Re-examining the Critical Success Factors of e-learning from the EU perspective

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Abstract: The paper explores the critical factors of the implementation of e-learning in higher institutions from the EU perspective, by comparing e-learning in two cultural contexts: the UK and Taiwan. The study employs qualitative methods to illustrate the e-learning implementation panorama, by interviewing top management groups, leaders and strategic planners, hardware and software experts, instructional designers, participants from different schools, and course participants (including students). This paper summarises the Critical Success Factors (CSF) of e-learning from the EU perspective. An initial framework is developed to present the main differences of e-learning development in the higher institutes in the two cultures examined.

Keywords: e-learning; success factor; higher education; EU perspective.

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1 Introduction

In the last three decades, Information Technology (IT) has become a constituent component of business activities (Cline and Guynes, 2001). Universities have been confronted with numerous technological developments since the 1990s (with the ascendancy of the internet), and currently almost all universities in the USA and most universities in the UK have their own e-learning development plans. Now, e-learning provides an alternative way for higher educational institutes to deliver knowledge to learners at a distance, rather than in the traditional way (Coen et al., 2004). Although there are a large number of research articles on e-learning, few of them address the most important issue of e-learning – CSFs (Selim, 2007). In this paper, the author will try to bring the different dimensions together by clarifying critical e-learning factors from the management perspective.

1.1 E-learning

The ‘e’ in e-learning stands for electronic. In other words, a computer or computer network is used, along with information technology, to achieve forms of learning not previously possible. However, this definition is not fixed; sometimes a ‘broad’ definition is used, in which all devices that use information technology are referred to as e-learning, and sometimes a ‘narrow’ definition is used, which assumes asynchronous and online forms such as Web-Based Training (WBT) (Horton, 2000).

Previously, e-learning most commonly referred to a more narrow definition, such as online education using WBT. However, technological innovation in e-learning tools has made a variety of functions available in a single tool. ‘Blended learning’ (Harris et al., 2009; Bluc et al., 2007), that is, the linkage or simultaneous use of e-learning with group education described above, has since become rather common. It has now become normal to use the broad definition. Rosenberg (2001) defines e-learning as using internet technologies to deliver a broad array of solutions that enhance knowledge creation and utilisation and improve institutional performance.
E-learning goes beyond training to include the delivery of information and tools that improve performance. For the same reason, WBT or Internet-Based Training (IBT) are simply more up-to-date descriptions of Computer-Based Training (CBT) and are also too limiting as a description of e-learning. The vast majority of organisations have only just started to search for ways to construct and maintain e-learning environments. According to a 1999 study by Mercer Management Consulting (1999), most companies that are using Virtual Learning Environments (VLEs), have maintained the traditional focus on ‘training’ and have not yet expanded their vision to the broader uses and possibilities afforded by e-learning. Table 1 shows the classification of e-learning (Romiszowski, 2004).

Table 1  A structured classification of e-learning with examples

<table>
<thead>
<tr>
<th></th>
<th>Individual self-study</th>
<th>Group collaborative</th>
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<tbody>
<tr>
<td></td>
<td>Computer-based</td>
<td>Computer-mediated</td>
</tr>
<tr>
<td></td>
<td>instruction/learning/training</td>
<td>communication</td>
</tr>
<tr>
<td><strong>Online study</strong></td>
<td>Surfing the internet, accessing websites to obtain information or to learn (knowledge or skill)</td>
<td>Chat rooms with(out) video (IRC; Electronic Whiteboards)</td>
</tr>
<tr>
<td><strong>Synchronous communication real time</strong></td>
<td></td>
<td>Audio/video – conferencing</td>
</tr>
<tr>
<td><strong>Offline study</strong></td>
<td>Using stand-alone courseware/downloading materials from the internet for later local study</td>
<td>Asynchronous communication by e-mail, discussion lists or a Learning Management System (WebCT; Blackboard; etc.)</td>
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<tr>
<td><strong>Asynchronous Communication flexi time</strong></td>
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Relying upon an analysis of the causes and forms of this diffusion process at a sector and a company level, some of the managerial literature maintains that the main factors in adopting an e-learning solution are the economic benefits that a firm may gain from it (Rosenberg, 2001; Horton, 2000). The corporate added value, obtained by a reduction in costs, improvement in quality of the training, and saving time or increased flexibility in delivering courses, seems to be a determinant in the adoption of e-learning. However, this economic-rational perspective of the adoption of e-learning does not take into account other aspects that may impact the decision, as highlighted by recent research (Martin et al., 2003).

