CHAPTER 6 DATA ANALYSIS

6.1 Introduction

The conceptualization of the change process underlying various innovations within the context of E-Learning is a theoretically under-developed area. To address such a shortfall, the author conducted research to examine E-Learning development processes with a focus on how E-Learning issues change and develop over time. As in previous process studies (Van De Ven, 1993; Van De Ven, 2007; Van De Ven and Huber, 1990; Pettigrew, 1990; Pettigrew, 1992), this research is concerned with how various elements and issues are collected, understood and connected in order to generate a comprehensive account of the change. In particular, this study adopted an event-driven approach to form an account that is capable of explaining chronological sequences and change events in a temporal order based on the case evidence collected by the author (Abbott, 1988; Pentland, 1999; Poole et al., 2000; Tsoukas, 2005).

6.2 Organizational Development Process Patterns

To analyse the three case studies, the study applied Rogers' (1995) organizational innovation process model as the basis. As outlined in Chapter 2, this framework is useful in categorizing various events that seemed to happen with very limited interconnection during their development into a logical order. The experience gained by applying this framework is that it provides a unified template for examining each case study and becomes a highly effective tool for making sense of the differences and similarities between the three case studies. Before the close similarities and wide differences can be outlined, this section first elaborates on the analysis result for each case study, based on Rogers' framework.

6.2.1 Case Study One —MELEES Project

As outlined in Figure 6.1 below, MELEES' organizational process can be categorized in three stages: initiation, implementation and expansion. Compared to the framework proposed by Rogers, it is clear that the organizational process underlying the development of MELEES offers greater complexity. Such complexity is captured in the expansion stage. The following figure outlines each stage in more detail

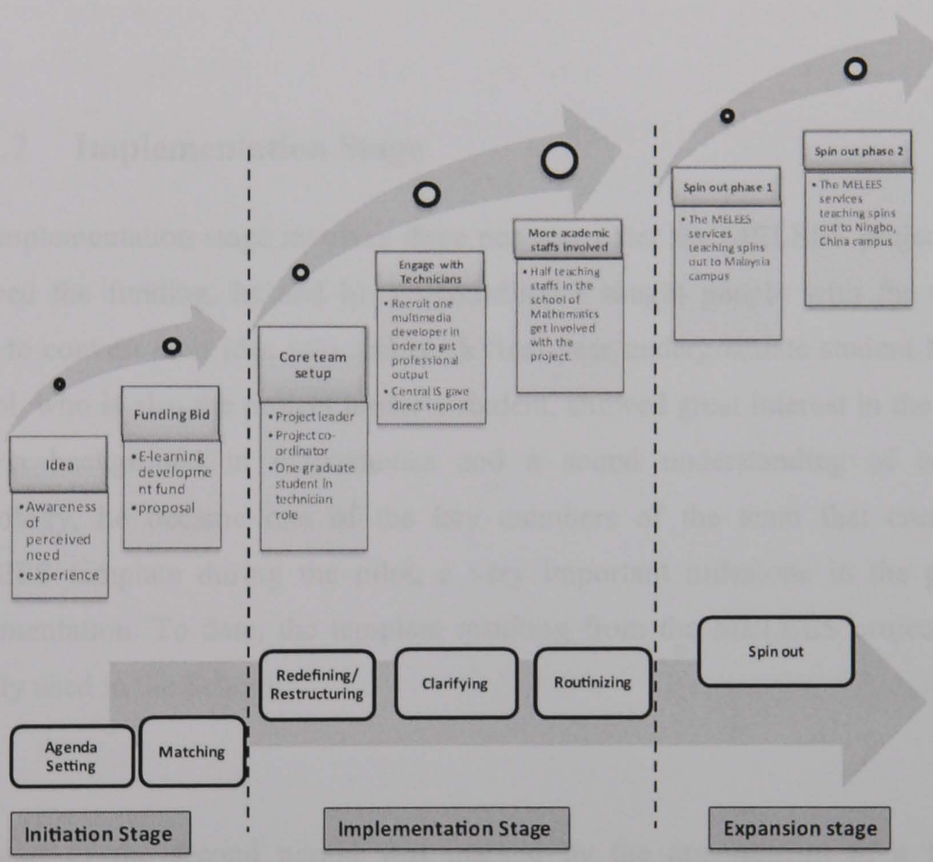

Figure 6.1 MELEES Organizational Innovation Process

6.2.1.1 Initiation Stage

Compared to the other three case studies, the MELEES project can be considered an early starter. Initiated in 2002, the project was heavily influenced by the HELM project, which was founded by HEFCE in 1998. The HELM project revealed the need to support engineers to learn mathematics and contributed to the creation of a

series of flexible learning resources. As one of the project members of HELM, the MELEES project leader gained significant experience in computer-assisted learning and applying new technology to help his students to learn mathematics. These elements led to the realisation that E-Learning can provide a useful approach to the teaching of mathematics. Such an understanding served as the source of inspiration for the project. In particular, when the University's E-Learning strategy group called for E-Learning bids, the project leader reacted quickly and completed an integrated proposal. In addition, he also received support from a senior staff member who was the leader of the Teaching and Learning Community of his School.

6.2.1.2 Implementation Stage

The implementation stage involves three periods. After the MELEES project leader received the funding, he and his co-coordinator sought people with the required skills to convert their idea into reality. A final year undergraduate student from the School, who is also the project leader's student, showed great interest in the project. With a background in mathematics and a sound understanding of computer technology, he became one of the key members of the team that created the MELEES template during the pilot, a very important milestone in the project's implementation. To date, the template resulting from the MELEES project is still broadly used in the School.

The start of the second period was marked by the appointment of a full-time technician. Following the graduation of the previous technician, the team recruited a professional and experienced technician to continue the mission. With her excellent social skills, she was capable of engaging not only the Central IS Department, but also the academics. The three core team members met, on average, once a week in order to check progress. In 2005, the technician managed to complete another 17 modules and involve 20 teaching staff in the project. So far, about a third of all teaching staff at the School of Mathematics have participated in the development of MELEES, and as a result, E-Learning has become the most important alternative

approach for students when learning mathematics. Outside the School, the quality of service teaching remained highly satisfactory. MELEES has been hugely successful, becoming a role model for many institutions in the UK.

6.2.1.3 Expansion Stage

From the aspect of innovation, the impact of MELEES will not cease when the project officially finishes. In addition to being a source of inspiration for other higher education institutions, the University has been exploring the possibility of extending the success of MELEES to its overseas campuses. For example, in 2007, the team has engaged with the IS staff of the Malaysian campus. Further, the University is anticipating its first trial at the China campus, as addressed in Section 5.3.4. The underlying aim of this is twofold: firstly, to reproduce the success of MELEES by utilising the existing available expertise and experience; and, secondly, to meet the challenge of providing high quality service teaching, particularly to students on overseas campuses. This stage, as an extension to Rogers' (1995) framework of the innovation process in organizations, characterises an organization's belief in capitalising its existing innovation.

6.2.2 Case Study Two— the School of Geography E-Learning Project

The E-Learning project at the School of Geography began in 2004, a later start than that of other projects examined in this research. Nevertheless, the development process of E-Learning was by comparison much smoother. Using the model of organizational innovation developed by Rogers (1995), this process is illustrated in Figure 6.2, divided into two stages, notably the initiation stage and the implementation stage:

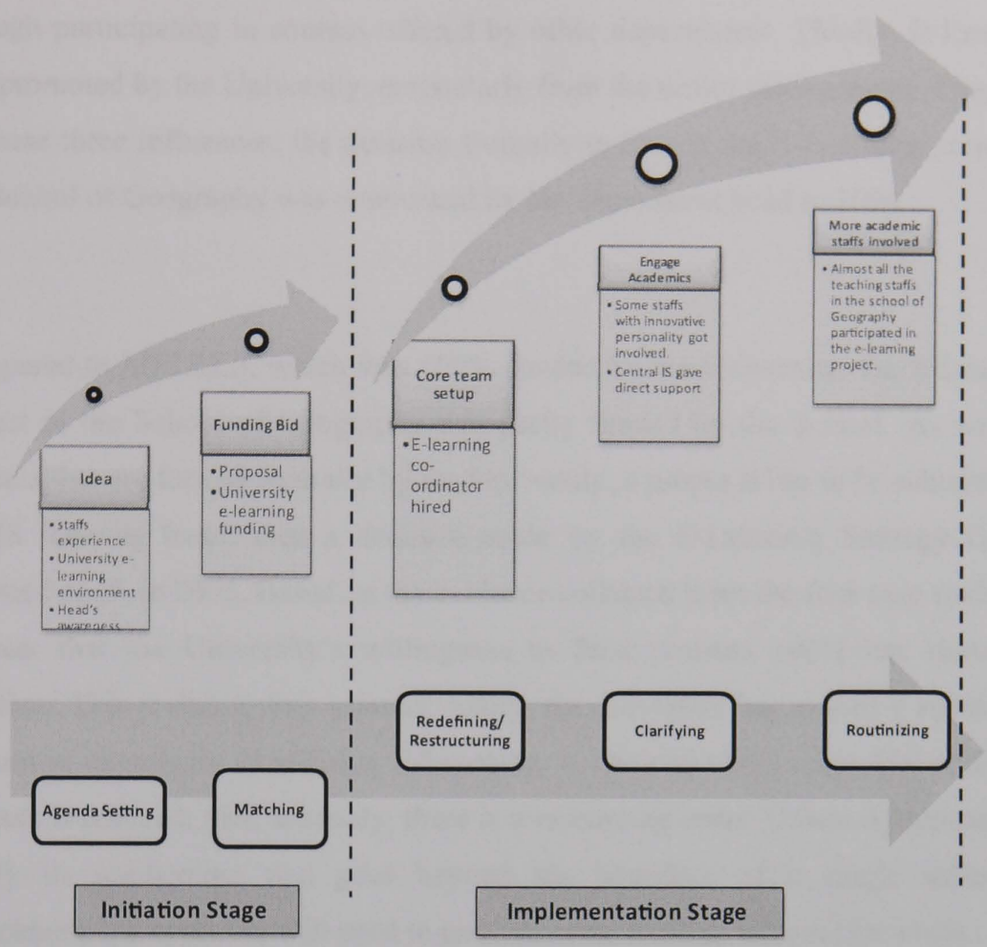

Figure 6.2 Geography Organizational Innovation Process

6.2.2.1 Initiation Stage

There are several reasons why the E-Learning project was initiated in the School of Geography. Firstly, there was already a prevailing culture within the School to use technology to supplement learning, since, although there was no E-Learning-related initiative yet implemented, there were plenty of technology-based supplementary materials, such as online mini games and videos, produced by members of staff to enhance the students' learning experience. It is unsurprising that the decision to introduce E-Learning into the School very quickly became a shared view among most of the staff. Secondly, from the time when the E-Learning strategy group was formed in 2000, up to 2004, the experience of E-Learning development in the school and at university level was already very mature. Due to the fact that many schools have already implemented E-Learning courses online, large numbers of students, including those from the School of Geography, have experienced E-Learning

through participating in courses offered by other departments. Thirdly, E-Learning was promoted by the University, particularly from the senior management. Triggered by these three influences, the decision formally to launch the E-Learning project in the School of Geography was announced by the department head in 2004.

Compared to MELEES, which was 100%-funded by the University, the E-Learning project in the School of Geography was partly funded by the School. As with all projects that are funded centrally by the University, a proposal has to be submitted to the IS learning team, then a decision made by the E-Learning Strategy Group, renamed eLeK in 2005. Based on the evidence collected from the four case studies, it is clear that the University's willingness to fund projects 100% has started to decrease. This is due to two reasons: firstly, the university has gained a substantial amount of experience in utilising E-Learning, so the need for further trial-and-error projects is reduced; and, secondly, there is a resourcing issue. Unless a proposal can justify its implication that goes beyond the boundary of a single school or department, the applicant will need to provide some funding to cover the costs.

6.2.2.2 Implementation Stage

After the decision to fund the E-Learning project proposed by the School of Geography was approved by the University, the first step in the implementation stage was to recruit staff to oversee it. The post created during this stage was that of E-Learning project coordinator. With more than a year of experience of the MELEES project, Claire Chamber was selected as the best candidate for this post. Unlike the other case studies, which have a project team to roll-out the project, in the School of Geography the E-Learning project coordinator is solely in charge of the project, with the support of other academic staff.

As mentioned earlier, the E-Learning project coordinator's experience with the MELEES project has equipped her with some valuable experience, even though the subject areas are primarily related to mathematics. Compared to other schools'

E-Learning projects, which typically did not have a strong team with the right combination of IT skills and E-Learning project implementation experience, the project in the School of Geography was very different. Further, having excellent experience in collaboration and a connection with the Central IS Department has helped significantly in ensuring the smooth implementation of the project. With a strong interest, too, in E-Learning, the E-Learning project coordinator is an active person involved in the Central E-Learning Focus Group.

Despite the fact that the decision to implement the E-Learning project in the School of Geography was a top-down process, the development process can be characterised as a continuous effort of engagement. The E-Learning project coordinator began by disseminating of E-Learning project information to all academic staff and whoever was interested in developing an E-Learning course could receive advice from her. Her contribution lies not only in assisting with the design of E-Learning materials, but also in providing the knowledge to apply the technology. A routine was gradually established for the development process. Even though the project started with only a few young academic staff, it has since spread throughout the department. With Claire Chamber's energy and assistance, almost all teaching staff in the School of Geography have participated in E-Learning. This not only demonstrates a great achievement, but also provides evidence to showcase the routinizing activity that forms the basis of the implementation stage.

With the growing maturity of using E-Learning on a very comprehensive scale, it is becoming increasingly apparent that having one person to manage all E-Learning-related activities is insufficient. This insufficiency is reflected in two different areas: firstly, in the mounting administration related to the use of E-Learning (for example, providing students with feedback and sorting out the contents); and, secondly, the need for renewing and updating materials. Furthermore, it is clear that academic staff have become more experienced in evaluating the effectiveness of E-Learning tools and the results that these tools yield. Revising existing materials and replacing with new technologies has therefore become a fresh

agenda for the department. This case study illustrates well how a new technology-based solution, such as E-Learning, can be quickly adopted and matured in an organization. Far from discouraging innovation, there is a need to continue and renew this innovation by introducing further improvements. This demonstrates the ongoing dynamic of innovation and the driving forces behind its continuity.

6.2.3 Case Study Three— the eELT Project

The eELT project team involved three geographically-dispersed sub-teams located at the University of Nottingham), Beijing Normal University and Beijing Foreign Studies University. For the convenience of the data collection and analysis, this study perceived the two teams based in China as one entity. With this in mind, this research labels the two sub-teams of the eELT project as the UoN team and the Chinese team. The eELT case Study is a pioneering cross-culture E-Learning project. One of the key aspects of this project is that is involves some changes to the traditional approach to teaching English as a foreign language. The project created some valuable opportunities to enable experts from different universities, located in two different countries, to collaborate. In particular, useful lessons generated from this project are described not only in evaluating the strengths and weaknesses of the traditional face-to-face method, but also in recommending with a new alternative.

The eELT project's organizational innovation process is based on Rogers' (1995) framework, with some modifications. This case study is very interesting, when comparing the two teams. In particular, the teams have undergone identical processes, yet demonstrated rather different behaviour. Figure 6.3 illustrates in more detail the organizational development stages and different behaviour of each team:

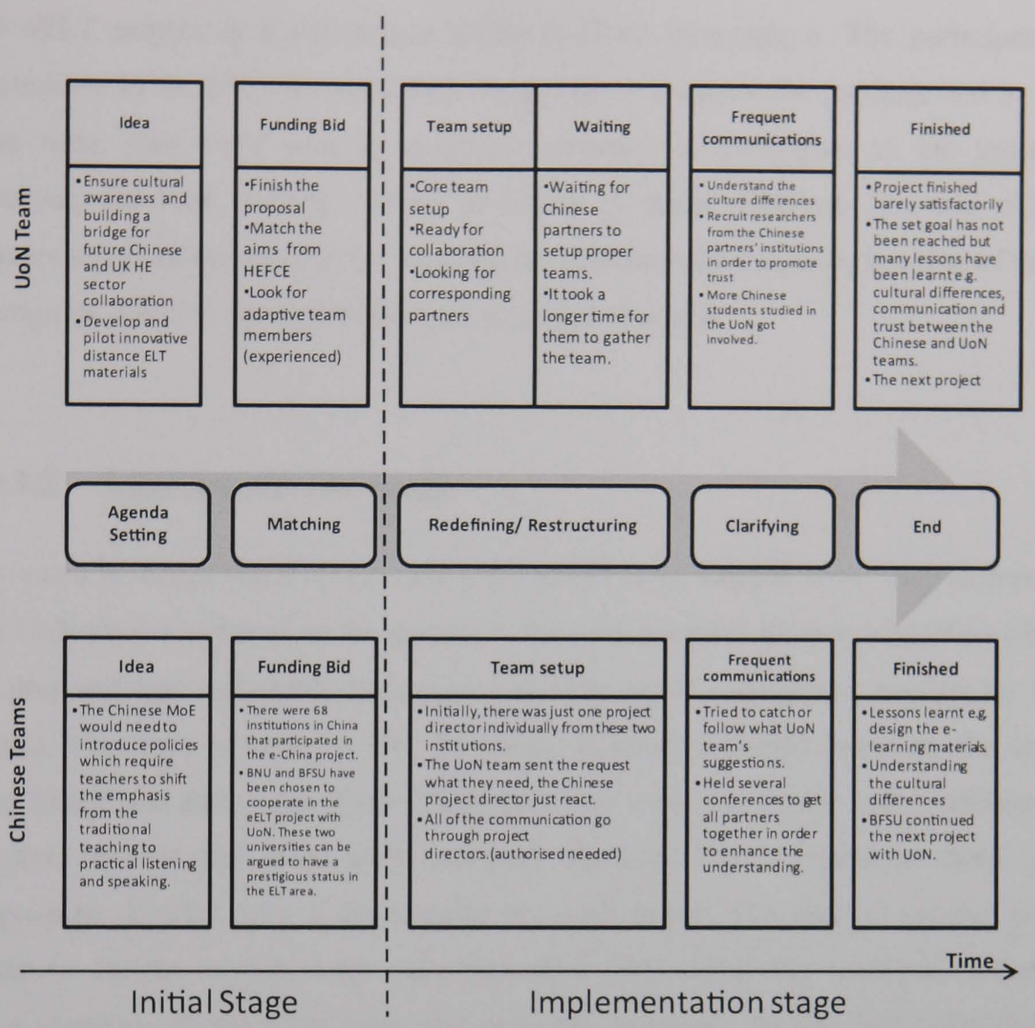

Figure 6.3 eELT Organizational Innovation Process

6.2.3.1 Initial Stage

As mentioned in the Chapter 5, the overall aim of the e-China programme was to establish a strategic collaboration between UK and China in the higher education sector. The focus of this collaboration was to promote innovative developments in E-Learning for training teachers who teach English as a foreign language. Even now, English language teaching in China is still teacher-centred and relies mainly on textbooks, using examination-based methods. The Chinese Ministry of Education would like to promote new pedagogical approaches to develop the sociable competencies of listening and speaking. Additionally, through the collaboration, the UK higher education institutions can gain experience in multi-cultural E-Learning innovation.

