courses, it is not possible to assess their students in the same manner as those who are present on campus. Therefore, universities will need to enhance the authentication processing of online students. Academics will face challenges with assessment methods which must

ensure that students meet the expected learning outcomes. Some of the challenges in Education are related to others in the Operation theme.

5.2.3 Operation

As shown in Figure 3, staff development, course development and review, course delivery, student support, technical support, enrolment, management, course administration, promotion/marketing and finance are grouped together within the Operation theme. In terms of course development and review the challenges will relate to different views with respect to course design and structure. In addition, academics may experience problems they develop teaching resources together with other universities. Course development and review are also linked to the Education theme which could be affected during the development process. Thus, universities have to ensure that the education outcomes after development and review meet the expectations of the universities involved. In terms of providing student support, the roles and responsibilities of staff in the various universities need to be discussed and agreed in the legal contract.

Enrolment issues involve the views of different academics with regard to processes and responsibilities. To address these issues the responsibilities have to be agreed in the contract. In terms of sharing the management of courses, universities will need to address course administration, VLE and teaching resources. These should be tackled following discussion and approved in the legal contract.

Financial issues include tuition fees, sharing the costs of staff training, development and maintenance of courses, teaching resources, course administration, IT resources and VLE.

5.2.4 Security

Security refers to a number of things including system security, student and staff access to resources, authentication and confidentiality. With a shared environment, universities need to secure student and staff access. In terms of adopting a collaborative environment through the cloud, reliability, security and ownership may require attention. In addition, universities will need to authenticate students' identity for assessment purposes.

5.2.5 Quality

The Quality theme includes academic standards, quality assurance, quality of teaching resources, quality of assessments, course evaluation by students, compatibility of regulations between universities and accreditation. Pressure from global competition will result in universities having to further improve the quality of their courses in a collaborative environment. Sharing the development of teaching resources and joint delivery of courses between universities will facilitate this. Ensuring the compatibility of processes, policies and regulations between universities in different countries will present additional challenges.

6 Implications for research and practise

Our research supports the establishment of cloud-based collaborative environments between universities for the delivery of online courses. These environments are subject to a range of issues that should be considered prior to adoption. The issues were investigated by means of interviews,

questionnaires and a literature review and were grouped together under five main theme headings, illustrating the relationships between them. The contributions to knowledge made by this paper are: 1) an exploration of the issues associated with cloud-based collaborative environments for online course provision; 2) the grouping together of related issues into suitable themes.

7 Limitations of the study

The primary data collection in the first phase of the study took a long time because the search for online courses and relevant staff, who were identified from their profiles and job titles, was time consuming. One-hundred-and-five participants from different universities in the UK were contacted and invited to participate in the interviews, but only 16 of them agreed to engage in the study. For the second phase, 1,554 invitation emails were sent to the target audience (both academics and students) but the researcher received responses from only 128 academics and 130 students.

8 Conclusion

This paper identifies a number of issues associated with online courses which can influence students' learning and experience. A two phased methodology was adopted to undertake this investigation. phase one consisted of interviews with 16 academics which explored the issues associated with collaborative environments, and resulted in the emergence of several themes. Phase two included two surveys which investigated the themes identified in phase one in greater depth and breadth, identifying challenges and opportunities.

The opportunities identified were divided into two categories: collaboration and improvements. Collaboration in course development and joint delivery can improve the skills and experience of academics. Moreover, collaborative teaching between academics can enhance the quality of delivery. Also, collaborative environments can provide better support to students. Sharing IT resources can reduce costs for the universities involved.

The challenges that should be taken into consideration before universities consider cloud-based collaborative working were identified and categorised into a number of themes. These were named: Legal, Education, Operation, Security and Quality.

Future work connected to this research will involve the development of a conceptual framework that will illustrate the relationships between the elements. The themes have already been redefined to become the elements that make up the conceptual framework, and each element has been divided into a number of sub-elements; the relationships between them have still to be defined. The framework will provide guidance to universities wishing to establish a cloud-based collaborative environment for online course provision.

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