1.2 Critical factors in e-learning

Critical Success Factors (CSFs) are viewed as those activities and constituents that must be addressed in order to ensure successful competitive performance for the individual, department, or organisation. CSFs should be measurable, controllable, and few in number (Masrom et al., 2008).

Much of the current research summarises three CSFs for e-learning: IT, instructor and student. For example, Volery and Lord (2000) identified three main CSFs in e-learning: technology (ease of access and navigation, interface design, level of interaction), instructor (attitudes towards students, technical competence, classroom interaction) and previous use of technology by the students; Soong et al. (2001) conclude that the main CSFs of e-learning are: human factors concerning the instructors (motivational skills, investment of time and effort), technical competency of instructors and students,
constructivist mindset of instructors and students, high level of collaboration, and user-friendly and sufficiently supported technical infrastructure.

The efficient and effective use of IT in delivering the e-learning based components of a course is of critical importance to the success and student acceptance of e-learning. Hence, ensuring that the university IT infrastructure is rich, reliable and capable of providing the courses with the necessary tools to make the delivery process as smooth as possible is critical to the success of e-learning (Selim, 2007).

Communication tools are extremely important in an e-learning environment. Asynchronous ones could be used to allow students to work in teams, so that the instructor does not have to respond to each individual posting (Branon and Essex, 2001). On the other hand, synchronous communication tools could be used to meet with smaller groups of students online (Selim, 2007).

A Learning Management System (LMS) can be adopted as a piece of enterprise architecture, operating as a ‘service’ to host e-learning courseware produced by (or for) the component elements of an organisation (Huddlestone and Pike, 2008). LMS usability can significantly affect learning (Debevec and Bele, 2008). The need for usability has been recognised in web design and development literature is critical when determining user satisfaction in such systems (Salmeron, 2009). Learning environments implemented in traditional HE settings usually require processes of change management, which can involve a complex technical component and require a systematic design and development methodology to translate pedagogical models into the reality of practice (Mcpherson and Nunes, 2006).

Student perspective is important, as many higher educational institutions endeavour to attract and retain students and to adopt e-learning courses or programmes (Masrom et al., 2008). One central point is the students’ attitude to IT. If they are comfortable with the LMS, their performances will be higher. Online assignments could motivate students. Finally, multimedia has been included in LMSs in the last years, which could provide additional motivation for students (Salmeron, 2009).

Academic acceptance has long been recognised by some scholars as one of the fundamental CSFs for successful e-learning. Participants proposed that this acceptance is dependent on guaranteeing good communication between educationalists and technologists, creating formalised processes for collaboration, cooperation and evaluation, and connecting best practices, both within the institution and from other institution’s experiences (Mcpherson and Nunes, 2006).

In addition to the three principal CSFs in e-learning, e-learning CSFs can also include intellectual property, building the e-learning course, e-learning course content, e-learning course maintenance, measuring the success of an e-learning course, evaluating the learning and the students’ performance, technology, and research on previous use of technology (Masrom et al., 2008); meanwhile, Salmeron (2009) includes the importance of content structure, usability, cost, and easy maintenance within his 10 CSFs.

Content structure is focused on the structure of the learning materials, rather than classical system usability. Regarding standards, the unshared learning resource will reduce its use and usefulness. In this sense, standards, such as Sharable Content Object Reference Model (SCORM) resolve that issue (Salmeron, 2009).

LMS costs and maintenance are obviously an important factor for managers, rather than students, but it is a critical consideration in assessing the efforts associated with LMS use in the long term (Salmeron, 2009). There are two main costs which should be considered: delivery factors (which include learning context, student characteristics and
instructional management characteristics) (Lee and Owens, 2001), and the second cost is university support. Alternatively, costs can be considered as a learning context factor (i.e., part of the constraints that operate in the context of instructional delivery) (Smith and Ragan, 2005).

University support is indicated as one CSF for both e-learning (Salmeron, 2009) and traditional learning (Selim, 2007). For institutional support, the availability of technical assistance or a help desk was the most CSF (Selim, 2007). It is necessary for university administrators and faculty to be cognizant of technological and institutional support factors when attempting to adopt e-learning courses or programmes. This study indicates that technological and institutional support factors play an important role in the usage of e-learning (Masrom et al., 2008). The transition from a traditional face-to-face learning process to one based on technology-enhanced environments, poses serious challenges and cognitive conflicts for both academic staff and students. Consequently, participants have focused heavily on the need for training and support in the use of the e-learning environments and corresponding affordances (Mcpherson and Nunes, 2006).