The eELT project is a sub-project of the e-China programme. The participating universities in the UK submitted their proposals to compete for funding, and at the same time, they were seeking qualified members to participate in the project. However, the fund bidding process in China is rather different. The two eELT partners were chosen directly by the Chinese Ministry of Education, because of their prestigious status in the area of English language teaching.

6.2.3.2 Implementation Stage

The ways in which the Chinese and UoN teams were formed were very different. The UoN team was based on the principle that each member, already identified when the proposal was submitted, possessed a unique set of experiences needed for the project. The team structure is flat. However, in the first project meeting, the UoN team found that each team from China only has a project leader and a university director, without any other team members. Between the two projects there is a programme director who is responsible for both teams. The lack of project team members clearly caused some communication difficulties. For instance, initially, when members of the UoN team (for example, academic writers and technicians) needed to negotiate with the reciprocal member in the Chinese team, they could deal only with the project leaders. When an issue was communicated, each project leader would then need to obtain authorisation from the university director and programme director, particularly with regard to recruiting and assigning members to the team. This led to inevitable delays.

Once the teams had been formed, the project was able to begin. However, cultural differences impeded collaboration. These differences were found in many areas, including defining the aims and objectives and the technological terms, and even in the writing of materials. In order to reduce the cultural gap and build trust, the UoN team decided to recruit some PhD researchers from the Chinese partner universities, yet these attempts, the Chinese teams still encountered difficulties, particularly with following the suggestions made by the UoN team. There was a clear need to

improve communication amongst the teams, so several face-to-face meetings and conferences were organised as a result.

6.3 Technological Development Process Patterns

This section presents the data analysis on the E-Learning technological development processes of the three case studies. In order to avoid the limitations indicated by Sabherwal and Robey (1993), the data analysis is based - with some adjustments - on two models: Cooper and Zmud's IS innovation process (1990) and Rogers' technological adoption process (1995), both detailed in Section 2.4.3.

6.3.1 Case Study One — the MELEES Project

6.3.1.1 E-Learning Platform Development

The MELEES project was one of the first official E-Learning projects at the University of Nottingham. At the time when the project started, computer-assisted learning as a supplement to conventional teaching has already gained some popularity and momentum in most departments, and the School of Mathematics was no exception. Individual teaching staff have been the driving force behind adopting the technology. Before 2002, the majority of computer-assistance learning materials were standalone, PC-based contents without any Internet connections.

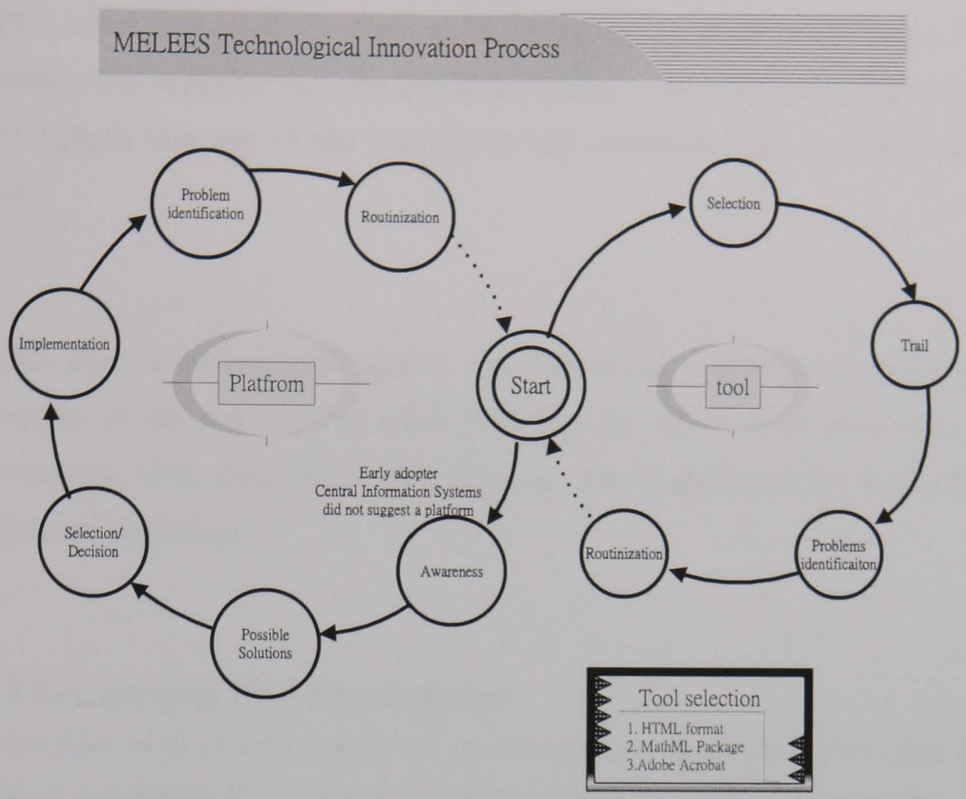

Figure 6.4 MELEES Technological Innovation Process

By responding to the call for a proposal from the E-Learning Strategy Group, the MELEES project aimed to create a web-based learning environment for students of engineering and science. Such an environment was anticipated to support mathematics teaching and learning, as well as to offer better information to the students' home schools (client schools). As soon as the aim had been confirmed, the platform selection immediately became a major task. However, there were several major difficulties. The sheer scope of the project not only covered more schools than any previous project, but also involved a large number of users. Without participants having prior experience in the technology that was to be used across different schools and that needed to be suitable for several thousand users, the significance of this task cannot be under-estimated. In addition, there were also other technological issues related to the selection of the medium and administration systems. In 2002, there were two platforms running parallel in the University; namely, WebCT and Blackboard. The MELEES team had no preferred option, so they compared these two platforms in terms of their functionalities, abilities and performances. The comparison showed very little difference between the two. However, when the

MELEES team contacted the Central IS Department, the WebCT support team responded more promptly than the Blackboard team, and so the availability of good quality support was one of the key factors that influenced the platform selection process.

MELEES aims to deliver high quality teaching rather than make a technological contribution. In the case study of MELEES, they are the platform users rather than the developers. They adopted the VLE platform that is influenced by the Central IS Department's decisions.

6.3.1.2 E-Learning Tool Development

After the pilot module was completed, another crucial issue was raised that it was difficult to use HTML[53] to import complex mathematical formulae into the course materials. It was easy to write the formulae by hand but not to present this on screen. It can be argued that the formulae could be shown as pictures. However, this lost the interactive functions and the quality became unstable. Finding an alternative way was a crucial turning point. The team identified two popular pieces of software; namely, LaTeX[54] and MathML (Mathematical Markup Language), which count for more than 90% of the market for scientific document preparation systems. LaTeX is a document preparation system for high-quality typesetting which was first developed in 1985 with large user groups. It is widely utilized for technical or scientific documents. At that time, LaTeX did not directly support HTML output. It was difficult to convert the LaTeX codes into HTML format. After the technical staff had tried all the possibilities, they decided to apply MathML to MELEES because it has several advantages, for example:

- it easily converts LaTeX documents to MathML by a number of converters
- converting MathML documents into LaTeX format is also possible.
- it gives direct web browser standard support for Windows, Unix/Linux and Macintosh.

[53] Hyper Text Markup Language (HTML) is the predominant markup language for web pages.
[54] LaTeX is a document markup language and document preparation system for the TeX typesetting programme.

Given that MELEES' teaching materials would be delivered in a HTML format, they decided to use MathML, which was recommended by W3C [55] for creating mathematical formulae.

The MELEES team also received feedback indicating that, even when applying MathML in conjunction with HTML into material development, the way in which the materials were displayed could vary depending on the brand and version of the web browsers. The team investigated various possible solutions. One was to present the workbooks based on the picture format. However, this had the disadvantage that they would lose interaction ability. Another possible solution was to convert the workbooks into PDF format. At that time, PDF had become quite popular and almost a document standard. PDF is also a decisive technology to apply. It is a markup language for recording how a document will appear when printed and replicating this on screen, which has been widely use in the digital world as a standard. The technician would no longer be concerned about the output into any other computer device. PDF was therefore chosen as a preferred format to ensure that users could achieve the same quality of display as on the developer's screen. The majority of workbooks and past examination papers were displayed in PDF format.

[55] http://www.w3.org/

6.3.2 Case Study Two — the School of Geography E-Learning Project

6.3.2.1 E-Learning Platform Development

At the time when the E-Learning project was about to be launched in the School of Geography, the E-Learning platform in the University was changed, not surprisingly, to a single platform, WebCT.

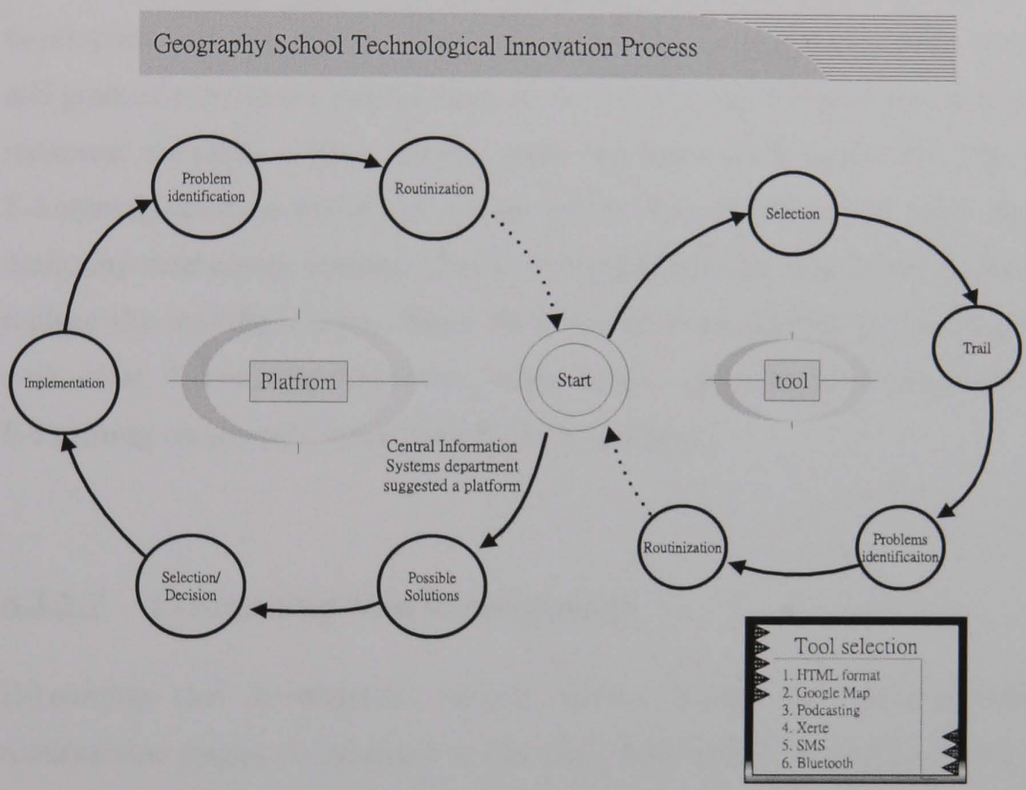

Figure 6.5 Geography Technological Innovation Process

During the implementation stage, the platform WebCT, developed by a commercial company, had already been adopted by many universities, including the University of Nottingham, where it had been embedded for several years. Building on this substantial experience, implementation of the E-Learning platform in the School of Geography was relatively smooth and straightforward. The E-Learning coordinator was very familiar with the technology and had abundant experience of creating content. Her rich experience of working with the WebCT platform was of particular

value. With the support of the Central IS Department, the adoption and use of the WebCT platform could be perceived as occurring in a hassle-free environment.

The routinization process was next observed. Before 2000, staff in the School of Geography had already expressed great interest in incorporating new technology into their teaching. By 2004, many E-Learning supplement materials such as online mini games and videos had been produced by individual staff who took advantage of technological innovation to renew their teaching. This background helped to promote the routinization process, and with the assistance of the E-Learning coordinator, the development of E-Learning materials and courses was systematically encouraged and gradually became a normal activity. In turn, this growth in experience made for increased demands - for example, some academic staff found that the existing E-Learning platform could not always satisfy their requirements when they were designing their course contents, therefore highlighting the need to improve and even replace the existing system. Some staff attempted to develop E-Learning courses with other E-Learning platforms, while others reported their problems to the E-Learning coordinator or the Central IS Department.

6.3.2.2 E-Learning Tool Development

E-Learning tool development usually occurs during the implementation and routinization stages. As reported in Section 2.4.3, the E-Learning tool development process is similar to the process of E-Learning innovation. This section will therefore explain in the same way the E-Learning tool development process within the School of Geography.

Selection: The School of Geography has considered four E-Learning tools which can be divided into two types. Firstly, there are those decided and selected by the Central IS Department, including Podcast and Xerte, and, secondly, those decided and selected by the School of Geography itself. The reason why the University developed the Xerte tool was explained in Section 4.4.3.4. The nature of the

E-Learning material is presented as a multimedia and interactive tool which required a great amount of time to create. In the School of Geography, many academic staff perceived that complex technology is always a barrier to adopting E-Learning. The workload for the E-Learning coordinator was quite heavy, especially as she assisted with every E-Learning course. The Xerte tool therefore simplified the authoring and deployment of interactive learning materials and reduced the E-Learning coordinator's work load. The record shows that Xerte Toolkits is a very powerful tool for creating E-Learning materials. The Podcast ranges from a speech, a natural video scene, and some outstanding geology, which provides a great supplement to the traditional teaching: the Podcast technology is therefore widely applied in the School.

The decision to use SMS (Mobile Messaging Service), Google Map, or Bluetooth is made by the academic staff themselves. Because of the characteristics of the School of Geography, complex technology is usually applied by the academic staff, according to the requirements of different courses. One lecturer applied SMS in the class to encourage more interaction between the lecturer and students, which helped the introverted students to become involved and encouraged them to ask questions in an indirect way. They also acquired Google Map in their E-Learning module to explain longitude, latitude and location and to enhance understanding. Currently, staff are investigating the possibilities of trialling mobile devices to deliver information through Bluetooth systems.

Trial (implementation): Once a tool has been tentatively selected, it is important to pilot it. The efficiency of tools such Xerte and Podcast, basic for the development of E-Learning content and design, had already been evaluated by the Central IS Department. For the trial implementation of other E-Learning tools, such as SMS, Google Map or Bluetooth, the academic staff developed a pilot E-Learning course and then evaluated the performance. It was hoped that a tool that performed well would be applied to more E-Learning courses.

Routinization: After the trial stage (implementation), some of the E-Learning tools were embedded into the normal activities of E-Learning course development, particularly those that received good evaluation results. More new E-Learning tools were further introduced into the E-Learning project and became part of the selection for E-Learning design.

Currently, the core E-Learning team are looking at the possibilities of trialling mobile devices to deliver information through Bluetooth systems. The mobile learning method could be a useful application in geography-related subjects, as it enables communication between learners and lecturers in any location and in real-time.

6.3.3 Case Study Three— the eELT Project

6.3.3.1 E-Learning Platform Development

It can be argued that platform selection is one of the most critical issues for an E-Learning project. Ideally, a standard platform should be used across the entire e-China project, so that benefits such as cost reduction and technological support efficiency can be actualised. However, before the start of the eELT project there was dispute over platform choice between the UK HEFCE and the Chinese Ministry of Education. The HECFE preferred to use the UKeU platform (which is no longer available), while the Chinese MoE insisted that the platform should be interoperable; control was another important concern. No conclusion was drawn from the debate, and as a result, each participant in the e-China project selected its own platform. While participants in the UK purchased the platform from established vendors, both Chinese institutions developed their own platforms. Due to this reason, some delay occurred even at the very early stage of the e-China project.

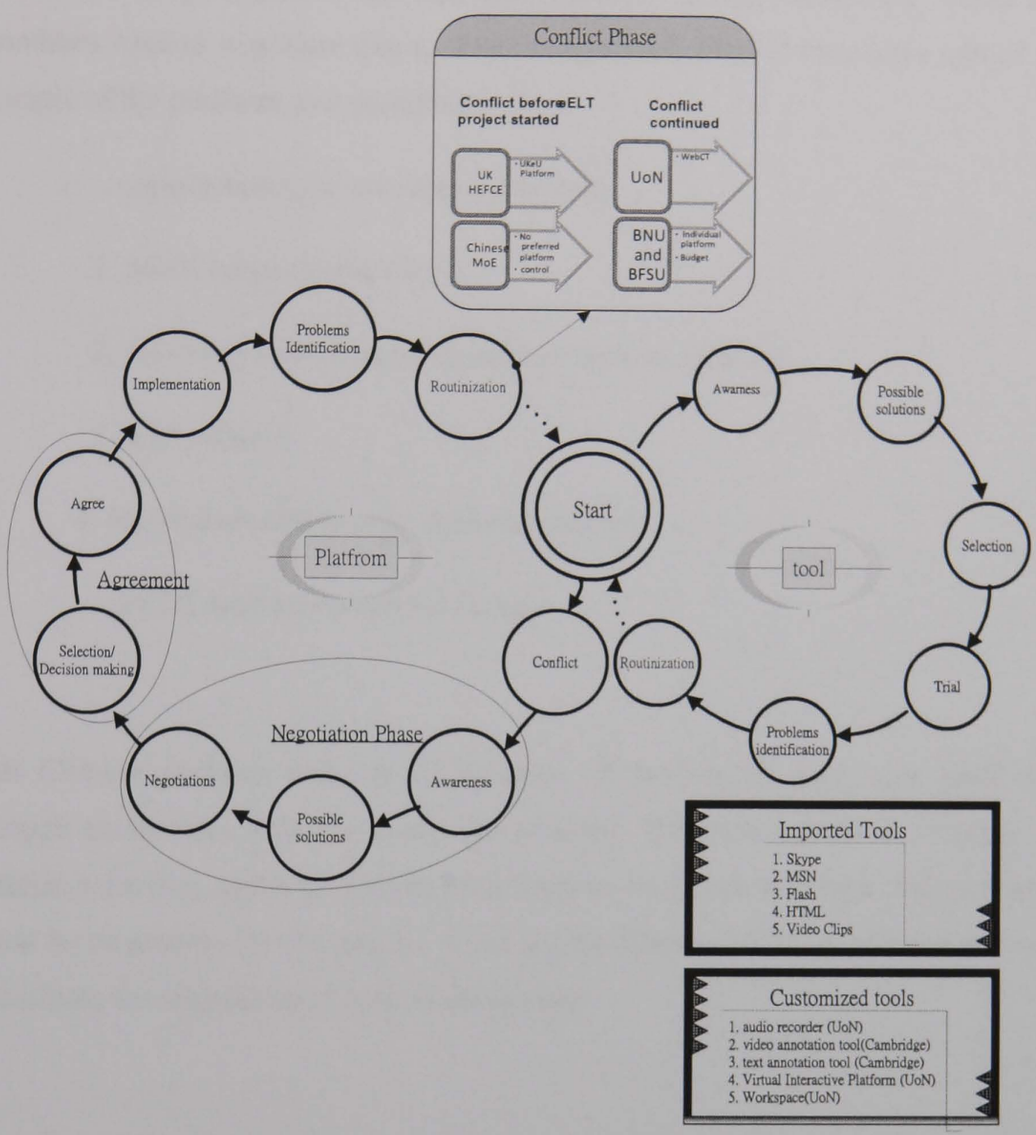

Figure 6.6 eELT Technological Innovation Processes

In the eELT project, the University of Nottingham team initially suggested that WebCT might be preferable because the UoN centrally supported WebCT as their official E-Learning platform before the eChina project began. However, both the Chinese partners insisted on developing new platforms since the commercial platforms are not popular in China. They preferred to adopt non-commercial platforms or to develop their own, which has led to some challenging discussions about the development materials. The rationale behind the development of a new

platform is reflected in the concerns that both partners had about cost and control. It would be more correct to say that each member had its standpoint, which was sometimes hard to negotiate due to their background, even if they have agreed the principle of the platform as a guideline:

> *.....requirements for selecting a platform*
>
> *1. Multi-language capability.*
>
> *2. following international standards such as SCROM.*
>
> *3. high security*
>
> *4. high bandwidth to cope with rich media .....*
>
> *(eELT multimedia officer Liung)*

Both Chinese partners were in the process of developing their own platforms, although these were still not ready for piloting. This was a central problem for platform selection, and it took them some time to recognise that their own platforms would be unsuitable for the project. Even so, the Chinese partners still did not wish to facilitate the adaptation of their existing ones.

Continuous negotiations yielded very little progress for the eELT project. The UoN team gave up their preference of WebCT, and suggested an open source platform "Moodle" as an alternative option. Moodle has several advantages, some of which are outlined below:

- Because the platform is an open source one, it allows the research team to develop tools which can be imported into the platform as Moodle modules, such as the workspace, the audio player and the video interactive player.
- The administrative interface supports both Chinese and English language, which made further material development more direct.

- The platform function comes with a chat and discussion forum and is easily customized. It is relatively easy to obtain support compared with other open source E-Learning platforms.
- Moodle also has a large community of users, including the University of Bath and the Open University, which is a pioneer in distance learning provision in the public sector in the UK.
- Moodle supports SCORM standards, and is compatible with other platforms which support the SCORM standards.

The final decision to adopt Moodle, in addition to the advantages listed above, was prompted by the potential to reduce maintenance costs in the long run. Despite the fact that the process of reaching such a decision was not straightforward, the actual deployment of the Moodle platform was extremely smooth, and both sides were able to enjoy the benefits as a result.

6.3.3.2 E-Learning Tool Development

There are two types of E-Learning tools applied to the eELT project. One of these is development software to meet the limitation of the open source platform Moodle, and another is a communication tool.

Awareness:

As stated above in Section 6.3.3.1, one of the main limitations of an E-Learning open source platform is that there is little tool support. At the start of the project, therefore, this technical issue - what development software would be applied - was considered by the eELT team. The eELT project involved collaboration between UK and China, between different universities, and between academic and technical staff. The joint teams thus needed to manage communication processes particularly carefully, which presented a special challenge. The core team found that the key issues of communication were:

- *What modes of communication (e.g. face-to-face meetings, email, video-conferencing, telephone, fax, web-based tools) are most effective for different purposes?*

- *How can the use of English and Chinese be managed to maximise communicative effectiveness?*

Selection:

Based on the main purpose of the eELT project, Macromedia Flash was selected as it could be used for any type of interactive elements within the courseware whilst HTML web pages were produced for static content. There are many benefits, including re-usable code and Movieclips; integration with other web and multimedia authoring tools such as Dreamweaver, Fireworks and web and mobile technologies; relatively rapid development of multimedia programs including use of video and sound; small file sizes due to vector graphics; and allowance for clean high quality graphics.

The communication tools required a high level of communication efficiency to meet the team's need for collaboration, identified before the project started. The eELT team decided to use Skype and MSN as the core communication tools. These two tools are free and have wide user groups.

It is vital to note that the majority of the tools applied or developed were fundamentally communication tools. For example, the tool implementation process started by becoming aware of the problems and seeking possible solutions. After this awareness stage, most effort was devoted to developing communication tools such as audio recorders, virtual integrative platforms and workspace. Implementation followed, characterized as a trial process. Any problem that was identified prompted a new innovation effort to search for the solution.

6.4 Services Development Process Patterns

In order to analyze the three case studies and unify the processes, the research adjusted the new service innovation process cycle developed by Johnson et al. (2000) and the E-Learning development process Khan (2004) for the data analysis. Each stage of the E-Learning service development process for each case study is presented in detail in the following sections:

6.4.1 Case Study One —MELEES Project

The MELEES project is the first formal E-Learning project at the UoN. The lack of prior examples at the University not only means that there were no existing E-Learning materials, but also suggests that there was only limited experience both at school and university level available to support the project in the School of Mathematics. Despite the fact that the MELEES project manager had previous experience with E-Learning, to tailor a project that was suitable for the requirements of all of the related schools remained a daunting task. Figure 6.7 highlights the service innovation process underlying the MELEES project, explained in more detail in the following section:

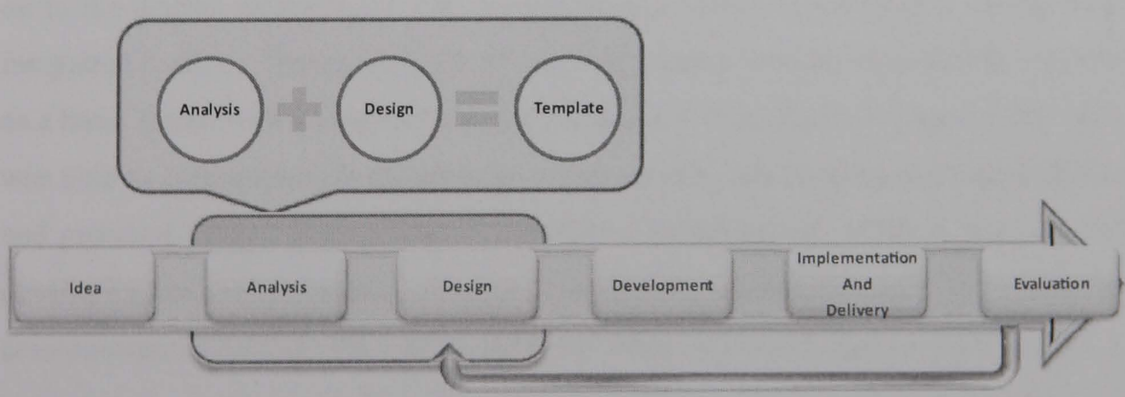

Figure 6.7 MELEES Service Innovation Process

Creation of Ideas: The project leader was undoubtedly the most important source of inspiration for the MELEES project. His aim was simply to convert his ideas about promoting and establishing E-Learning into reality, one of which - the creation of a template - significantly influenced the project. According to the project leader, a template is necessary for further development, due to two reasons: firstly, a template helps to reduce the time required for designing the online material; secondly, it helps to reduce the time for students to become familiar with the functions and key features of E-Learning.

Template for Development: After the MELEES team was formed and the decision related to the platform had been confirmed, course development commenced. From the beginning of the project, the development team focused on the project's structure and communicated their viewpoints with the other members of staff in the School of Mathematics, identifying what could be delivered to the client schools. The development team met on a weekly basis to discuss areas which needed to be incorporated into the teaching materials.

Once the academic writers who were also the teaching staff at the School of Mathematics, had completed the transcriptions or teaching notes, they passed them on to the project technologist who attempted to present these in digital format with integrated features. During the pilot phase, they chose a module to launch the system as a basic framework acting as the initial template. Following this template, the team was able to concentrate on the analysis of the module and create a more appropriate and practical design. It is crucial to note that a template only offers a structure for developing an online module. It is not intended to replace the need for extensive communication between the various staff members involved in the process.

Implementation and Delivery: After the second technologist started to get involved in the project, she followed the procedure mentioned before. Efforts were also made by both the project leader and the E-Learning coordinator to promote E-Learning

among colleagues in the School of Mathematics, and within two years, there were more than twenty teaching staff involved in the MELEES project, sending ideas or teaching notes to the project leader. With this amount of support from the academic staff, the MELEES team was able to build on their success in applying the template and effectively completing the development of E-Learning teaching materials to fulfil the requirements of service teaching.

Evaluation: Soon after the first module was finished and delivered through the platform to the students, it received excellent feedback from the students. More than 80% students logged onto MELEES more than once and 87% used MELEES after the end of formal teaching. Because the feedback has been so positive, the template was confirmed and rolled out to three more modules in the second semester.

The team learnt the importance of evaluation. A proper evaluation process was carried out in order to receive direct feedback from the students. A learner-oriented project will always improved by their feedback. The MELEES team also held regular meetings with the client schools, as direct comments from lecturers are valuable. Despite the fact that the template is still in use, evaluation has become a vital mechanism for the project team, academic staff and E-Learning coordinator to understand and judge the quality of design and delivery.

6.4.2 Case Study Two — the School of Geography E-Learning Project

The E-Learning project at the School of Geography has been developed at a relatively high speed. To date, there are 72 courses online. There is just one course that needs to be redesigned due to poor student feedback. The process of service innovation in the School of Geography is summarized in Figure 6.8, and explained in more detail in the following section:

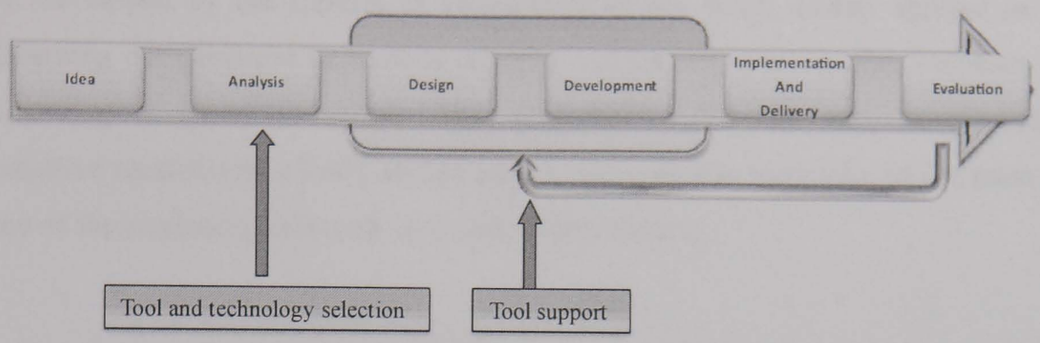

Figure 6.8 Geography E-Learning Service Innovation Process

Creation of Ideas: When the decision to implement the E-Learning project was announced in the School of Geography, the E-Learning coordinator sent the information to every member of the academic staff. In addition to identifying academic staff who might need technical help, the E-Learning coordinator was also able to form a community of academic staff with similar interests in E-Learning. Academic staff who then wanted to create E-Learning courses would discuss their ideas with the E-Learning coordinator.

Analysis: Once the idea has been agreed, the E-Learning coordinator would first work closely with the module lecturers to analyse the courses. As previously mentioned, the courses in the School of Geography differ from those in other schools, and the courses in the area of geography often require specific technology to support them. The evaluation of any special E-Learning needs for a module is therefore a crucial step that cannot be under-estimated - for example, one E-Learning course embedded the Google Map technology.

Design and Development: After analyzing the requirements of an E-Learning course, the E-Learning coordinator and module lecturers would then work together on design and development. The main role played by the module lecturers was to provide the course content, and the E-Learning coordinator created the courses on the platform according to the course requirement. During this stage, some tools

would be selected to support the design and development. For example, the Xerte tool, developed by the Central IS Department at the UoN, widely applied in the E-Learning development in various schools, resulted in some useful templates for E-Learning designers to utilize. This tool was useful not only in generating productive results with a fairly stylish output, but was also very easy to use even for some of the academic staff with very little Xerte training.

Implementation and Evaluation: From time to time, the E-Learning coordinator and academic staff would ask a small number of students to give feedback, before the module was formally delivered to all students. It is vital to note that not all E-Learning courses were delivered to the students after piloting. Once E-Learning courses were officially introduced, the standard evaluation forms were distributed to the students for their feedback. After many courses had been attempted, the students expressed frustration that they needed more time to become used to the different icons used in the different modules. Creating a template was a useful way to address this. It was noted that student feedback always provided guidance regarding ways to improve, so after the evaluation, there would be discussion about developing the next version in response to views expressed.

6.4.3 Case Study Three — the eELT Project

Compared to the two previous case studies, the e-China project is unique in its coverage and scope. Having to collaborate with external organisations, particularly in a different country with a very distinctively different culture, is a challenge in its own right. Due to this reason, it is understandable that much effort was made in communicating and debating ideas during the early stage of the project. The process of service innovation underlying the eELT is summarized in Figure 6.9, and explained in more detail in the following section:

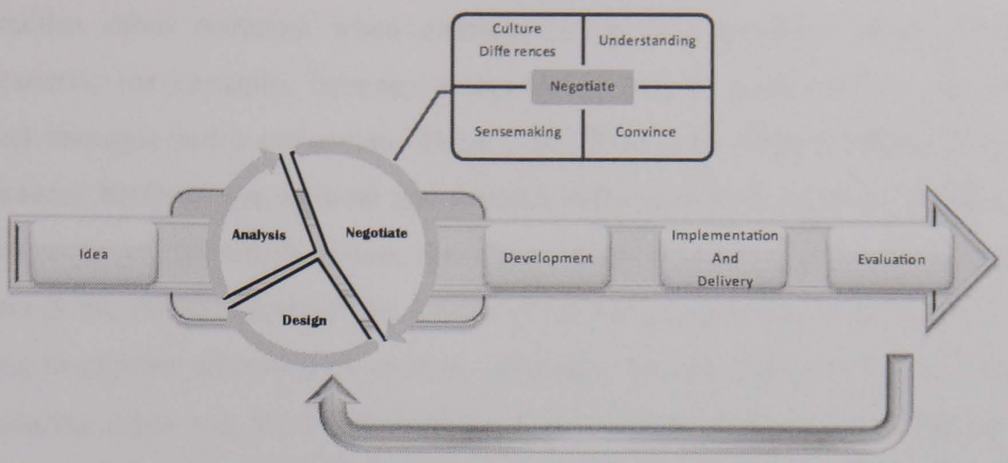

Figure 6.9 eELT Service Innovation Process

Creation of Ideas: The first step of any service development process is always prompted by the generation of ideas. Initially, module ideas originated from both parties, albeit neither had any experience of writing E-Learning materials. In the eELT case study, the majority of the ideas were from academics at the University of Nottingham, and most of these were well received by the Chinese partners. Nevertheless, this did not mean that a full understanding and agreement over project details was achieved. This is evident in the following process, when much time was spent in negotiation, in making sense of design details and in overcoming cultural barriers.

Negotiation in the Analysis and Design: Investigating the differences between the UoN and Chinese teams is a fascinating aspect of the project. Such differences were reflected in their working practice, even within the same profession. For example, the technicians who worked for the UoN team preferred to communicate their ideas and design with the other stakeholders on a very regular basis. In contrast, the Chinese technicians preferred to show their work after it was completed. However, despite the differences in working practice, as indicated by several interviewees, communication amongst the members within the same profession seemed to be more straightforward. For example, academic writers were able effectively to communicate their ideas and thoughts with one another, despite the fact that they work for different universities and come from different countries. However, major

difficulties often occurred when communication was required across different professions; for example, between a technician and an academic, or between a project manager and a technician. These difficulties were further amplified by the differences between the national and institutional cultures. In order to enhance the performance of the collaboration, the eELT team decided to place the academic writers at the centre, supported by a team of learning technologists led by UoN and aiming to provide solutions for creating materials. During this process, the time for exchanging ideas was successfully reduced as a result of better visualization and sharing. The learning materials were also created through this "rapid prototyping approach".

As shown in Figure 6.9 above, the negotiation process involved an understanding of the cultural and sub-cultural differences that resulted from nationality, institution and profession. Once this process had been established, project members needed to achieve a consensus in defining how to progress with the project. It is vital to note that during the early stages, as pointed out by the interviewees, building a trusting relationship for collaboration was a challenge. The negotiation process served as a vital mechanism for overcoming barriers and fostering trust. This process highlights that the essential element of an analysis and design phase can be characterized as a continuous negotiation amongst members of the project teams.

Development: The development phase followed the analysis and design phase, when most of the workload focussed on technological development. All technologists involved in the eELT project were experiencing an exceptionally high workload and some elements of the project were facing delays - for example, some parts of the E-Learning materials that contained fully interactive functions took much longer to develop than originally anticipated.

In order to increase progress, they decided to outsource some of the development work to four Chinese companies and two British multimedia development

companies. Initially, the rationale behind the outsourcing decision was to reduce the time required to develop the E-Learning materials. However, during the later stage, it was apparent that outsourcing might work well for certain aspects of the project, but did not provide a panacea for the overall problems of the project. In particular, some problems occurred due to a misunderstanding of the project specifications. Members of the project teams therefore needed to act as a bridge to enable communication and inevitably, there were further delays in the progress of the project.

Implementation, Delivery and Evaluation: Compared with earlier phases, the implementation and delivery stage was relatively smooth. They also introduced an extensive evaluation during the process, especially after the Beta version of e-materials was released by the learning technologists. These evaluations could be the catalyst for pushing boundaries and may achieve a positive result. One of the most remarkable achievements was the feedback from the Chinese ELT teachers who rated the E-Learning materials as highly satisfactory. It is important to note that, compared with the original plan, the results of the project were very different. Nevertheless, much appropriation and innovation took place, serving as a vital source for refining the project.

6.5 Interactions among Three Innovation Processes

The interactions among three innovation processes are more complex than between two innovation processes because interactions may each time lead change on different innovation processes. The start and end statuses present delicate equilibrium postures. Any pressure or enquiry may influence the whole balance. In order to summarise interactions among organizational, technological and services innovation, this section will present the case study of an IS tool project such as Xerte. However, due to the complexity of change influence, this case study can only demonstrate the interaction from one delicate equilibrium posture to another (Figure 6.10). Section 7.2.4 will discuss in detail the interaction between two and three innovation processes.