Strategy factors, including supporting technologies and generating learning resources, can be identified to enhance e-learning success (Testa and Freitas, 2004). Sridharan et al. (2008) stated the importance of strategy factors for identifying and evaluating CSFs based on the perceptions of key stakeholders in an e-learning environment.

One strategy factor, the management strategy, concerns itself with scheduling lessons, production and allocation of required resources, assessment handling, production of management information and evaluation of the effectiveness of the system (Huddlestone and Pike, 2008). “Clear and defined project plan” was another factor that was commonly cited in all of the regions and countries (Ngai et al., 2008). The challenge for managers also increases, as there are few experts in the subject. Wrong decisions may jeopardise the success of a programme under development, and among the several choices that must be made while establishing a strategy, it is important to keep the focus on the CSFs (Testa and Freitas, 2004).

2 Methodology

A qualitative approach was chosen to understand the critical factors of e-learning implementation within the rich organisational contexts, and the sensitive nature of the data needed (Yin, 1984). In order to examine the critical factors of e-learning implementation in higher education institutes with an EU perspective, this study first tried to find the differences of e-learning implementation between Eastern and Western contexts. The original plan was to access several universities in different countries. However, due to limited resources, primarily funding available for travel, the researcher had to limit the study to three countries: the UK, China and Taiwan. In China, the researcher interviewed three top universities, based in Beijing and Shanghai, in 2006. However, the result showed that the e-learning development in Chinese universities was still at the ‘distance learning’ stage, which made comparison with western e-learning development all but impossible. The researcher also contacted several universities in Taiwan. Although it is known that Taiwan is strongly influenced by Western systems, this research found that the e-learning development in Taiwan still can represent the Eastern style of e-learning, for several reasons. Firstly, this researcher visited several Taiwanese universities and found that, whether in Taiwan or China, universities preferred
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Secondly, the main group in charge of e-learning development in China and Taiwan came from the Department of Computer Science. Thirdly, the main reason for e-learning adoption is not a jumping on the bandwagon mentality, but, rather, government policies. In Taiwan, the main e-learning development in universities began in around 1998.

Overall, the performance of e-learning development in Taiwan was rather encouraging. There are three universities in Taiwan, which were recognised as the best universities for e-learning development by the Ministry of Education. The National Chung Cheng University (CCU) is one of these. In March 2006, the National Chung Cheng University became the designated case for the pilot study. The researcher interviewed eight members of the staff, including three key stakeholders, involved in e-learning development.

After the comparison study, the University of Nottingham was selected as the main case site for a number of different reasons. E-learning implementation in UK universities started in around 1999, and the University of Nottingham was one of the pioneers. Unlike other UK universities, e-learning development at the University of Nottingham covers all campuses, schools and centres. As a former student at the University of Nottingham, the researcher was able to observe e-learning development within the university from 2004.

At the same time, in order to achieve some understanding of the different aspects of critical factors, the researcher wanted to examine them in multiple cases. To explore the critical factors, three detailed case studies were conducted (shown in Table 2).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>The main factors for the e-learning projects</th>
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<tbody>
<tr>
<td>MELEES project</td>
<td>Geography e-learning project</td>
</tr>
<tr>
<td>Background</td>
<td>School of mathematics</td>
</tr>
<tr>
<td>User</td>
<td>Students of engineering and science</td>
</tr>
<tr>
<td>Core team</td>
<td>Project leader, coordinator, technologist</td>
</tr>
<tr>
<td>Platform</td>
<td>WebCT</td>
</tr>
<tr>
<td>E-learning material</td>
<td>HTML with PDF output</td>
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The case sites were selected based on a combination of accessibility (to staff involved), representativeness, and cross-case diversity (Sabherwal et al., 2001). To fulfil the proposed objectives of this research, three cases were conducted in a university context. We use the University of Nottingham as the research context, three school e-learning projects (school of mathematics, school of geography, and school of education) to represent the three cases. The three projects are in different time stages. The e-learning projects in the school of mathematics and school of geography are internal projects, and the e-learning project in the school of education is international, collaborating with a Chinese university.
2.1 Data collection

In alignment with one of the objectives of conducting a process research, various data sources were used, including observation, interviewing and archival documents (Van De Ven and Huber, 1990). In this study, a four-year period of observation was carried out in order to experience e-learning development. Two types of documentation were collected in this research. The information for the e-learning development at the university level was mainly documented in the electronic database and categorised based on events and various functional areas. For the three cases at the school level, the main documents were the outcomes of the projects, such as the course module demonstration.