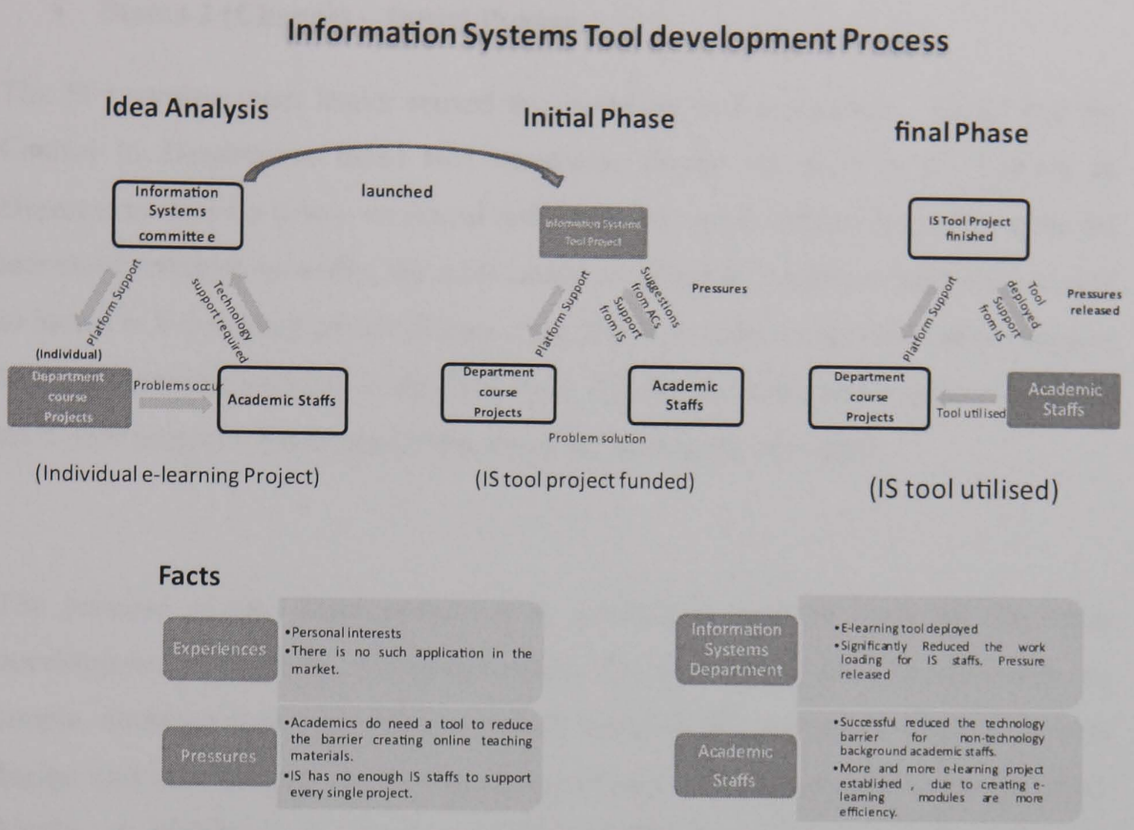

Figure 6.10 IS Tool Development Process

- **Status 1 (Balanced) – Idea Analysis**

Before the project started, the E-Learning innovation process appeared balanced. There was no significant organizational change for which people were assigned and strategies implemented; the technological innovation (platform selection) was quite stable, and Central IS Department undertook their responsibilities for technological and platform support. A few E-Learning projects were launched and some academic staff in different schools became involved. The MEELES project demonstrated that - due to lack of technology - PDF was the preferred format for E-Learning courses. The present research also found that there was a requirement for more technological support from academic staff leading the E-Learning projects not only in the School of Mathematics, but also in other schools. This put additional pressure on Central IS Department, as their capacity remained the same while an increasing number of E-Learning projects were launched.

- **Status 2 (Change) – Initial Pphase**

The IS Learning team leader sensed this problem, and meanwhile found that the Central IS Department faced two situations: firstly, the staff in the Central IS Department faced a heavy workload and could not spare sufficient time to meet the increased demand; secondly, the main concerns raised by academic staff were related to issues in E-Learning course design. As a result, in order to provide quality support to the E-Learning projects at services level, the eLeK community formally launched an IS tool project - Xerte appointing a new technological developer.

The purpose of the Xerte project is to provide a suite of tools for the rapid development of interactive learning content. The principle of the tool is to carry out simple, common tasks, providing a stylish template for interactive learning content design and accelerating the development process. The advantages were four fold. Firstly, it addressed a common concern raised by academic staff about the technological difficulty of using a platform for E-Learning course design, Xerte is a visual authoring development tool which allows E-Learning content to be easily created without technological barriers. Secondly, Xerte, with advanced interface and navigation systems for design, was suitable for any level of interactive learning objective designer. Thirdly, Xerte was a cost-efficient open-source software. Finally, Xerte significantly reduced the number of requests from academics for support.

- **Status 3 (Balanced) – Final Phase**

As stated previously, before Xerte tool was developed the academic staff encountered many difficulties in attempting to overcome technological barriers in designing E-Learning courses; by comparison, after Xerte was introduced, they could devote all their enthusiasm to developing content; the Central IS Department consistently provided the platform support and technological support to more E-Learning projects. The E-Learning coordinator of the School of Geography reported that E-Learning course development was significantly different before and after Xerte. Before Xerte, she needed to devote more effort to providing

technological support to academic staff. After Xerte, more academic staff were interested in joining E-Learning projects because course design was no longer so difficult, and therefore required less effort or time than previously. After successfully utilizing Xerte, the organization, technology and service aspects once again achieved a delicate equilibrium. Nevertheless, more and more E-Learning modules were created by Xerte.

This section only presented three statuses, but in fact there was interaction during the development of the Xerte project. Before it was formally announced, each trial version was changed according to influence from organization and service. Currently, Xerte is version 2.6.

6.6 Conclusions

It is clear from the above discussion that the complexity underlying the process of E-Learning innovation cannot be over-stated. Starting from the aspect of organisational innovation, this chapter has highlighted the process of each case study. By comparing the three case studies, one of the most important points that emerged is that Rogers' process model (1995) has provided a useful base for examining the process of E-Learning innovation. However, it is also evident that his model has fallen short of capturing the full complexity, particularly the MELEES case study. The second aspect examined in this chapter is technological innovation. From the analysis, the results have indicated that technological details and specifications are vital parts of the design and development. Nevertheless, the need to achieve a consensus and understanding to apply the technology is equally vital. As indicated in all three case studies, incorporating technology into E-Learning innovation is a continuous process. Its continuity is fuelled by the development of a better understanding of the technology, as well as the increasing level of maturity in E-Learning. From the service innovation aspect, this chapter has outlined and elaborated how a new service can be created through the incorporation of technology. All three case studies suggest a mushroom effect that shows how a general idea of enhancing E-Learning can lead to a transformation in organisation. Details about

each aspect have indicated the need to examine and understand their role in and impact on the overall E-Learning development. More importantly, these details reveal that these three aspects, despite their uniqueness, need to be conceptualised in conjunction. To do so, a case study of triple interaction was highlighted in this chapter.

In the following chapter, the findings will be further synthesized in a list of key deductions made by the researcher with a comparison of literature and a conceptual framework that integrates the three aspects proposed.

CHAPTER 7 COMPARATIVE ANALYSIS AND DISCUSSIONS

7.1 Introduction

The previous chapter on data analysis focussed mainly on the three identified aspects of E-Learning innovation processes in each case study. This chapter aims to compare and discuss the findings of the data analysis based on the result displayed in chapter six. The comparative analysis is structured according to the research objectives, leading to a discussion of how the research objectives have been met. As introduced in the chapters on "Literature Review" and "Data Analysis", there are three main aspects of E-Learning innovation: organizational, technological, service and innovation. The key link which integrates these three aspects is how they interact with one another. Firstly, there are four parts presented in the following: organizational, technological, service innovation and interaction among these three aspects of innovation. Secondly, a framework is developed according to the findings of the above four parts. The resulting framework is an addition to the present research agenda and the researcher has strived to draw an interpretation from the literature review and comparative analysis.

7.2 Cross-Case Analysis Comparison of E-Learning Innovation Process among Three Selected Case Studies

This part provides a comparative analysis within the results obtained from three case studies. Due to the complexity of E-Learning innovation processes, the comparative analysis has been synthesized into a summary of key deductions made by the researcher. A discussion on these deductions encourages an understanding of the dynamics of E-Learning innovation.

7.2.1 Organizational Innovation

To date, most studies seem to focus on the technological and service aspects; few researchers have discussed the organizational aspect of E-Learning innovation (Mcpherson and Nunes, 2006). This research found that the organizational aspect is the most complex part of E-Learning innovation compared to technological and service innovation, and indicates three main ways of presenting the E-Learning organizational innovation process, introduced in detail below. These are: triggers for E-Learning innovation; diversity of core team setup for E-Learning innovation; and three tails of organizational innovation process.

7.2.1.1 Triggers for E-Learning Innovation

For both research and practice, most E-Learning innovation within organizations begins with the question: "Why adopt E-Learning?" Research on E-Learning adoption indicates that although the numbers of courses that incorporate ICT have increased dramatically in the last three to five years, E-Learning as such has not reached its potential (Elgort, 2005). The first stage of Roger's model also starts with "ideas" of adopting innovation. This research found that the triggers for E-Learning innovation vary according to different contexts. By analyzing the E-Learning innovation at school and university levels, three types of triggers were found for E-Learning innovation:

1) E-Learning Bandwagon Pressure to University as a Trigger for E-Learning Innovation

Organizational change is typically triggered by a relevant environmental shift that, once sensed by the organization, leads to an intentionally-generated response (Porras and Silvers, 1991). The reason for the E-Learning adoption in the University of Nottingham is not only because of the demands from its individual staff, but also from pressure from outside the University.

As Clegg et al. (2003) stated, the specific external drivers in relation to using new media are varied. Leaders of elite universities see the potential to capitalise on their

international reputation. The University of Nottingham, as in other universities, is also inevitably facing the vigorous challenges of the digital world. During the E-Learning bandwagon of the dot-com era, E-Learning is viewed by many as a "killer app" of the Internet (Oblinger and Kidwell, 2000). Universities, as the investors, seek to put their money into E-Learning start-ups because they believe that there will be huge payoffs. After 2000, almost 90% per cent of all universities in the US, such as NYU Online, the University of Illinois On-line, and most of the universities in the UK - for example, the University of Warwick, Imperial College and the majority of universities in the Russell Group[56], have an individual E-Learning plan (Svetcov, 2000) in the face of pressures from serious competition. The trend was for universities to be afraid of being left behind by their competitors; they believed that E-Learning would bring them additional strength and benefits.

Porras and Silvers (1991) also argued that organizational development is triggered not only by current environmental mismatches but also by an organization's desire to fit into future environmental niches. There have been more recent attempts in the field of Higher Education to restructure through the adoption of new forms of governance and managerialism (Salter and Tapper, 2000) with a top down approach (Clegg et al., 2003).

Based on the experience gained from the early implementation of E-Learning, some lessons became apparent to the decision makers at university level. Firstly, there was a need to standardise the technology used to power the E-Learning. This was evident in the decision to select WebCT as the official E-Learning platform for the University. Secondly, there was a need to expand the scope of E-Learning activities as a means of achieving economies of scale. For instance, utilising E-Learning to facilitate service teaching and introducing E-Learning to different campuses are just two of the many examples which showcased the University's efforts to maximise the impact and potential of E-Learning. Thirdly, there was a need to continue reforming

[56] The Russell Group: is an association of 20 major research-intensive universities of the United Kingdom which accounted for 66% of Universities' research grant and contract income in 2006/2007 (Source: http://www.russellgroup.ac.uk/)

the organisational structure in order to maximise the usage of the existing available resources; for instance, having the Central IS Department to coordinate the technology has helped the university to cut down the cost of appointing one or more technicians for each school. Moreover, with the creation of eLeK and the Learning and Teaching Committee, the University can be more selective in funding E-Learning projects which are able to yield more potential for other schools.

2) The Interest of Individual Staff Members as a Trigger for E-Learning Innovation

Teaching innovation initiated by individual staff members was found to be one of the most crucial triggers for E-Learning innovation. As observed in the case studies, some individuals applied new technology to enhance their teaching before the E-Learning project had been formally established in the university. Initially, even though there was no centralised E-Learning innovation strategy or committee available at university level, the University and most Schools have adopted an attitude that permitted all staff to apply new concepts to innovate their teaching. When an increasing number of staff became involved, some pressure started to emerge at school level - for instance, in the case study of MEELES. Fishbein and Ajzen's (1975) theory of reasoned action posits that an individual's behaviour is a function of both their attitude toward a specific behaviour and the social influences and norms surrounding that behaviour (Jebeile and Reeve, 2003).

Over the last two decades considerable research has been conducted into the adoption by individuals of new technology in a variety of settings (Jebeile and Reeve, 2003). From the 1960s, language teachers were considering alternative ways to assist learning (Barson and Debski, 1996), from behaviouristic and communicative learning to integrated learning, which along the timeline indicates a trend for computer-assisted language learning. From its early days, drill-and-practice for integrated learning was applied to computers in order to increase the integration between learners and instructors.

Traditionally, lecturers in Higher Education have control over the individual curricula and teaching methodologies, so they can choose innovative ways using any

media (Clegg et al., 2003). From the 1990s, personal computers have gradually become an indispensable aid for teachers and students within a variety of disciplines. Teachers started to utilize the computer as a tool to enhance their teaching performance. In traditional classroom teaching, students can be isolated and lack motivation. Through developing computer technology, some teachers who were technologically-advanced users initiated activities using computers as supplements to the traditional teaching methods in multi-disciplines e.g. Education, Geography and Mathematics.

This research found that within the university there was no formal E-Learning strategy to popularize E-Learning before 2000, and only some staff members developed courses with multi-media solutions. However, the pressure of developing E-Learning within the university is increasing due to the Internet and the development of related technology, and also to the increased demands on teaching. This trend matches the viewpoint of organizational development which states that organizational change is usually triggered by the failure of people to create continuously adaptive organizations (Weick and Quinn, 1999). Organizational development occurs in response to modest mismatches with the environment and produces relatively moderate adjustments in those segments of the organization not congruent with the environment (Porras and Silvers, 1991). Some research studies stated that the E-Learning strategy attempted to employ both top-down and bottom-up approaches to implementation (Sharpe et al., 2006). As stated in the previous section, the present research found that top management of the University is one trigger of E-Learning innovation; however, this research has also found that individuals adopt a positive role which also triggers to the E-Learning innovation.

3) Pressure from Schools as a Trigger for E-Learning Innovation

As this research stated above, universities attempted to employ both a top-down strategy and bottom-up implementation (Sharpe et al., 2006); attention therefore needs to be drawn to the importance of schools which are embedded between top management and individual staff.

Some staff at school level also experienced the advantages of E-Learning and championed the adoption of the new technology to innovate teaching within their school. This pressurised the schools examined in this study to change in order to be competitive and also to reduce costs. However, before they could adopt E-Learning the schools needed more time to understand the advantages it could bring. More importantly, schools would require substantial resources from the university to fund the innovation. The demand for resources at the school level therefore became a vital force for the university to approach E-Learning strategically from the aspects of pedagogical innovation and of resource distribution and utilisation.

The pressure from schools to innovate their pedagogy then became a driving force to trigger some changes at university level. For example, the establishment of eLeK to manage and coordinate E-Learning initiatives was a necessary step in order to accommodate the continuous development of E-Learning activities. Given that the amount of investment required for E-Learning is very substantial, it was vital for the university to utilize and mobilize the available resources effectively, covering finance, technology and knowledge.

Few research studies mentioned the importance and impact of schools during the organizational change. Sharpe et al (2006) observed that the role of the school in E-Learning innovation is to follow university strategy. The University produced and distributed a template for a school strategy with a covering memo that clearly explained why they had been asked to do this and what the benefits would be (Sharpe et al., 2006). Fitz (1994) also explained that schools are needed to promote E-Learning and to encourage bottom-up activity. This research found that E-Learning innovation is not a one-way approach in response to top-down strategy, but an interactive one with the school adopting the role of both trigger and follower.

Gamoran et al.(1997) argued that the strategy and activities of the schools were principally a response to the external environment. The present research found the

external environment - including competition and collaboration with other universities - is an important motivation for schools to engage in E-Learning. For example, the experience of collaborating with similar projects at other universities enhanced the involvement in E-Learning by the School of Mathematics; also the eLeK project was generated partly due to the competing pressure from Schools of Education in other universities conducting E-Learning research. This is also observed by Woods et al. (1998): "*competing pressures and values have a significant bearing on schools' strategies and changes*" *(p181).*

It is clear from the above discussion that innovation at individual and school level represented two sources of input which were vital for triggering changes at university level. Moreover, to accommodate, coordinate and maximise the E-Learning efforts the university could not simply stand still. Rather, transformational innovation occurred as the university gained from the various E-Learning innovation activities occurring within the institution.

4) Integration of the Three Triggers of E-Learning Innovation

Most research focuses on the first and second triggers (individual and university level) as found in this research. For example, Toffler (1985) suggests that significant organisational change only occurs when three conditions are met: "*First, there must be enormous external pressures. Second, there must be people inside who are strongly dissatisfied with the existing order. And third, there must be a coherent alternative embodied in a plan, a model, or a vision*" *(p. 14).* However, the present research also found that in order to sustain E-Learning developing throughout the university, it is essential to consider the trigger from school level. Senge (1990) argued very strongly that learning organisations require all employees to be involved in change processes and it should not be left to senior managers to drive top-down change. Jones and O'Shea (2004) pointed out that the management of universities represents a very formidable challenge for vice-chancellors, their management teams and governors - even when judged against many other public or private sector organisations. It reveals how universities undertake the transition of combining

top-down deliberate strategy with bottom-up emergent strategy (Jones and O'shea, 2004). However there is little research on the link between top-down and bottom-up strategies. This present research argues an interactive approach involving the three levels - individual, school and university.

Furthermore, few research studies focus on organizational innovation at these three levels, especially in E-Learning. Examining the theory of organizational learning, Crossan et al (1999) firstly addressed an "organizational learning framework" with three-level interaction: individual, group and organization. However, according to this theory, the individual is the trigger of organizational learning only; this present research found that group and organization are also triggers. In the framework presented by Crossan et al (1999), the interrelation within three levels is described as a one-way approach; in comparison, this research found a two-way interactive trigger approach and therefore proposes a revised E-Learning trigger framework (Figure 7.1) which indicates interactive role-playing within the three levels, demonstrated below:

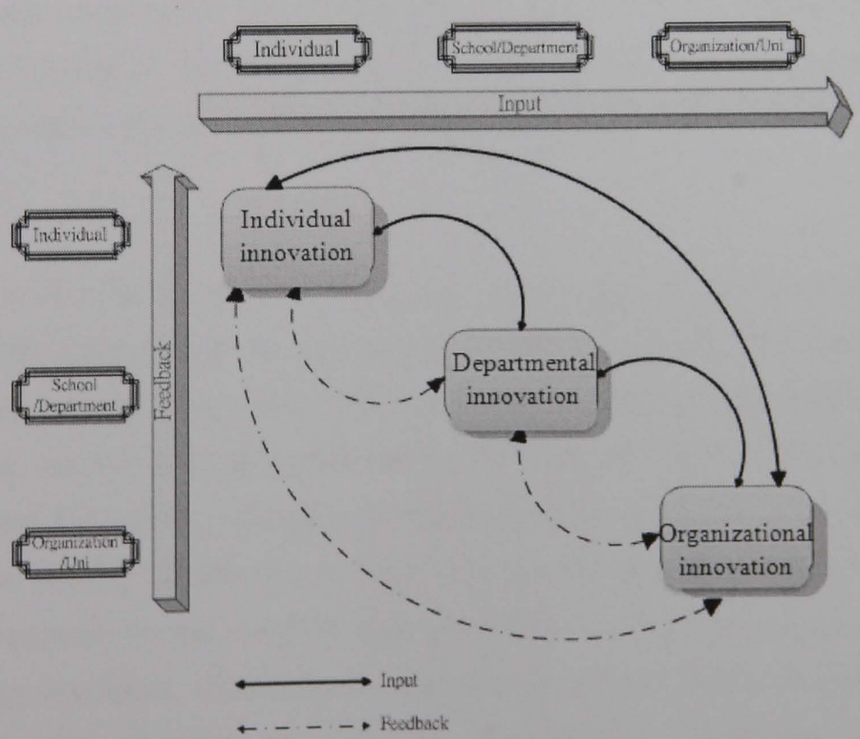

Figure 7.1 Triple Trigger of Organizational Innovation

Organizational innovation that took place at university level was found to cascade down to school and individual levels. For example, in order to provide quality support to the growing number of E-Learning projects in the various schools, Xerte was launched by the Central IS Department. The academics can therefore devote more time to developing content, while the Central IS Department can concentrate on providing platform support and technological advice to the newly- formed E-Learning projects.

Organizational innovation taking place at university level also serves as a feedback mechanism for impacting on E-Learning innovation decisions and activities at school and individual levels. For instance, eLeK was established as a central body for making E-Learning-related decisions; eLeK aims not only to approve or disapprove the E-Learning funding proposals submitted by each school, but also to reinforce the strategic objectives of E-Learning formed by the University. The Central IS Department is a vital feedback mechanism influencing departmental E-Learning innovation. Despite the fact that many technological standards and infrastructures were already established, the expertise from the Central IS Department is still extremely valuable to various schools. This is particularly evident in the introduction of Xerte by the Central IS Department, illustrated earlier.

Despite the fact that the level of maturity in departmental innovation varies among schools, the common aim to enhance the students' learning experience through technology remains the same. The growing maturity in understanding how E-Learning can facilitate individual innovation certainly helps the three Schools to reinforce the E-Learning strategy proposed by the University, and to be flexible and creative in arriving at solutions to achieve their goal. Moreover, each of the three Schools examined by this study has demonstrated a very coherent viewpoint towards E-Learning innovation, which impacts significantly on individual academic staff. For example, in the case study of the School of Geography, the ultimate goal of its E-Learning is to make all of its modules available online. By so doing, the students will be provided with a choice between the conventional learning and E-Learning

methods. The school therefore also plays a role in promoting continuously innovative teaching among its academic staff.

The E-Learning project in the School of Geography is a typical example, launched by these three triggers together. There are several reasons why the E-Learning project was initiated in the School of Geography. Firstly, the culture already existed within the School of Geography to use technology to supplement learning, since, although there was no E-Learning-related initiative yet implemented by the School, there were many technology-based supplementary materials (e.g. online mini games, videos) produced by members of staff to enhance the students' learning experience. It is unsurprising that the decision to introduce E-Learning into the School very quickly became a shared view among most of the staff. Secondly, from the time when the E-Learning strategy group was formed in 2000, until 2004, E-Learning development in the school and at university level became well established. Due to the fact that many schools have already implemented E-Learning courses online, considerable numbers of students, including many from the School of Geography, have experienced E-Learning through participating in courses offered by other departments. Thirdly, E-Learning was promoted by the university, particularly by the top management. Triggered by these three forces, the decision formally to launch the E-Learning project in the School of Geography was announced by the School head in 2004.

7.2.1.2 Diversity of Core Team Setup for E-Learning Project

1) Academic Driven

From the discussion of triggers for E-Learning innovation, this research found that academics were first to be involved in setting up the E-Learning strategy. For example, "individual as a trigger of E-Learning innovation" is due to the interests and needs of the academic staff. In the MELEES project, the project leader gained significant experience in computer-assisted learning from the HELM project and from applying new technology to encourage his students to learn mathematics. These elements led to the realisation that E-Learning can provide a useful approach to the

teaching of mathematics. Such an understanding served as the source of inspiration for the project. In particular, when the university's E-Learning strategy group called for E-Learning bids, the project leader reacted quickly and completed an integrated proposal. In addition, he also received support from a senior staff member who was the leader of the Teaching and Learning Community of his School. Karelis (1999) also had the same opinion that pedagogical concerns are rightfully maintain centre focus for academics.

As key pedagogic themes are important in E-Learning design (Moon et al., 2005; Hutchins and Hutchison, 2008), this research found that the entire MEELES project is led mainly by academic staff (the project leader and the leader of the Teaching and Learning Community of his School), and that the main role of the technician is to design E-Learning courses according to pedagogic needs.

2) Technician Driven

There is no doubt of the importance of technology in E-Learning (Jones and O'shea, 2004). However, as stated in the previous section, the majority of research studies argued that pedagogic needs are the central concern of E-Learning (e.g. Moon et al, 2005). For example, in Khan's (2004) E-Learning development process, the first step is to analyze E-Learning products. A comparison of the difference in E-Learning projects between the Schools of Mathematics and Geography, Section 3.2.7 (case selection) proposed that these two projects were at different university E-Learning development stages: the E-Learning of the School of Mathematics was at an early stage, while the E-Learning of the School of Geography was at a mature stage. Compared with the School of Mathematics, the School of Geography has more experience of technology.

As stated in the previous section, the E-Learning project in the School of Mathematics is academic driven, while the E-Learning project in the School of Geography can be claimed to be technician driven. After the decision to fund the E-Learning project proposed by the School of Geography was approved by the university, the project coordinator was selected to lead the E-Learning project. The main role of the E-Learning coordinator is to disseminate E-Learning project information to all academic staff; assist with the design of E-Learning materials; and provide the knowledge to apply the technology.

3) Collaboration Driven

The present research identified the third type of diversity of core team setup for the E-Learning project as "collaboration driven". As mentioned in the case studies, the overall aim of the e-China programme was established as a strategic collaboration between UK and China in the Higher Education sector. The Chinese Ministry of Education would like to promote new pedagogical approaches to develop the sociable competencies of listening and speaking. Additionally, through this collaboration, the institutions of Higher Education in the UK can gain multi-cultural E-Learning innovation experience. Marshall and Mitchell (2002) also suggested that "*Institutional leaders are also recognizing the need for a clear vision and integrated strategy for E-Learning that also addresses opportunities for collaboration with other institutions*" (Reid, 1999, p.22). Building partnerships with other institutions is crucial (Bates, 2001), and there is potential for inter-institutional and trans-national partnerships (Hodgson, 2002). Multiple universities can share resources for collaboration (Mason and Lefrere, 2003); they cannot afford to ignore the idea that foreign E-Learning programmes may represent a threat to the culture and language of national educational institutions (Bates, 2001).

7.2.1.3 Three Tails of Organizational Innovation Process

A comparison of three case studies reveals that, although most steps of organizational innovation processes are similar in case studies fitting the first four stages of Rogers' model, there are three types of "last stage" (shown in Table 7.1), named "three tails"

(Figure 7.2), as described in this research. These three tails can indicate three different organizational innovation processes with different value impact (Figure 7.3). More importantly, these three tails should be integrated to enable comprehensive understanding.

Project/Stage	Agenda Setting	Matching	Redefining/ Restructuring	Clarifying	Last Stage
eELT	√	√	√	√	End
Geography	√	√	√	√	Routining
MELEES	√	√	√	√	Spin Out

Table 7.1 Comparison of Organizational Innovation Process within Three Case Studies

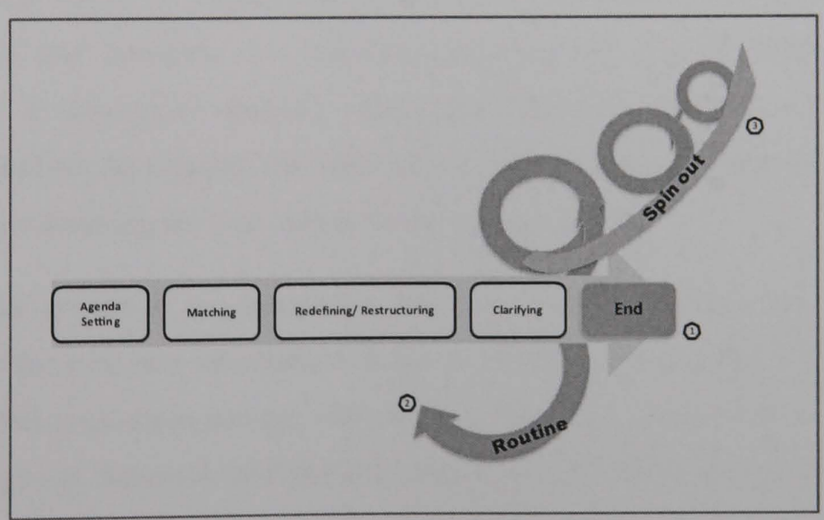

Figure 7.2 Three Tail of Organizational Innovation Process

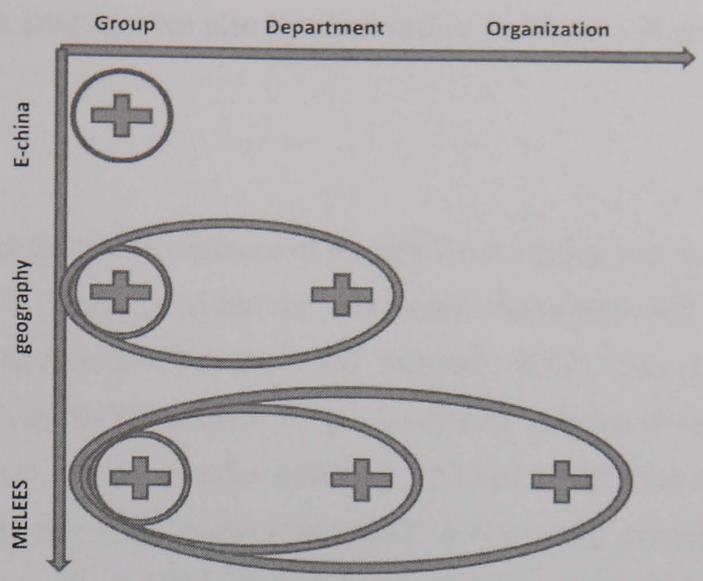

Figure 7.3 The Coverage of Value Creation within Three Case Studies

1) Tail One — "End" Stage (eELT E-Learning Project)

This research found that the E-Learning innovation process of the eELT E-Learning project ceased when the project finished (shown in Figure 7.2, "type 1"). This type is similar to the theory of "organizational life cycle". Models of life cycle stages are not new in the literature on organizations (Jawahar and Mclaughlin, 2001). According to life-cycle theorists, innovation tends to increase and facilitate organizational success during the early stages of a firm, then slowly decreases and hinders success during the later stages (Koberg et al., 1996).

The e-China project is an example of how the innovation decreased and finally ended with the project's termination. From the value creation point of view, in the organizational innovation process with tail one, the value mostly spread only within the project group. Research by Felin and Hesterly (2007) indicated that the value was created by individuals at the beginning; similarly Nonaka's studies (1994) also stated that "*an organization cannot create knowledge without individuals. The organization supports creative individuals or provides a context for such individuals to create knowledge*" *(p17).* In order to gain better understanding and communication, the value or knowledge/information was exchanged within group members, and with other University group members (shown in Figure 7.3). It also proved that interaction between individuals has the effect of sharing and developing knowledge,

not only through language but also by observation, imitation and practice (Nonaka, 1994).

There is no doubt that the importance of the eELT E-Learning project impacts on the development of E-Learning within the University, especially with the purpose of "international collaboration"(Marshall and Mitchell, 2002). The reasons why the value mainly exists within groups is due to several reasons. Firstly, knowledge complexity mainly affects transfer difficulty (Hansen, 1999; Teece et al., 1997). Unlike the other two case studies, the eELT project is a pioneer cross-culture E-Learning project which differs from Rogers' research setting. These two research teams are based on backgrounds from totally different cultures. The knowledge therefore created by the eELT project is more complex than other E-Learning projects in the University of Nottingham, thus creating barriers for knowledge capture by other staff or groups. Secondly, the indirectly-related knowledge makes it difficult to extend knowledge to other groups (Hansen, 1999). Because the E-Learning platform and course concept of eELT are different from other E-Learning projects, this makes it difficult to transfer knowledge to other groups.

2) Tail Two— "Routine" Stage (Geography E-Learning Project)

There are two essential stages in Rogers' framework - the initiation and implementation phases. The E-Learning project in the School of Geography seems to fit best into Rogers' framework for two reasons. First, the School of Geography is a single organization which matches Rogers' research setting. Second, the School was more recently established within the University of Nottingham's E-Learning development timetable, which means they could benefit from of relevant experience, thus avoiding unnecessary difficulties.

The results from this research can be fitted into the theory of "organizational routines" (shown in Figure 7.2, type 2). Organizational routines are considered the basic components of organizational behaviour (Becker et al., 2005) and there must be a

certain amount of stability to the conditions influencing behaviour within existing recurrent activities and interaction (Becker and Zirpoli, 2008). At the beginning of the E-Learning project of the School of Geography, the E-Learning concept was actively accepted and implied by the staff with high personal motivation; after a period, more and more staff became aware of the benefit of E-Learning from the pioneer staff. The routines that appeared since the introduction of E-Learning were admired by most staff in the School. E-Learning became a common channel for teaching, and the same stable and familiar behaviour routines continue (Becker et al., 2005).

From the perspective of value creation, the value/ knowledge is transferred from a group level to a school level. One reason why the knowledge can transfer successfully is due to the related information (Hansen, 1999) as mentioned in the last section, which suggests that the experience or technology of E-Learning in teaching Geography is more or less similar. Another reason can be explained as "creation of new advantage" where the harvest created by the E-Learning core team members provides greater information and knowledge that can be used by other school members to combine and exchange this information in a way that produces new organizational knowledge (Lepak et al., 2007). The third reason may be because of "leadership" which influences value creation and capture (Nonaka, 1994). As this research has stated, the E-Learning in the School of Geography is fully supported both by the Head of School and by the E-Learning coordinator who is highly experienced, very supportive in enhancing staff motivation, and who provides the discretion needed to take appropriate actions to achieve needs/goals.

3) Tail Three— "Spin Out" Stage (MELEES E-Learning Project)

We also can find initiation and implementation phases in the MELEES case study. However, after the implementation phase, the MELEES did not come to an end - as the result of this highly successful project. MELEES rolled out to the overseas campus and inspired the innovations which form an extension to Rogers' framework. This research named this as tail 3 – "spin out" (shown in Figure 7.2, type 3).

Many researchers mentioned that knowledge transfer is firmly connected to the concept of learning organization (Gilbert and Cordey-Hayes, 1996; Huber, 1991). Szulanski (1996) pointed out that the success of many organizations can be based on their ability to transfer the knowledge embodied in organizational routines from one organization unit to another. Since 2000, the University of Nottingham has exerted great efforts to popularize E-Learning, not only over campuses in the UK but also on other overseas campuses (Malaysia and China). The MELLES E-Learning project is one case study which presents the University's ability and effort to encourage value transfer. Although the value transfer takes place within the University, the most suitably supportive theory is "inter-organizational learning/knowledge transfer"(Albino et al., 1999).

In addition to the importance of "related knowledge" and "leadership" (Nonaka, 1994; Hansen, 1999) - discussed in the previous section - another important feature of inter-organizational value transfer is leader status, from which others can learn about what brings success and failure (Holmqvist, 2003). This research also found that organizational rules are also very important (Zhou, 1993), especially for the efforts of inner-organizational marketing which spread information to the imitative party. Another critical factor for successful value transfer is the support or collaboration by the original party (Holmqvist, 2003).

This section has presented three tails which indicate three different organizational innovation processes with different value impact. More importantly, these three tails are not isolated but integrated. These three tails also can be viewed as three stages for organizational innovation process. Taking the MELEES project, for example - before it went to tail 3 it also passed through tail 1 and tail 2, explained in more detail in Section 6.2.1.

7.2.2 Technological Innovation

There is no doubt that E-Learning development involves a high level of technological innovation (Tse et al., 2007; Gyambrah, 2007; Morrison, 2003; Vatnal et al., 2004; Alonso et al., 2005; Selim, 2007). The technological innovation process in E-Learning can be the backbone for development. In other words, E-Learning cannot exist without technology. The majority of literature on E-Learning considered the technological issue as a whole (Allen, 2000), or the issue of tool application development separately (Ruiz et al., 2006; Upton, 2006; Lin et al., 2006). However, the present research found that platform and tool application considerations from a micro view and IS development from a macro view are of equal importance.

7.2.2.1 Platform Considerations

It has to be noted that the researches on E-Learning platform are more likely to focus on new technology which could enhance the platform functions (Taudes et al., 2000), open source (West, 2003) or E-Learning platform design (Alonso et al., 2005). Few studies paid attention to the E-Learning platform selection (Ardito et al., 2006). Data shows a great emergence of E-Learning modules after the official E-Learning platform was announced and deployed, also indicating that E-Learning platform selection is a further crucial issue in the early stage of E-Learning development in a Higher Education institution. The problem is particularly conspicuous if the institutions decided to adopt the platforms from the market rather than develop these themselves. This research found that platform selection can be divided into two types: a self-develop E-Learning platform, and the adoption of the E-Learning platform from the market with different considerations.

1) Self-Develop E-Learning Platform

This research found that the main considerations of selecting a self-develop E-Learning platform are about environmental and resource control.

The environmental considerations are based on the E-Learning platform market and the environment of the Internet infrastructure. From the pilot research site, the National Chung Cheng University initiated their E-Learning development early in 1997, when there was no established E-Learning platform in the educational market - even broadband capacity was still limited. However, the advanced foundation Internet infrastructure in Taiwan did provide the environment to enable the possibility for early incubation of E-Learning solutions. It also possessed the high quality yet cheap human resources for computer programming, which led to the decision to develop the E-Learning platform themselves. Scott (2004) also argued that the IT environment and numbers of technical staff influenced the consideration of the self-develop platform.

The main benefit of the self-develop E-Learning platform is flexibility. The case study of National Chung Cheng University observes that a considerable amount of effort was put into developing the tailor-made E-Learning platform. Holding the source code means they hold the initiative and can be flexible. However, developing a platform did consume the limited resources. Self-made systems are cheaper to build and upgrade than a vendor solution. Savings in total cost of ownership are less clear cut, but self-made systems often require more maintenance (Scott, 2004). Moreover, from a macro-view point, if every institution has its own platform, this causes unnecessary waste, and it is difficult to reach an economic scale; further, there are limits to developing strength for the future.