The interviewees targeted and selected for this research spread down from the top management, central information system to the academic staff. The pro-vice chancellor, several project managers and members of the central information system team were interviewed. At the school level, the researcher interviewed all of the core team members for all three projects. It is vital to note that there are three types of staff involved in the school projects, including the core team members, who were involved in developing and driving the project, the academic staff, who implemented the outcome of the project or were involved at a later stage and the students or staff, who were the end users of the projects. It is equally critical to take into account those organisational members who were not involved in the projects at the school level, but who were involved in the e-learning development. The researcher also attended most of the e-learning related meetings held at the university level, and held discussions as frequently as possible with various stakeholders during coffee and lunch-breaks. In total, 83 interviews were conducted for the research. The majority of the interviews lasted between 60 min and 90 min and were recorded with the interviewees’ permission. Most of the interviews were conducted according to an interview guide that was based on the key themes that this study aimed to explore. Requests for follow up interviews were also made at the end of several interviews. In total, there were 15 follow-up interviews conducted, mainly to ask further questions and clarify ambiguities that arose during the initial interviews.

3 Case study

3.1 Case 1: The University of Nottingham, UK

The University of Nottingham is a leading university with 30,000 students and staff and excellence in teaching and learning quality. The university has spread globally with two overseas campuses (Malaysia and China). To enhance the teaching quality and learning efficiency, a comprehensive e-learning strategy is a vital element in developing a next generation university.

In 1994, Mosaic explorer was introduced as a predecessor to Internet Explorer. After 1996, the growth of broadband capabilities became the major goal of the internet and served as a catalyst for distance learning (Khvilon and Patru, 2002).

3.1.1 Initial stage

The University of Nottingham came under huge pressure from the e-learning bandwagon between 1994 and 2000. Pursing a defender strategy, the University continued to function
in a conservative way. In this period, computer hardware and internet broadband
capabilities were maturing, laying the foundation for e-learning development. The
decision making processes in the University included schools and departments and were
mechanistic centralised with little control. Most schools felt the desire to change but no
proposition was carried out. The Information Systems (IS) management units were
executed in a decentralised fashion, aiming to provide direct support for each department.
Each school of Nottingham University had a separate IS unit. From the innovation
perspective, there was a strong demand from instructors to recommend e-learning as a
part of teaching and learning activities.

3.1.2 Second stage: 2000–2004 (the pilot stage)

The revolutionary change began with the establishment of the e-learning strategy group
in December 2000 with a brief to review the University’s involvement in e-learning,
evaluate options for potential future involvement, and identify potential human capital
and infrastructure requirements associated with further investment in technology
mediated learning.3

In April 2001, the e-learning strategy group forwarded an initial report and
recommendations to the Management Group.4 In this period, WebCT and Blackboard
(well-known VLE systems) were widely adopted by schools and achieved some success,
but it was quite clear that the higher management group had little control over it. In this
stage, indeed, there was a great deal of waste of e-learning investments. It can be
argued that there still existed different opinions in each school. In other words, it would
be necessary to reconsider a comprehensive e-learning strategy for the university
(the solution finding phase).

3.1.3 Third stage: March, 2004 – present

The central IS department was doing the basic implementation (e.g., providing training
sessions for academics), and the IS unit in each school provided the essential support for
staff in creating the teaching material, which enhanced the advantages of shared IS.
The IS can quickly provide the technological support when the teaching staff needs it
(Julian Tenney5). The IS strategy also shifted from growth innovation to low-cost and
growth, by cutting unnecessary cost. In late July 2004, WebCT has been confirmed by
the e-learning focus group as a preferred single VLE (Andy Beggan6). This was a crucial
turning point, as it concentrated all the energy and effort on the single platform.
Currently, the e-learning implementation progress is quite satisfactory with nearly 800
course sections available online.7

3.2 Case 2: National Chung Cheng University, Taiwan

National Chung Cheng University, Taiwan, was the first public University established
after Taiwan’s economic boom in the 1980s. It was founded to be a research-oriented
University, which aims to provide students with necessary skills in humanities, the
sciences, technology, law and management. It is this type of liberal arts education that
allows students to effectively deal with the complexity of life in the 21st century.8
3.2.1 CCU timetable of e-learning

Starting in the early 1990s, the timing of the initial e-learning development is pretty much the same as that of western leading universities (Professor Ren-Hung Hwang). Yet, the foundation of broadband capability infrastructure is better than that in most countries around the world. The reason for this might be that Taiwan is the heart of IT hardware development, producing cheaper and more reliable IT products. But the Taiwanese educational market is small and does not have close connections with western countries. Taiwanese universities desired to create a route to make a better connection with other universities in order to recruit more new students.