2) Adoption of the E-Learning Platform from the Market

Another E-Learning platform solution is to adopt from the market. The detailed evaluation and selection of platform approaches may vary, but the rationale to discover a proper E-Learning platform is the same. Two kinds of E-Learning platforms can be chosen - licensed proprietary platforms and free open-source platforms.

- **Licensed Proprietary Platform Selection**

Licensed proprietary E-Learning platforms are packages that facilitate the administration of a course, its management, and the communication and discussions within it (Halawi et al., 2009). It means that systems manufacturers control all hardware and software layers of the standard architecture (West, 2003). Viorres et al. (2007) pointed out that many universities prefer proprietary E-Learning platforms due to the availability of accessibility applications in combination with assistive technology compatibility. These kinds of platforms provide a number of learning tools for the purpose of assignments, discussions, course material, e-mails, exams, and tests such as discussion boards, chat rooms (Ngai et al., 2007).

One main reason for the University of Nottingham to adopt Blackboard as its official E-Learning platform is because it has been used by five thousand institutions all over the world, including famous universities such as Stanford and UCLA[57], which reduces barriers to collaboration with other universities. Both MELEES and the School of Geography took the E-Learning platform decision made by the Central IS Department in different phases of E-Learning development at the University, subject to support from Central IS Department and to compatibility. Course content management, such as Blackboard and WebCT, use proprietary database formats that make it very difficult or impossible to transfer learning content from one system to another (Jones, 2002). Beside this, the issues of license fee and flexibility are also significant disadvantages of a licensed proprietary platform. This will be examined in the following comparison of open source platforms.

- **Free Open-Source Platform Selection**

There are many universities using open source E-Learning platforms; for example, a study by Campanella et al (2008) calculated that 32% of Italian universities were using open source. With open source, Higher Education institutions can easily and freely audit systems such as ultimate access/control, ownership, and freedom (Koohang and Harman, 2005). The eELT case study, with its specific background, is

[57] http://www.blackboard.com/

a large project led jointly by HEFCE and the Chinese MoE. It goes without saying that these organisations should address the issue of E-Learning platform selection before attending to the details. The eELT project did not make a decision about a platform until a year after the project had started, which caused significant delays. In addition, the chosen platform Moodle in the eELT project was an open-source based VLE. The reason why this compromised solution was reached was due to resistance from the Chinese partner to the platform license fee, stated specifically by Sife et al.(2007) as one of the main benefits of open source platform adoption.

However, in the case study of eELT, the present research found that open-source based platforms do not mean "free" - they often have no official technology support for difficulties experienced by the development team. Koohang and Harman (2005) observed that open source requires the allocation and securing of a budget for "free" software. Another issue for open source implementation is the cost of open-source code complexity which requires a high level of technical expertise to modify the code (Dalziel, 2003).

7.2.2.2 Tool Application Considerations

As described in the literature, E-Learning technology often refers to the tool applications which are utilized on E-Learning platforms (Franceschi et al., 2009; Li and Leung, 2009; Martínez-Torres et al., 2008; Scalise et al., 2007; Connolly and Stansfield, 2007). E-Learning technology is unique in its breadth and continuous improvement, yet E-Learning handbooks contain just a brief introduction to E-Learning technologies without giving a clear classification of the variety of technologies that could be applied (Morrison, 2003). The present research found that there are three dimensions by which E-Learning tool applications can be considered: considerations of subject, the requirements of E-Learning design and delivery, and concerns about communication.

1) Subject Oriented E-Learning Tool Application Considerations

Most research on E-Learning technology is carried out separately as a micro view in different subjects e.g.(Ruiz et al., 2006). The present research discovered that the tool applications which they adopted often have a closed relationship with the subject areas. The author therefore argues that some of the tool applications which may apply were subject oriented, especially those related to Science and Engineering. Examples included the Google Map in the School of Geography E-Learning project and Mathematic workbooks in the MELEES project. The embedding of Google Map resulted in very good performance by and feedback from students, but was unsuitable for other subject areas. The content-oriented theories developed by Lijnse and Klaassen (2004) proposed that the primary goal for science education research is a content-specific didactical knowledge based on the development of exemplary teaching. However, the majority of research studies which mentioned contented–oriented implied suitability and format preferences e.g. Fetaji and Fetaji (2007). Andersson and Wallin's research (2006) defined it as a specific topic. It can be argued that subject and content should be carefully considered as part of E-Learning course design and delivery.

2) E-Learning Design & Delivery Requirement

This research found that the main requirement of E-Learning design and delivery is usability, which plays a significant role towards the success of E-Learning design and delivery (Squires and Preece, 1996). If an E-Learning system is not sufficiently usable, people have to spend more time learning how to use the system rather than designing or learning the contents (Ardito et al., 2006). As introduced in this research, the purpose of the Xerte tool is to assist E-Learning course design due to the lack of E-Learning platform support. When considering E-Learning course delivery, the challenge is to create a system that does not confuse or frustrate learners. A poorly designed interface will hinder effective learning and information retention (Ardito et al., 2006). Moreover, technology should not become a barrier. For example, in the School of Geography Google Map is a valuable E-Learning application tool which is simple to use giving high quality information.

3) Concerns about Communication

Frequency and quality of communication was another concern for the selection of E-Learning tool applications for the eELT project, which has a diverse cultural background involving several partners. Conflicts between Chinese partners and University of Nottingham teams could be identified on many occasions. Communication is the most common way to reduce the impact of conflicts (Te'eni, 2001; Barki and Hartwick, 2001). After the eELT project team discovered that effective communication might be the only way to move the project on they started to customise the communication tools in order to enhance the frequency and quality of communications. Paton (2009) grouped the E-Learning tools into the broad categories of asynchronous tools (that allow for interaction in a time-delayed manner, such as Podcast) and synchronous tools (real time or live activities such as chat rooms). E-Learning communication tools allowed users to exchange information, to ask help and to suggest solutions which could enhance the interaction between students and teachers.

7.2.2.3 Integration of E-Learning Platform and Tool Application Innovation Processes

There is no doubt that the E-Learning platform and tool application are the two main constituents for the E-Learning technological innovation process. An IS innovation process can cover a wide variety of concepts and techniques (Iivari et al., 2000). Dietrich and Walz (1997) argued that it is essential to distinguish between the IS innovation process and the acceptance of tools and techniques. However, the present research suggests that it is not only necessary to concentrate E-Learning platform and tool application innovation processes separately as Dietrich and Walz's (1997) research argues, but it is also important to integrate these two processes (e.g. Figure 6.4).

7.2.3 Service Innovation

According to the author's research definition of services innovation in E-Learning development, the case studies all demonstrated the essential steps in E-Learning service innovation, mentioned in the literature review. These steps include better learning outcomes (Ellis et al., 2007); interactions between students, instructors and students to students (Box, 1999, Kirby, 1999, Davis and Wong, 2007); and an alternative way to achieve a better teaching and learning outcome (Stefl-Mabry, 1999). Nevertheless, the service innovation processes in E-Learning maybe similar. However, the present research found three distinct features that may have been considered in previous studies, described below:

7.2.3.1 Template

Many studies proposed the use of templates (Muzio et al., 2002; Winne et al., 2006), yet only a few researchers have provided information on their purpose and how to design them (Lohr and Heng-Yu, 2003). This research found that templates are used practically during the E-Learning course development process, but that the theory of template use is not explored. Templates are "*designer-friendly tools that require very little computer expertise and time involvement on the part of the instructional designer*" (Loucks-Horsley, 1996, p.13). Normally, E-Learning platforms provide instructional authoring templates such as navigation tools, glossaries, scoring devices, annotation aids, multiple choice testing tools, highlighting devices, chat rooms, and bulletin boards.

When instructors attempt to develop E-Learning materials, there are several issues which should be taken into account. These include the degree of technical expertise required, the budget, and the consistency of the E-Learning material quality being presented. However, the templates mentioned above cannot usually satisfy the needs from academics. For this reason, the MELEES project team developed their own template and created the Xerte tool. Templates are most often used where a team of programmers, instructional designers, graphic artists, interface designers and

technical writers work together to create prototypes of instruction that gradually evolve into a final product (Vaughn, 1994). It is entirely fair to say that applying the templates can bring various advantages: saving time and effort for both technicians and academics; giving consistency, especially in large scale E-Learning course design; and increasing output and creativity. However, as argued by Lohr and Heng-Yu (2003), templates are often limited in functionality, particularly when designed by computer programmers who have technical rather than instructional expertise; further, templates are not always as user-friendly and as easy to use as programmers who created them suppose.

7.2.3.2 Collaboration

Communication is an important factor for E-Learning development (Te'eni, 2001). Its importance is not limited only to the stakeholders within the team, but also those outside the team and, in the case study of eELT, outside the country. Within the E-Learning project, communication between the project manager, technicians, and module lecturers is crucial. For example, technicians ensure the successful day-to-day running of E-Learning, and are vital for all E-Learning projects (Sharpe et al., 2006). Most E-Learning courses are designed jointly by the technician and the module lecturers, and communication becomes even more significant when the project requires cooperation between several teams in different locations with different cultural backgrounds. Interviews with team members of the eELT project revealed that improving communication was one of the most important issues between them and the Chinese universities. Extra efforts had to be made, for instance, to apply communication tools and increase the number of face-to-face meetings.

This research observed that trust is an important element in collaboration (Mason and Lefrere, 2003). Two types of trust are required for effective E-Learning development. The first of these is the inner-trust that is built within the team, and the second type is inter-trust between the team and other stakeholders. Mistrust can seriously delay the progress of any E-Learning development. Normally, it is relatively easy to build the inner-trust within an E-Learning project, and it can be quite difficult to build the

inter-trust between 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, arguing that it offered inadequate attention and effort in supporting them.

Some studies have described the phenomenon of negotiation in the E-Learning innovation process, especially during organizational change (Samarawickrema and Stacey, 2007; Arnold, 2003). However, this research found that "negotiation" also always occurs during E-Learning course development, especially between technicians (Central IS Department) and academic staff, and that the more complex the E-Learning project, the more negotiation occurs, as in the eELT project (detail explained in Chapter 6).

7.2.3.3 Students' Views on E-Learning Development

There is no doubt of the importance of students' views in E-Learning course development (Jennifer Gilbert, 2007). Evaluation is the main role of students in E-Learning development. The E-Learning coordinator and academic staff would students to give feedback before the module was formally delivered. Evaluation is a vital mechanism for the project team, academic staff and the E-Learning coordinator to understand and judge the quality of design and delivery. The continuing evaluation of the courses suggests the importance of learning by doing, and encourages continuous innovation.

Despite the above assertion that it is very important to take the views of students into account in E-Learning course development, this research has also found that the value of students' views is given different weighting for different aspects of E-Learning innovation processes. When interviewed, the Central IS Department argued that "*students don't know what they need*"; and in explaining the triggers of E-Learning adoption (Section 4.4), the "students" were not counted. Many researchers and implementers have observed that the end users often express a less

than enthusiastic response to many technological innovations introduced by the organization (O'connor et al., 1990; Leonard-Barton and Kraus, 1985; Gold, 1981; Blackler and Brown, 1985; Ellen et al., 1991). Riesz (1980) explains: "*the average customer's inability to articulate needs and wants for goods and services that are technologically or functionally advanced is a significant problem" (p.51).* However, the present research also argues that it is increasingly important to involve customers in new research trends in innovation management, both user-driven or open innovation. The students' views should therefore be considered not only for the development of E-Learning courses but also when developing E-Learning strategy.

7.2.4 Interaction

Much research focuses on interaction, for example Cooper (2000) and Staudenmayer et al. (2002). However the majority of studies only examine the impact of one side on another side's process, such as how technology is embedded in the organizational change (Leonardi, 2007). Few researchers have described the interaction between two processes, especially two parallel processes. The present research therefore attempted to understand the interaction between two or even three parallel interdependent processes. Abdomerovic and Blakemore (2002) are the only researchers who considered the interaction process, when they analyzed the variables of product-oriented and project management processes. However, they did not explain the interaction or interdependence of these two processes. The present research sought to fill this gap by categorizing the interactions between two and three innovation processes.

7.2.4.1 Interactions between Organizational and Technological Innovation Processes

There are two theoretical areas of research on the relation between technology and organizations: the first is how technology support decision- making or strategy, e.g Banker and Kauffman (2004); the other is the impact of technology on organizational change, e.g. Bloodgood and Salisbury (2001) and Markus and Robey

(1988). The present research suggests that the interaction between organization and technology can be categorised as follows:

1. Pressure

Alshara and Alsharo (2007) asserted that E-Learning technology can significantly affect the structure, business process, practices and politics of the educational organization. Gallick (1998), argued that advancement in E-Learning technologies and capabilities have forced the institutions of Higher Education to revisit - and, in some case studies, redefine - their key objectives. Oblinger and Maruyama (1996) described the various pressures exerted by technology on universities, as discussed in Section 7.2.1 of the present study.

Results of this study demonstrated that - in addition to pressure from external technology such as technological development and the popularization of the E-Learning platform - there were also individuals applying new technology to enhance their teaching before the E-Learning innovation was formally established. Initially, the organization adopted a permissive attitude, showing a flexibility that allowed all staff to apply new concepts for teaching. Hardgrave and Johnson (2003) made a similar observation: the growing number of individuals using a process can often result in a decision to standardize the process as an organizational process; likewise, this research found that when more and more staff became involved, the organization perceived pressure from them, indicating that a change would be necessary in order to accommodate the E-Learning activities.

This research recognised that the starting point of the technological innovation process is followed by organizational decision/strategy regarding whether and how to change technology. The observation is also made in Banker and Kauffman's paper (2004) that the decision to support and the organizational strategy both impact on the technological innovation process. The dissatisfaction regarding platform or tool applications expressed by IT or academic staff is also an important pressure on

technological innovation. For example, Gladieux and Swail (1999) indicate that such feedback, especially dissatisfaction over technology, will encourage the university, school or individual staff to adopt new technology; meanwhile a range of providers have become increasingly influential in the Higher Education sector by offering new services with technological support, which also react to feedback from universities about technology.

2. Adoption

The adoption of technological innovation is explored in detail in Section 7.2.2, which considers platform and tool application. The main discussion of the organization in this section is about how it makes investments and decides on how to adopt technology. From the technological viewpoint, the greatest investment in the E-Learning innovation process is platform adoption. The investment in the platform can take the form of a pilot project, prototype, establishment of vital infrastructure, or some baseline implementation of the platform itself (Fichman, 2004). As in this research, the University initially invested two platforms for pilot study; Taudes et al.(2000) presented a similar example of an ERP case study with several different initiatives for investing platforms. However, the platform adoption issue does not only focus on the acceptance of technology but also on how the adoption process allows a detailed evaluation of the technology and larger "baseline" implementations of the full platform (Fichman, 2004).

The debate over adopting technology relates not only to the technology itself but also to the organizational issues. The main impact of technology on organizational innovation can be summarized as organizational structure change and people involvement adoption. Nunan et al. (2000) highlight "*the importance of integration: information technologies are bringing structural change to serve areas, causing a convergence of roles and functions between registry, library, corporate services, production and teaching support and student services" (p.72).* This present research observed that the University launched the eLeK community and a VLE focus group to evaluate all possible solutions, and appointed an IS learning team leader. A range

of academic, technical, and administrative staff, and people with new composite skills from different departments across the University, became involved in E-Learning development. Jones and O'Shea (2004) reported that the development of an E-Learning environment led to the creation of multi-disciplinary teams networked to work together. They argued that "*there were very few examples of staff from so many different areas of the University working together in one group, the boundaries between academic departments and support departments were well protected by tradition and culture*" *(p.386).*

3. Adaptation with Resistance

Vaast & Levina (2006) argued that the interdependence between organization and information systems implies that change in one area requires adaptation in the other. The adaptation period for both technological and organizational innovation processes gives opportunity to confront "turbulence". The previous section argued how the adoption of an E-Learning platform can have a significant impact on the organization, including structural change and reassignment of staff. The adoption of technological innovation requires the organization to adapt rules, procedures and structures to a new technology (Damanpour and Evan, 1984). Adaptation to organizational innovation processes relates mainly to how staff adapt to technology adopted by higher level management. In order to accommodate the new system, the members of the organization first need to acquire common knowledge of the technology before attempting to adopt it. Some members of staff were new to E-Learning, so they needed more time to learn to utilise the new technology or tools.

However, it is not easy when organizational inertia often hinders internal adaptation (Tripsas and Gavetti, 2000). When technological innovation occurs, there is always a group driving the innovation forward. However, it is important to notice that some members of staff may express opposite opinions. There is a natural resistance to change which may be explained:

- Technological innovation seeks to change the working habits of members of staff. Resistance may occur when they perceive that the new technology is not as good as they expected or when they question its advantages.
- Certain staff are more conservative and prefer to keep to traditional practices rather than change.
- Some of the schools may refuse to accept this technology with the argument that the technology cannot offer what they want. The situation occurs due to insufficient information or knowledge being provided.

Economists have stressed the importance of incentives and rewards obtained from innovations (Henderson, 1993), but have ignored the motivation of the employees or workers who may not directly benefit economically (Hage, 1999).

The technological innovation process is influenced by the "turbulent" adaptation period of organizational innovation, when the adopted technology may need to be revised or replaced. A significant example is the eELT E-Learning project which involves two organizations. Each decision about adopting technology needs negotiation and prolongs this adaptation period. This research identified that any change requires extra costs (Orlikowski, 2000), especially platform change. Collaboration with technical experts, such as the providers of technological solutions who have expertise in designing and marshaling support, may assist the stability of technological adaptation (Weigelt and Sarkar, 2009). However, unsuccessful adaptation of organizations to new embedded technology implies that a new technology has to be adopted. For instance, in the eELT project the communication tool application had to be reconsidered and replaced several times. Most previous research has focused only on successful adaptation.

4. Support

Tyre and Hauptman (1992) argued that it is important that organizations respond to support technological innovation, especially in problem solving. The present research observed that technological innovation required robust organizational support in order to sustain the strength of the innovation, especially at the university level. To provide consistent support in terms of financial and organizational strategy, the senior management of the university made adjustments to the organization structure in order to establish mission- oriented communities such as a VLE focus group, an E-Learning community and eLeK. The Central IS Department also expanded numbers of staff and the capacities of technology sustainability. These are the cores to drive the E-Learning innovation forward.

This research suggests that the main support of technological innovation for organizational innovation process is provided by IS stability and flexibility. For example, because IS stability supports sub-schools, they do not have to concern themselves with the platform issue, and so the school E-Learning technologists can devote all their attention to creating materials and new tool trials. This focus on supporting the teaching staff in creating more E-Learning materials may also give the advantage of better results and encourage more staff to become involved. However, Orlikowski (2000) argued that the stability of the technology and its applications is only provisional because different elements continue to be developed, existing functions fail and are fixed, and new materials are invented. IS innovation should full support strategy (Ettlie et al., 1984). Other innovation researchers have structured similar arguments about IS flexibility supporting the directions of different strategies (Fichman, 2001).

7.2.4.2 Interactions between Technological and Service Innovation Processes

Claims about the importance of interdependence between technology and service are persuasive: the technology not only involve the design and delivery of the service, but also its marketing (Orlikowski, 2000). This research categorizes three types of interaction between technology and service during their innovation processes:

1. Sustentation

All the E-Learning materials are running on the E-Learning platform and delivered via the Internet. From this aspect, technology is one of the core elements in the E-Learning service. In other words, technology is the soul of the E-Learning service. The sustentation of technology impacts on all service innovation processes from ideas, design, delivery and also communication (Fichman, 2001). The process of creating and delivering the service is fundamentally rich in information exchange requiring technological support (Looy B. V. et al., 2003).

There is little research that investigates the interaction of sustentation of service with technological innovation (Lievens and Moenaert, 2001). This research found that the positive feedback from service or continuous usage of existing technology means sustentation to technological innovation, maintaining technological stability. Alternatively, it responds to other types of interaction, as follows.

2. Limitations

The E-Learning services are created and delivered by technology. However, limitations such as Internet bandwidth, technological development and the capacities of information systems all influence E-Learning services innovation. For example, in the MELEES case study, the delivery of services to the overseas campus presented the team with a challenge. The narrow Internet bandwidth limited and affected service performance. In fact, the original idea was to install all the services and information in the UK; the students in the overseas campuses were to log in to the UK server for the E-Learning services. However, students were dissatisfied with the effect of the narrow bandwidth on service performance. In the eELT case study, the complex technical involvement led to unavoidable delays. The design and implementation of the heavy animations and interactive E-Learning materials required considerable time. The limitation affected all related technology, including platform (Fichman, 2004), tool application Orlikowski (2000) and

communication software (Fichman, 2001) all of which may influence the whole service innovation process, including design or delivery (Das and Ven, 2000).

The limitation of service to technological innovation seems not significant. However this research found that the limitation was due to different education subjects/areas related to the stage of "platform consideration" and "tool application consideration". Alavi and Leidner (2001a) put forward a similar argument that it is necessary to evaluate technology tools with subject matter and how this interaction produces desired learning outcomes. The selection of technologies should suit subject matter, content type or course designs (Piccoli et al., 2001). For example, Google Map is a very good tool application for E-Learning courses in the School of Geography; however, it is not suitable for E-Learning courses in the School of Mathematics.

3. Catalyst

Advance technology used to lead the novel E-Learning service innovation. IT is a key factor that led to a radical transformation of service (Buzzacchi et al., 1995). Educational technology is for enhancing both teaching and learning through Learning Management Systems (Gyambrah, 2007). In the case study of the School of Geography, the E-Learning technology officer utilized the technology and tools well to speed up the design and implementation processes. There were 72 modules online within three years in the School of Geography. Further, Barras (1986) stated that IT was initially developed and used to improve the efficiency of the service delivery of existing services.

Tellis (2008) argued that all innovation ultimately aims to produce better products or service. The feedback or demands from service innovation often promote technological innovation. Gladieux and Swail (1999) indicate that the feedback, especially dissatisfaction expressed over technology, will enhance technological innovation. In the eELT case study, the international cooperation research team required wide scale communication which the former method could not offer.

Pressures moved the technology forward to develop new and efficient communication tools in order to enhance understanding, resulting in improved E-Learning materials.

7.2.4.3 Interactions between Organizational and Service Innovation Processes

This research identified two aspects of interaction between organizational and service innovation processes. These can be divided into three categories, as follows:

1 Decision and Planning

Damanpour (1991) argued that organization can have an impact on determining service innovation. The organization decides on E-Learning services required, and also plans how to achieve this. This interaction can be found in every case study. Service innovation needs to fit into an organizational perspective (Stevens and Dimitriadis, 2005; Fitzsimmons and Fitzsimmons, 2001). The first stage of service innovation (e.g. idea) starts always according to the organizational decision and planning, regardless of strategies devised by top management or schools.

In comparison, this research found that the feedback during or after the introduction of service innovation processes will assist the organization to adjust or make new strategies. Similarly, Stevens and Dimitriadis (2005) also stated that the service innovation can gather and translate information, and contribute to the improvement of the decisions made during the development. For example, the Xerte project is based on the feedback about problems in course design; the University realized that the previous decision on the adoption of WebCT was insufficient, so it decided to launch the Xerte project.

2 Support

The organization has the responsibility to support the service innovation. The service innovation often requires multilateral resources which need the organization's full

support in terms of financial and professional knowledge. The E-Learning course in particular is an entire new concept compared to traditional courses. For example, Gyambrah (2007) proposed that such faculty members as administrator, facilitator, technical support and evaluator were required to support E-Learning, and Laurillard (2005) suggested that institutions of Higher Education should provide sufficient time and resources for lecturers to be re-skilled.

The main support of services to organizational innovation processes is "organizational learning". Service innovation can be perceived as a collective knowledge creation process (Takeuchi and Nonaka, 1995). Knowledge is a vital mechanism for organizational learning (March, 1991). Takeuchi and Nonaka (1995) demonstrated the existence of links between the learning process and service innovation processes. It is especially vital in the early period of E-Learning innovation in the organization. For example, the knowledge created by MEELE's course promoted better understanding of E-Learning and E-Learning strategies within the university.

3 Restructure

The E-Learning innovation process is a complex development process; the old organization structure may not be appropriate to face those challenges. Service innovation requires some systematic changes in organizations in order to provide the best solution (Stevens and Dimitriadis, 2005; Fitzsimmons and Fitzsimmons, 2001). In the eELT case study, the high level of cultural difference and low level of understanding led to difficulties. There had to be several restructures in order to enhance the collaboration. As an E-Learning services project, the eELT research team utilized face-to-face communication skills to reduce the cultural barriers. They also outsourced some technological jobs to several multimedia companies.

This research found that service need be restructured according to organizational innovation progress. The process of transforming traditional courses into E-Learning

courses is a service process which restructures design, delivery and the involvement of staff according to organizational strategy. Damanpour (1991) presented an example of team restructure in service innovation depending on determinants. An example in this research is the decision of the Xerte project to change the structure of E-Learning design dramatically, not only within the University but also to influence the E-Learning development of other universities.

7.2.4.4 Interactions among Three Innovation Processes

This discussion of interaction between two innovation processes has led this research to recognise that interaction implies influences to both related processes, although each category of interaction leads to different efforts for different innovation processes. Because the E-Learning innovation process is related to three parallel innovation processes, it is necessary to gain a deeper understanding of the dynamic processes that shape interaction among these three processes. However, the triple interaction is more complex compared with bi-interaction. For example, the triple interaction case study of Xerte project is only one example in the E-Learning innovation process. An overview of the whole E-Learning innovation process indicates that the triple interaction will occur constantly.

As stated at the beginning of this section, there is little research on interaction that focuses on processes. Rukanova et al. (2009) mentioned the multi-interaction between processes. The "multi-level" they used is micro, meso, macro by Damsgaard & Lyytinen (1998), and their study did not explain how different levels engage, nor did they identify patterns of interaction (Rukanova et al., 2009). In contrast to their research, this study focused on "multi-dimension" and tried to identify the pattern of interaction between the two innovation processes. It also discovered that the interactions among organizational, technological and services innovation complemented each other. In addition, approaches to the development of E-Learning may vary within different subjects or disciplines. For example: the social science learning style requires a higher amount of reading and listening and therefore a relatively lower level of involvement with technology; on the other hand natural

science requires a higher level of interaction with the learning materials in order to enhance the learning outcome. Nevertheless, no matter what the subjects, the case studies have presented a delicate equilibrium posture. According to Ellen et al. (1991) and Orlikowski (2000), the delicate equilibrium posture is always temporary and requires continues improvements.

The present research summarized the characteristics of interaction among three innovation processes (Figure 7.4) as:

- The interaction occurs among ***parallel*** innovation processes (3D)
- It occurs from one delicate equilibrium posture to another
- Each change in one innovation process is due to the interaction between one or two other innovation processes

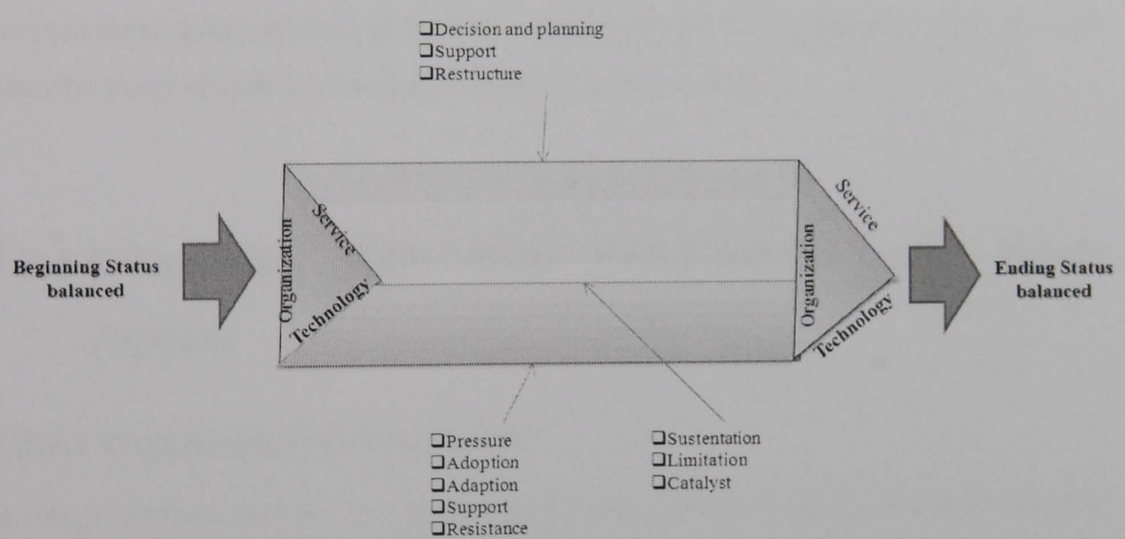

Figure 7.4 Interaction among three innovation process

7.3 Framework Development

From the above sections, it is clear that each aspect of E-Learning innovation has its own complexity and unique processes. It is also evident that each of the organisation, technology or service aspects contribute only partially to the understanding of the overall innovation. To obtain a holistic understanding, it is crucial to examine each individual aspect. More importantly, it is important to understand the interactions

and dynamic interrelationships between the three aspects. The need to understand the dynamic interrelationships and interactions occurred at the individual, school/department and organisational/university levels and is reflected in the core objective of this research, serving as a vital contrast to some of the prior studies on and/or related to E-Learning. For instance, many prior studies of E-Learning innovation tended to focus on one aspect of the innovation (Mcpherson and Nunes, 2006; Stephen and Geoff, 2004). By contrast, many accounts of technological innovation appear to take into account the organisational context in conjunction with the technological characteristics (Volkoff et al., 2007; Gilbert and Cordey-Hayes, 1996; Mustonen-Ollila and Lyytinen, 2004; Nystrom et al., 2002). Very few studies have examined how technological and organisational innovation affect and are affected by service innovation. Referring to the need to understand the dynamic interactions between organisation, technology and service innovation, it is clear that the conceptualisation of teaching and pedagogical innovation, without taking into account these three aspects collectively, remains problematic. The following sections describe the proposed conceptual framework in more detail.

7.3.1 E-Learning Innovation Development with Triple Aspects

7.3.1.1 Organizational Innovation

In the literature review, the author compared several organizational innovation models (Damanpour, 1991; Damanpour and Gopalakrishnan, 2001; Van De Ven and Poole, 1995; Van De Ven, 2007; Rogers, 1995). However, the outcomes of E-Learning innovation in organization are normally described in terms of types of subject, leadership, organization size and complexity of objectivity issues. The author therefore adopted the linear model proposed by Rogers (1995) as the basis for the organizational innovation in E-Learning in order to simplify the comparison procedures. Rogers' framework is a particularly effective tool for clarifying the differences and similarities across the case studies.

As in Rogers' (1995) model, the first stage starts with "ideas" of adopting innovation. The present research found that the triggers for E-Learning innovation vary according to different contexts. By analyzing the E-Learning innovation at school and university levels, three types of trigger were found. More important, it should be an interactive approach with the three levels of individual, school and university, all of which are actively involved in E-Learning development combining a deliberate top-down strategy with a bottom-up emergent strategy (shown in Figure 7.1).

Each E-Learning project has a different set of purposes and a diversity of core team set up. An "academic driven" E-Learning project recommends that, normally, academics are the first to be involved in setting up the E-Learning strategy since key pedagogic themes are important in E-Learning design. However, due to the importance of technology in E-Learning, some E-Learning projects are "technician driven", and their core teams are led by highly experienced technicians. Moreover, some E-Learning projects are "collaboration driven" because universities always address opportunities for collaboration with other institutions.

There are two essential stages in Rogers' framework: initiation and implementation. The case study based on the School of Geography seems to be the best fit into Rogers' framework. The initiation and implementation phases can also be found in the MELEES case, although after the implementation phase MELEES continued and developed into a highly successful project. MELEES was rolled out to the overseas campus and inspired the innovations, thus extending Rogers' framework. The eELT project was a pioneering, cross-cultural E-Learning project, differing from Rogers' research setting. The two research teams of this project had completely different cultural backgrounds which delayed the development process significantly. Acknowledging the differences within these three cases, this research names the three types of "last stage" (shown in Table 7.1) as "three tails" (Figure 7.2), indicating three different organizational innovation processes with varying impact in value (Figure 7.3). More importantly, these three tails should be integrated as three stages for organizational innovation process.

		Findings	Literature Support
Three Tails of Organizational Innovation Process	Triggers for E-Learning Innovation	E-Learning bandwagon pressure as a trigger to university for E-Learning innovation	Clegg et al (2003)
		Individual staff interests as a trigger for E-Learning innovation	Crossan et al (1999)
		Pressure from schools as a trigger for E-Learning innovation	Sharpe et al (2006) Fitz (1994) Goldring (1997)
		Integration of three triggers of E-Learning innovation	Sharpe et al.(2006) Senge (1990) Jones and O'shea (2004) Crossan's et al (1999)
	Diversity of Core Team Setup for E-Learning Project	Academic driven	Karelis (1999) Moon et al.(2005) Hutchins and Hutchison(2008)
		Technician driven	Jones and O'shea (2004)
		Collaboration driven	Marshall and Mitchell (2002) Reid (1999) Bates (2001) Hodgson (2002)
		Tail one — "end" stage: "organizational life cycle"	Jawahar and Mclaughlin (2001) Koberg et al.(1996) Felin and Hesterly (2007) Nonaka's studies (1994)
		Tail two— "routine" stage : "organizational routines"	Becker et al.(2005) (Becker and Zirpoli, 2008) Hansen (1999) Lepak et al.(2007)
		Tail three— "spin out" stage: "inter-organizational learning/knowledge transfer"	Albino et al.(1999) Nonaka (1994) Hansen (Hansen, 1999) Holmqvist (2003) Zhou (1993)

Table 7.2 E-Learning Organizational Innovation

7.3.1.2 Technological Innovation

To avoid the limitations recognised by Sabherwal and Robey (1993), two models - Cooper and Zmud's (1990) IS innovation process and Rogers' (1995) technological adoption process - are adopted in the research. In order to enhance the understanding of the technological innovation in E-Learning, it is necessary to include the

technology adoption process (Mentzas et al., 2001), mainly relating to the E-Learning platform selection and tool adoption process.

The three case studies display a similar innovation pattern. However, there are some valuable points that need to be addressed:

1. The official E-Learning technological innovation started with the platform selection/adoption process. This research found that platform selection can be divided into two types: a self-develop E-Learning platform and the adoption of the E-Learning platform from the market; each type has different considerations. The process can be identified as four steps: awareness of the problem, selection of the solution, implementation, and identification of feedback/problem for future improvement. As those technological innovation circles become more firmly established, they are more likely to promote the next generation platform adoption.

2. Tool implementation processes follow the E-Learning platform adoption process. Any tool adopted by the project team depends on the needs of individual subjects. As an example of a *subject oriented E-Learning tool application consideration*, MELEES required highly complex mathematics formula output, so the team adopted MathML as a tool. The School of Geography E-Learning project had an *E-Learning design & delivery requirement*, so adopted Google Map, Podcast and SMS technology into teaching and utilized Xerte to reduce the time required for producing the E-Learning materials. The eELT project is an example of *communication concern* as it is a collaborative project with geographical and cultural differences which indicated that the first priority of their demand is communication; they therefore imported some basic package communication tools, such as Skype and MSN. They went on to develop and customize several further tools, such as an audio recorder, virtual interactive platform and workplace, in order to complete the project.

3. Technological innovation in E-Learning differs from standard IS innovation, with two major distinctions. Firstly, technological innovation in E-Learning occurs as a series, although the E-Learning platform selection/adoption process is the foundation of all technological innovation. Secondly, the tool selection/adoption process shows a strong similarity to typical IS innovation, in that they both aim to improve products and services. This research suggests that it is not only necessary to view E-Learning platform and tool application as separate innovation processes, as argued in Dietrich and Walz's (1997) research, but it is also important to integrate these two processes.

	Findings	Literature Support
Platform Considerations	Self-develop E-Learning platform	Scott (2004)
	Adoption of the E-Learning platform from the market • Licensed proprietary platform selection • Free open-source platform selection	Viorres et al. (2007) Ngai et al.(2007) Koohang and Harman (2005) Dalziel (2003)
Tool Application Considerations	Subject oriented E-Learning tool application consideration	Lijnse and Klaassen (2004)
	E-Learning design & delivery requirement	Squires and Preece (1996). Ardito et al.(2006)
	Communication concern	Te'eni (2001) Barki and Hartwick(2001)
Integration	Integration of E-Learning platform and tool application innovation processes	Dietrich and Walz (1997)

Table 7.3 E-Learning Technological Innovation

7.3.1.3 Service Innovation

The history of service innovation research has a close relationship with the literature on new product development in manufacturing (Oke, 2007). However, there are still some differences between products and services which have been clearly addressed in the literature. Teachers adopt and utilize E-Learning for the purposes of teaching

preparation and teaching delivery (Jebeile and Reeve, 2003). Service innovation in the context of E-Learning is therefore developed in two stages: course design and course delivery. From a detailed examination, the service innovation processes of all cases appear similar - ideas (creation/gathering), analysis, design, development, implementation/delivery and, finally, evaluation. If adjustments have to be made, the process loops back to the design stage and starts again.

All case studies display quite similar service innovation patterns. Nonetheless, each case still contributed some important distinctive features:

1. Template: applying templates is advantageous especially when the E-Learning system cannot satisfy academic need. That is why the MELEES project team developed their own template, and created the Xerte tool.

2. Collaboration: this is important both inner- and inter-team, and between organisations. Collaboration and negotiation strongly affected the project result. The eELT project which involved three teams and two different cultures demonstrated that conflict intensified a situation which was already challenging to manage. Two types of trust are required during E-Learning development - inner-trust that is built within the team, and inter-trust between the team and other stakeholders. It is quite difficult to build inter-trust between the university's Central IS Department and the schools, or between partners from different institutions.