3.2.2 The first stage: 1995–2002 (the initial stage)

National Chung Cheng University can be identified as a pioneer, providing distance learning courses in Taiwan since 1995 by participating in some distance learning projects. There were significant results from the projects, e.g., 45 courses online and over 6000 students enrolled (Professor Pao-Ta Yu). During this period, the university treated distance learning as an extra workload for the IS department. From the organisational point of view, this foundation has not changed from that time. After the university decided to participate in the pioneering distance learning course with the Taiwan Ministry of Education (MoE), they started to develop their own platform (conformed to SCORM 1.2 standard) in 1999, instead of buying the platform from some LMS vendors. The teachers were keen to put the courses online but the quality can be argued to be relatively low (Professor Ren-Hung Hwang).

3.2.3 The second stage: 2002–2004

The revolutionary change began with the establishment of the e-learning studio, which was affiliated with the audio-visual centre in the library. From the organisational view, the university still assumes that e-learning activities are a pilot project. There are still lots of areas that remain to be covered. In 2002, Server 4 was implemented by two postgraduate students using PHP as the main language, which is compatible with SCORM 1.2 Standard.

In August 2004, the e-learning centre was renamed and upgraded from the e-learning studio, which was established in January 2002, and was made independent of the library in order to solve two key bottlenecks (Professor Pao-Ta Yu):

1. It is difficult and time-consuming to create multimedia instructional materials
2. The need for a professional platform server and video and audio server was unfulfilled.

From the technological point of view, the equipment for e-learning also needs to be upgraded. For the past three years, the servers for e-learning have been subject to the advanced Linux system and PC which are not suitable for making video-based materials. In this stage, CCU completed the evolution of the technological requirements and obtained much valuable experience to prepare for the next stage.
3.2.4 The third stage: 2005 – present

In order to maintain strength and remain competent, CCU gave the e-learning centre a brand new organisational setting, ‘CyberCCU’, which was established in September 2005. At the same time, the MoE also responded to the e-learning pressure by starting to acknowledge the course credits obtained through e-learning. To make the most of its platform, CyberCCU is promoting its platform service by using its own resources. In the near future, CyberCCU will be expected to make ends meet (Professor Pao-Ta Yu). This means that CyberCCU will become a new source of revenue for the university and even improve the university’s competitiveness.

From the course development perspective, CyberCCU will start recruiting students from February 2007. Half of CCU’s course credits will be delivered online (Professor Ren-Chuan Luo). This will have great benefits for part-time students who have jobs but are willing to improve their abilities and get an advanced degree.

4 Finding 1: comparative study

By comparing these two cases, we find that the e-learning phenomenon happened at a similar time all over the world, because of the dramatic technological development and world globalisation that has occurred since the 1990s. For both the University of Nottingham and the Taiwan National Chung Cheng University, the pressure of the e-learning bandwagon is the major reason for adopting e-learning. They believed that e-learning can bring huge benefits for teaching and learning activities and that e-learning is a major agenda which is related to competitiveness. Another reason for the University of Nottingham adopting e-learning is the multi-campus teaching. The University of Nottingham has several, not only in the UK, but also in Malaysia and China. In order to improve the teaching quality, e-learning is the best choice. Compared to the University of Nottingham, the Taiwan National Chung Cheng University has not suffered from this issue, but the e-learning application in this university is closely linked with MoE. In order to participate in the plan of ‘e-learning pioneers’ by MoE, CCU introduced e-learning in 1995, and also because of MoE planning in 2006, CCU established the ‘CyberCCU’.

The consequences of the initial stage in the two universities are different. At the University of Nottingham, the first sign of e-learning appeared in 1994, in the education department, but was not networked. Until December 2000, a strategy group was found for the e-learning implementation, which is the formal beginning of implementing e-learning from top to bottom at the University of Nottingham. For the CCU, it was because of ‘e-learning pioneers’ from MoE. From then on, CCU applied e-learning from top to bottom in the ATM network.

There are two significant differences between these two universities. One is the core of e-learning execution. The University of Nottingham founded a ‘Focus group’ for the e-learning strategy, and the responsibility of the IS department is to assist with technical support. The CCU established an e-learning studio in 2002, which was renamed the ‘e-learning centre’ in 2004. The duties of the e-learning centre include not only the e-learning strategy, but also platform development. Therefore, the other significant difference between these two universities is platform development.
There were two large companies for e-learning platform development at that time, WebCT and Blackboard (these two companies merged into one company ‘Blackboard’ since October 2005). They were the main source for e-learning platforms, commanding over 80% of the market. The University of Nottingham’s strategy was to buy an e-learning platform; so, before July 2004, two platforms were used at the University of Nottingham for initial trial, and, after July 2004, a focus group at the University of Nottingham decided to use a single platform WebCT. The CCU chose a different approach – to develop its own platform. Most universities in China and Taiwan prefer to develop their own e-learning platform. Buying an e-learning platform requires huge copyright and maintenance fees. Also, because most of the western e-learning platform development companies did not include an Asian languages package in their software, the language barrier is a big issue for Asian universities when adopting these e-learning platforms. With its powerful computer technology, CCU developed its own platform, beginning in 1999, and has now released version 5.

Although these two universities approached these processes differently, with the University of Nottingham focusing on organisational strategy and CCU focusing on technology and course development, it can be argued that they both succeeded, just in different ways.

5 Finding 2: the critical factors of e-learning development

After comparison of the two universities, this researcher tried to indicate the e-learning CSFs from an EU perspective based on the case of the University of Nottingham. As mentioned in the ‘Methodology’ section, three e-learning school projects were selected. Although the three test cases of e-learning projects in the University of Nottingham context are different in many aspects, the research found some common factors that were critical to the success of these three projects. These factors are divided into four categories: organisational, technological, e-learning content related, and general factors.

5.1 Organisational factors

Expertise and experience

The importance of expertise and experience is highly significant, particularly when the e-learning development process is complex. Having experienced experts is found to be beneficial not only in reducing the cost and time of development, but also in sustaining the longer term continuity. For example, in the School of Geography, the e-learning coordinator has played a key role. Her ability has been appraised by all of the interviewees in this school as being one of the most CSFs. For the MELEES project at the School of Mathematics, most members of the core team had no prior experience, except for the project manager. Prior to the MELEES project, he was engaged in the development, promotion and use of Computer Assistance Learning (CAL) for mathematics and he was also a member of HELM Project Steering Group. If we compare the two schools, the e-learning project at the School of Education is far more complex and ambitious. The school’s specialisation in education certainly gives the project a lot of advantages. Therefore, although the eELT project was new in its content, by utilising
experience, the school of education could still apply its large range of expertise to fulfil the unique requirements of the project.

Leadership

Leadership at the school level was found to be equally important as at the university level. Some similarities across all of these cases are evident. In addition to the expertise and experience of leaders regarding e-learning, two of their key contributions were decision making and problem solving skills. In the MELEES project and eELT project, the main decision makers for both projects are their project managers. In the project at the School of Geography, the e-learning coordinator was the person who received the latest information and technology from the central IS Department and the final feedback from the academic staff and students. Therefore, she was often the person who made the final decision. In order to solve problems, one core skill evident in all three cases is the ability to influence and motivate people, particularly the module lecturers. Given that the technology was relatively problem-free, to achieve the goal of having as many e-learning courses online as possible required a lot of buy-in from the academic staff. Therefore, motivating the module lecturers to get involved was clearly one of the most crucial problems for the leader to address. For the eELT project, the challenge did not stop within the school of education. It also covered two governments, their Chinese partners and the outsourcing vendors.

Top management support

The influence of the top management on an e-learning project is significant. Their support can range over three different aspects, notably funding support, technological support and experience support. In terms of funding support, it is clear that, without them, the project could not happen. It is evident that funding was relatively easy to obtain during the early stage of e-learning development at the university. However, with the growing maturity in this area, funding support was restricted. As the projects at the School of Mathematics and the School of Geography were perceived as two flagship projects at Nottingham, funding was less of an issue. Although the eELT project was not funded by the university, it received other means of support from the top management. In terms of technological support, the top management played a critical role, particularly in allocating central IS resources to facilitate the project implementation. Moreover, the support can take the form of an e-learning platform and tools provision. In terms of knowledge support, the top management also plays a key part. Such knowledge is created and acquired from the experience of various e-learning projects. The top management’s growing understanding of e-learning clearly helps them to filter project proposals and to invest in those with stronger potentials.

5.2 Technological factors

Three aspects of technological factors are crucial to the project success.

Platform support

A platform is like the backbone of an e-learning course. Due to its importance, it is necessary to choose the platform before the e-learning course design. If the platform is not powerful enough or supportable, it will lead to problems later during the development stage. The platform for the MELEES project and Geography e-learning project is
‘WebCT’, which is the official technology supported by the university. By contrast, the eELT project used an open source platform named ‘Moodle’. The platform choice was a decision based on the negotiations between several universities. The open source platform is free, but there is no support. Therefore, the eELT project needs to have strong in-house technicians in order to develop e-learning tools by themselves. In 2008, the team found that the platform of ‘Moodle’ cannot provide enough support for further e-learning development. Therefore, the need to reconsider another platform is clearly evident.

**Tool support**

Any e-learning platform will inevitably have its limitations. Normally, the platform can provide some basic services. Platforms, such as WebCT, are sufficient for simple e-learning course design, but not for the complex ones. For instance, the e-learning courses for the MELEES project are HTML with PDF output, and the platform of WebCT is powerful enough. The e-learning courses for the e-learning project at the School of Geography are far more complex. Therefore, professional Geography technology is needed. As a result, one of the e-learning tool supports at the School of Geography was to embed the professional Geography technology into the platform. In addition, an application named ‘Xerte’, developed by the IS department of the University of Nottingham, helped to reduce a lot of workload to speed up the development. For the eELT project, one of the key issues was communication between the UK and Chinese universities. They applied several tools into the platform of ‘Moodle’ in order to enhance the communication quality.

**Technician support**

Technicians are crucial for ensuring the successful day-to-day running of e-learning and are necessary for all e-learning projects. Technicians are often involved in two different areas. Firstly, every e-learning project is related to a platform and e-learning tool application. The main task for the technician is to control the platform and e-learning tools. Secondly, due to the fact that academic staff is familiar with the courses, but not the e-learning technology, they need support from the technicians when designing e-learning courses.

5.3 **E-learning content related factors**

Normally, the content and style of e-learning is restrained by organisational and technological factors. This research found some content related factors, which can enhance the success of e-learning development.

**Simplification**

If the e-learning content is simple, it is easy to design and deliver. This researcher found that, at the beginning of the e-learning development, most e-learning projects were at the trial stage. This is reflected in the lack of experience and inadequate technological infrastructure. Therefore, to ensure the success of e-learning development, starting with something simple is necessary. For example, the e-learning content in the MELEES project is based on HTML with PDF output. Compared with the other two projects, its e-learning content is much simpler. At the beginning of MELEES projects (in 2002), the e-learning platforms were not mature, and the MELEES team found that it was difficult
to present mathematics formulae electronically in e-learning. Therefore, they decided to use the PDF style to simplify the mathematics e-learning courses.

Creativeness

Another vital factor in determining the success of an e-learning project is its popularity and usage. In other words, the students’ acceptance or rejection can simply conclude the project. One of the key purposes of e-learning development at the UoN is to attract more students by using e-learning as an additional tool for facilitating traditional teaching. Therefore, the creativeness of e-learning design and content is important. For instance, the e-learning project at the School of Geography applied Short Message Service (SMS) to increase the interaction between students and lecturers.

Template auxiliary

The template auxiliary is very important for e-learning course design, especially when a large amount of e-learning courses have been developed. Comparing the three cases, the e-learning project at the School of Geography extends through the whole school with the involvement of almost all academic staff. Even as early as 2005, there were 25 modules with 72 courses online. Before the ‘Xerte’ application was introduced, the workload of the e-learning coordinator was very heavy. This was because she had to contribute to a large part of each e-learning course. The creation and usage of the e-learning template with ‘Xerte’ significantly reduced the required input.

Documentation

During development, it is common for some members of the team to leave and be replaced by someone new. Therefore, storing the knowledge or experience is important. Documentation can help the e-learning development to continue without being seriously disabled by any knowledge gap. For example, in the MELEES project, in order to help the new technician to become familiar with the project without further delaying the progress, the previous technician included many lessons learned from the project in the documentation to pass on his experience.

5.4 General factors

Besides the three factors vital to successful e-learning development, there are some general critical factors which should be highlighted:

Motivation

One of the main purposes of e-learning implementation in higher educational institutions is to move from a traditional teaching and learning style to a new one. Making such a paradigm shift requires more than the installation of technology. More crucially, it requires the involvement of the teaching staff and students to utilise the service. Therefore, it is not surprising that, during the e-learning development in the university, one of the main tasks for the core team was to motivate as many academic staff as possible to get involved. During the data collection, the researcher found that one of the standards for the e-learning project performance evaluation is the quantity of academic staff involvement. Besides motivating the staff, it is also necessary to encourage more students to use the e-learning courses. This is because students are the main users.
Communication

Communication is another important factor for e-learning development. Its importance is not limited only to the stakeholders within the team, but also those outside the team and, in the case of eELT, outside the country. Within the e-learning project, communication between the project manager, technicians, and module lecturers is necessary. For example, most e-learning courses are designed by both the technician and the module lecturers jointly. Therefore, they need to understand each other, through communication. The importance of communication becomes even more significant when the e-learning project requires cooperation between several teams, in different locations, with different cultural backgrounds. During their interviews, all of the team members of the eELT project mentioned that one of the most important issues in their collaboration with the Chinese universities was communication. Improving communication required extra effort, such as applying communication tools and increasing the number of face-to-face meetings.

Trust

There are two types of trust required during e-learning development. The first type is inner trust, built within the e-learning project team. The second type is inter-trust, between the e-learning project team and other stakeholders, such as central IS department or partners outside university. Mistrust can seriously delay the progress of any e-learning development. Normally, it is relatively easy to build the inner trust inside an e-learning project, and usually it is quite difficult to build the inter-trust with the university’s central IS department or between partners from different institutions. For example, this research found that some of the academic staff complained about the central IS Department, and did not think that it gave them enough attention or made enough effort to help them. The trust problem is significant, in particular, in the eELT project, due to the number of institutions involved. During the interviews, the members of staff from the school of education complained that the ‘safeguard issue’ shocked them, as international collaboration is quite sensitive in China, such that it is always observed by Chinese government. Some of them pointed out that they could not trust their partners due to this kind of behaviour.

6 Framework development

Based on the three e-learning projects in the University of Nottingham and the comparison between the two universities, this research developed an initial framework of e-learning CSFs on comparison between EU and Asia perspectives (shown in Figure 1). This research found that the four aspects of e-learning CSFs are all important for both universities’ e-learning development, however, the priority and content are different due to the differences between the EU and Asia perspectives stated above. For example, the ‘higher management’ in the EU perspectives mainly means ‘top management’ and ‘central Information System department’. It means ‘department of Computer Science’ and ‘department of Education’ in the Asian perspectives. The relation between ‘technological factors’ and “e-learning content-related factors” is ‘constraint’ in the EU perspectives, mainly because the e-learning platform and tool applications are adopted from the market with limited flexibility. The relation in the Asia perspectives is ‘support’
because of the flexibility from “self-developed e-learning platforms”. Therefore, the weight of “self-developed e-learning platform” is quite heavy in the CSFs on Asia perspectives. Appositively, the weights of these four aspects of e-learning CSFs are nearly equal on EU perspectives.

Figure 1  An initial framework of e-learning success factors in a comparison of EU and Asia perspectives (see online version for colours)

7 Discussion

Although this research examined a variety of critical factors for e-learning implementation, the different studies have produced different sets of factors. Hence, there is no general agreement on which set of factors is the key to success in e-learning implementation (Zhang et al., 2003). One possible reason why different factors were generated is that these studies were based on different samples and research settings, which may have placed more emphasis on some critical factors but less on others. In addition, the critical factors are also different due to the fact that the researchers conducted their research in different countries or territories. Cultures, government regulations, and economic environments differ among countries, a fact that raises some issues and challenges for e-learning implementation (Huang and Palvia, 2001). As is the case in this research, the reason for self-development of e-learning platforms in Asian universities is because the IT and financial environment lends more confidence in the IT ability and emphasises the lack of financial support for commercial e-learning platforms (Professor Pao-Ta Yu). This situation leads to some limitations for e-learning development, such as internationalisation and standardisation. Therefore, this research focused on the critical factors of e-learning implementation with an EU perspective.
This research proposes a workable tool for appraising the e-learning implementation towards the footprints of each decision, event, and response. By examining the e-learning implementation over a period of time, the manager can recollect and determine the current process. The implementation can also be used to monitor and track the development process and predict changes in an organisation by the simulated reallocation of the resources.

In addition, this research also serves as a model for universities that wish to produce a new e-learning plan. Combined critical factors at all levels of the institution are essential to successful e-learning. However, this research only presents an initial framework of e-learning CSFs on EU perspectives by comparing two institutions, and it is obvious that it would be enhanced by similar research in other institutions (both EU and Asian universities) in order to make comparisons.

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Notes
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