3. Students' views on E-Learning development: this research recognised different value weights for views of students on different aspects of E-Learning innovation processes. Students' views and evaluation make a very important contribution to E-Learning course development. Further, this research suggests that the student viewpoint should also be considered for E-Learning strategy development.

	Findings	Literature Support
Template	• Limitation of E-Learning platform instructional authoring templates • Self-developed E-Learning templates • Benefits of templates	Lohr and Heng-Yu (2003)
Collaboration	• Collaboration inner- team • Collaboration inter- teams • Cooperation between several teams in different locations with different cultural backgrounds Two types of trust required during E-Learning development • inner-trust that is built within the team • inter-trust between the team and other stakeholders	Te'eni (2001) Mason and Lefrere (2003) Samarawickrema and Stacey (2007) Arnold (2003)
Students' View on E-Learning Development	• Different value weights of students' view • Importance of students' view on E-Learning course development and strategy development	Jennifer Gilbert (2007) Riesz (1980)

Table 7.4 E-Learning Service Innovation

7.3.2 Interaction and Dynamics within Three Innovation Processes

Few research studies observed the interaction between two processes, especially two parallel processes. This research therefore focuses on "multi-dimension" and seeks to understand the interaction between two parallel innovation processes and even within three parallel interdependent processes. Drawing from this discussion, the research observed that "interaction" implied influences to both sides of the related innovation processes, although each category of interaction led to varied efforts on these different processes:

1. The interactions between the organizational, technological and services innovations can be divided into three aspects:
   - Interactions between organizational and information systems development processes can be illustrated as follows: *pressure, adoption, adaption with resistance, and support*

- Interactions between information systems and service innovation process can be illustrated as follows: *sustentation, limitation, and catalyst*
- Interactions between organizational innovation and service innovation process can be illustrated as follows: *decision and planning, support, and restructure*

2. Interactions among three innovation processes:

Since the E-Learning innovation process is related to three parallel innovation processes, it was necessary to gain a deeper understanding of the dynamic processes that shape interaction among three innovation processes. However, it was observed that the triple interaction was more complex compared with bi-interaction. Within the whole E-Learning innovation process, the triple interaction would occur constantly. This research also found that the interactions among organizational, technological and services innovations complemented one another and presented a delicate equilibrium posture (shown in Figure 7.4).

	Findings	Literature Support
Interactions between Organizational and Information Systems Development Processes	*Pressure* • E-Learning technologies have forced institutions to revisit • Technological innovation is followed by organizational decision/strategy	Banker and Kauffman's paper (2004) Gladieux and Swail (1999)
	Adoption • Organization makes investments and decides on how to adopt technology • Organizational structure change and people involvement for technology adoption	Fichman (2004) Nunan et al. (2000) Jones and O'Shea (2004)
	Adaptation with Resistance • How staff adapt to technology adopted by higher level management • Revision or replacement of technology according to the "turbulent" adaptation period of organizational innovation	Vaast & Levina (2006) Damanpour and Evan (1984) Tripsas and Gavetti (2000)
	Support • Importance of organizations respond to support technological innovation • IS stability and flexibility to organizational innovation	Tyre and Hauptman (1992) Fichman (2001)

Interactions between Information Systems and Service Innovation Processes	process	
	Sustentation • Technological support to process of creating and delivering the service • Positive feedback from service or continuous usage of existing technology means sustentation to technological innovation	Orlikowski (2000) Looy et al (2003)
	Limitation • Limitations of IS capacities influence E-Learning services innovation • Limitations were due to different education subjects/areas related influence IS considerations	Fichman (2004) Orlikowski (2000) Fichman (2001) Alavi and Leidner (2001a) Piccoli et al.(2001)
Interactions between Organizational Innovation and Service Innovation Processes	*Catalyst* • Learning Management Systems enhance teaching and learning • The feedback/demands from service innovation promote technological innovation.	Barras (1986) Tellis (2008) Gyambrah (2007) Gladieux and Swail (1999)
	Decision and Planning • The organization decides and plans on E-Learning services • Feedback during or after the introduction of service innovation processes will assist the organizational adjustment	Damanpour (1991) Fitzsimmons and Fitzsimmons (2001) Stevens and Dimitriadis (2005)
	Support • Responsibility of organization to support the service innovation • "Organizational learning" as main support of services to organizational innovation processes	Laurillard (2005) March (1991) Nonaka and Takeuchi (1995)
	Restructure • Organizational changes to provide the best solution for service innovation • Service restructure according to organizational innovation progress	Damanpour (1991) Stevens and Dimitriadis (2005)
Triple interaction	• The interaction occurs among ***parallel*** innovation processes (3D) • From one delicate equilibrium posture to another • Each change in an innovation process is due to interaction from one or two other innovation processes	Rukanova et al. (2009) Damsgaard & Lyytinen (1998) Ellen et al. (1991) Orlikowski (2000)

Table 7.5 Interaction within Three Innovation Processes

7.3.3 Framework Development

In order to extend existing knowledge, this research also compared the findings with the prior literature, and developed a framework for achieving a greater understanding of the complex E-Learning innovation process with its triple aspects and interactions. As stated in Chapter 2, previous researchers have studied only one aspect of E-Learning innovation, especially E-Learning technological innovation, but few

studies consider combinations of these, or cover the same areas as the present research. This research found, firstly, that most individual observations on innovation process or interaction were supported by the existing literature. Secondly, however, results of this research proved the limitations of the current literature by demonstrating its lack of a combined analysis of triple aspects of organizational, technological and service innovation. Figure 7.5 illustrates a simplified framework which summarises the complex results of this research.

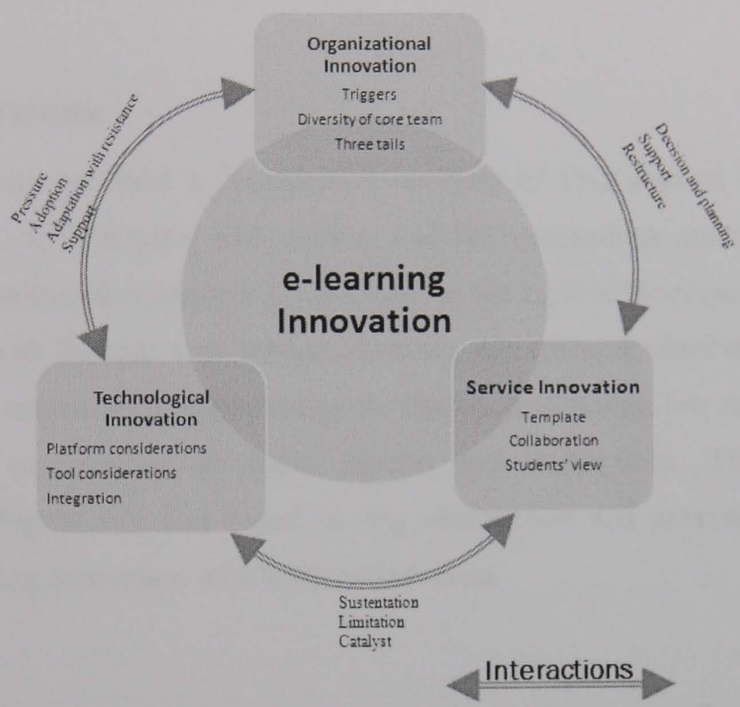

Figure 7.5 Framework Developed by the Researcher

7.3.4 Managerial Accounts of the Research Framework

In the last section the author stated that the research framework (Figure 7.5) followed a pattern matching strategy where the information was gathered from the chosen research site and compared with the results of current literature. By utilizing this detailed method, the framework was able to illustrate how the E-Learning innovation process inter-related with three sub processes, and to show the inner-interaction in an objective and unbiased manner. The research obtained a wide coverage from different individuals at university

level and from different stakeholders. With the knowledge provided by this research, organizations can more easily detect reasons for and solutions to problems within their E-Learning development. The research framework can facilitate the implementation of E-Learning in speeding up the progress and hopefully achieve a more satisfactory outcome. For example: senior management officers could propose a comprehensive E-Learning strategy by integrating all the resources; technicians could pay more attention to different subject areas; and the academic writers of E-Learning could take more account of the pressures of time faced by the technicians.

7.4 Conclusions

This chapter has provided a comparative analysis of four aspects of innovation: organizational, technological and service, and the interactions among these triple aspects. The comparative analysis is structured in the light of the research objectives. By contrasting its findings with related literature, this research observed that most of the individual results were supported in the literature, although few research studies explored the combination of triple aspects and interactions. The framework, illustrated in Figure 7.5, was based on this observation and presents a simplified triple E-Learning innovation with triple interactions.

CHAPTER 8 CONCLUSIONS

Chapter 8 presents the conclusions, contributions, and recommendations for future research arising from this research. The chapter includes an introduction; review of the methodology; restatement of the research questions; review of the findings by conclusions drawn from research questioning; contributions to the literature; questions and suggestions for future research.

8.1 Reflection on Previous Chapters

8.1.1 Current Debates and Perspectives

Chapter 2 critically examined the current literature, focusing mainly on the areas of E-Learning, innovation process, and interaction. The research focused on mainly E-Learning in the context of higher education institutions. Within the discussion of innovation process, three innovations - organizational, technological and service - were introduced, especially within the E-Learning context. The interactions among those innovation processes can be divided into three types: interaction between organizational-technological innovation; technological-service innovation; and organizational-service innovation. This drew attention to a theoretical gap, namely, that the concept of the E-Learning development process with three aspects of innovation was under-developed.

E-Learning has been extremely popular in the education sector, with the growth of Internet usage (Rungtusanatham et al., 2004). Given its benefits, E-Learning is applied by many organizations to essential training and teaching supplements and as an alternate learning channel. E-Learning provides the opportunity to change traditional learning styles, and is a comprehensive way to share knowledge (Zhang and Nunamaker, 2003). Many studies have proposed that E-Learning implementation is a process of innovation (Romiszowski, 2004; De Freitas and Oliver, 2005; Hardaker and Smith, 2000) and so focus on technological innovation (Rossiter, 2007; Salmon, 2005). For example, even though UKeU received sufficient funding

from the government and had the most advanced platform technology at that time, the project still failed. It is necessary to reconsider the E-Learning innovation process in a more comprehensive manner rather than as a single process. From the viewpoint of senior management or the stakeholder, the study considered the E-Learning innovation process from three aspects, organizational, technological and services.

Organizational innovation has been consistently used to describe an organization's behaviour when adopting and introducing new ideas within it (e.g. Oerlemans et al., 1998; Zammuto and O'connor, 1992). More recently, there has been a significant shift in the focus of understanding organizational processes, relationships and boundaries (Pettigrew and Fenton, 2000). From the viewpoint of organizational innovation, it is clear that E-Learning implementation is more than merely the adoption of a technology to change the way in which education is delivered and received. Rather, it can often be a change that requires the adopting organizations to perform radical re-engineering and adjustment in a relatively comprehensive manner. The deployment of E-Learning technology is also a crucial process that should be taken into account by senior management.

The discussion of technological innovation indicated that technology has been identified as an important competitive weapon for research-intensive firms (Frohman, 1982). The innovation process requires the technological development of an invention. However, technological innovation can often be difficult to initiate. In this research, technological innovation includes E-Learning platform development, course delivery methods, and E-Learning infrastructure development, all of which are, typically, the key ingredients of an E-Learning innovation. There are three types of technological innovation processes applied in this research: IS innovation (Iivari et al., 2000), technology adoption and tool adoption (Orlikowski, 1993).

The review of the current literature suggests that the definition of service innovation is different from that of product innovation, and also the new service development process should be considered as distinct from the NPD process (Menor et al., 2002). It is clear that E-Learning development involves both product and service innovation, but the rationale behind perceiving the design and implementation of an E-Learning project as a service innovation is twofold, as explained in Section 2.5.3. The literature review observes that the development of service innovation in the context of E-Learning is mainly based on two stages, namely, course design and course delivery.

The discussion in Section 2.6 stated the relationship between each pair of these three types of innovation. It is clear that little research focuses on the interaction between two aspects of innovation (Abdomerovic and Blakemore, 2002), especially the interaction between each stage of innovation process or three aspects of innovation. The concept of interaction between different levels of innovation is also a key to promoting E-Learning innovation.

8.1.2 Research Methodology

Chapter 3 elaborated on the multiple research objectives of investigating the processes of E-Learning innovation; the interaction between the different levels of innovation; and the issues which influence those processes, meeting these questions through the collection and analysis of empirical evidence. Based on the philosophical stance of phenomenology, qualitative research was undertaken to interpret the social actor's perception of the meanings embedded within their social settings (Cochran and Dolan, 1984). Additionally, a lack of theories with regard to the E-Learning innovation process has been addressed by this thesis, which has employed a pattern matching strategy (Campbell, 1975; Campbell, 1966; Trochim, 1989). Using a case study approach as the main research design for building emerging theories (Eisenhardt, 1989; Orlikowski, 1993; Langley, 1999), research methods, including interviews, on-site observations and documentation, were employed to collect evidence. This helped not only to ensure construct validity (Yin, 2003b), but also to

triangulate the data and ensure the reliability of the research findings (Bryman, 1989; Denzin, 1989).

An analysis of the data collected from the research sites was carried out based on the four types of strategies of understanding process data proposed by Langley (1999), as well as the technique of event listing displays suggested by Miles and Huberman (1994). During the stage of narrative strategy, the focus of analysis aimed to construct a detailed story from raw data which is also a tool for validation (Eisenhardt, 1989). The visual mapping strategy which was presented by the event listing displays technique helped to clarify the process stage based on the data. The pattern-matching strategy is a consistent mechanism linking the data to propositions (Campbell, 1975; Campbell, 1966). The final stage of analysis focused on selection, integration, refinement and validation. In other words, the case studies were compared with the three aspects and identified patterns relating to the process.

The emerging E-Learning innovation process theory was then compared with a broad range of literature. Such a comparison helped to ensure not only the new theory's internal validity, but also generalisation and conceptualisation (Eisenhardt, 1989). Additionally, a literature comparison facilitated the exploration of new opportunities for analysing and interpreting the data, especially when the new theory contradicted the current literature (Eisenhardt 1989).

8.1.3 The Case Studies of National Chung Cheng University and University of Nottingham

The pilot study of this research was conducted with the National Chung Cheng University, Taiwan, recognised as one of the three leading universities for E-Learning development by the Taiwanese Ministry of Education. The experience gained from the National Chung Cheng University produced three key aspects in E-Learning development - organizational, technological and service - that are not fully explored in the current literature. Moreover, during the interview, the

interviewees also drew attention to the existence and importance of the interaction between these three aspects.

The main case study was conducted with the University of Nottingham, which has been one of the pioneers of E-Learning implementation in UK universities since 1999. Unlike other UK universities, E-Learning development at the University of Nottingham covers all campuses, schools and centres. This research employed three School E-Learning projects, selected mainly because they were developed in different situations, thus providing a comprehensive as well as an in-depth E-Learning study: for example, the E-Learning project in the School of Mathematics was developed at an early stage of whole-university E-Learning development; the E-Learning project in the School of Geography was developed when the University's E-Learning development had reached a mature stage; and the E-Learning project in the School of Education is an example of collaboration with other universities.

8.2 Contributions

8.2.1 A Synergistic Account of E-Learning Innovation Process

Given the synergistic nature of this study, one of the major contributions is to provide an integrated and novel account of the E-Learning development process. Three interrelated innovation processes of integration were proposed that not only provided a critical comparison with current empirical findings, but also synthesised numerous areas that have until now been examined in isolation.

The discussion of the organizational E-Learning innovation process identified that the organizational aspect is the most complex part of E-Learning innovation compared with technological and service innovation, discussed by only a few researchers (Mcpherson and Nunes, 2006). The result indicated three critical dimensions of presenting the E-Learning organizational innovation process: triggers for E-Learning innovation; diversity of core team setup for E-Learning innovation; and three tails of organizational innovation process.

This study argued that the triggers for E-Learning innovation vary according to different contexts with an interactive approach involving the three levels - individual, school and university - and observed that most previous research focused only on the triggers at individual and university levels. Based on the organizational learning framework developed by Crossan et al (1999) which elaborated that the individual was the trigger of organizational learning only, this present research demonstrated that group and organization are also triggers, proposing a revised two-way interactive trigger framework for E-Learning.

By exploring the organizational innovation process, this study has extended the Rogers' theory (1995) by indicating three different organizational innovation processes with different value impact, named "three tails". It also contributed knowledge to the literature on organizational innovation process by describing value creation and transfer among individuals, groups and organizations. More importantly, these three tails are not isolated but integrated - this can be viewed as three stages for organizational innovation process.

This study explored the E-Learning technological innovation process by developing a process which integrated platform and tool application processes, and provided two classifications of platform selection and three dimensions of tool applications, previously neglected by most previous studies (Ardito et al., 2006; Morrison, 2003).

8.2.2 Interaction within Three Innovation Processes

This research study is the first to focus on "multi-dimensional" interaction between two or even three parallel interdependent processes. The present research also identified patterns of interaction between each two out of three innovation processes (organization, technology, and service), the results indicating that while "interaction" implies influences to both related processes, each category of interaction leads to different efforts for different innovation processes; previous research has examined only the impact of one side on another side's process (Leonardi (2007).

This study reported that the E-Learning innovation process is related to three parallel innovation processes. An overview of the whole E-Learning innovation process indicated that triple interaction is more complex compared with bi-interaction. The characteristics of the triple interaction were identified, based on the theory of the delicate equilibrium posture by Ellen et al. (1991) and Orlikowski (2000).

8.2.3 A Contemporary E-Learning Definition

The author stated a preliminary definition of E-Learning in section 2.1.1. In the literature review which followed, he gave a broader definition of E-Learning which integrated the preliminary definition and organizational, technological and services innovation processes. The research did prove the E-Learning definition proposed by the researcher in section 2.7.2. In addition, the research framework requires that the interactions between the three innovation processes be included in the extended contemporary definition of E-Learning as "*A complete network system that engages the processes and interaction of technology (hardware, software), organization and service to deliver a broad array of solutions that enhance knowledge and performance, and in which the organizational innovation process secures E-Learning system development, the technological innovation process constructs the system and the service innovation process involvement enhances the diversity of E-Learning*".

8.3 Limitations and Future Research

Despite its significant contribution to knowledge, this investigation into E-Learning innovation has limitations that are not yet overcome and more research effort is called for. This section summarises these limitations and makes a number of suggestions for future research directions.

Firstly, this research investigated as a pilot study several universities for case selection and subsequently decided to use the University of Nottingham for the case study. The main reason is the pioneer of E-Learning development in the UK and also

embeds one of the popular E-Learning platforms, which occupies almost 70% of the E-Learning commercial market. However, although this case can present general E-Learning development in higher education, other E-Learning application patterns exist. For example, some universities have developed their own E-Learning platforms; E-Learning development does not cover entire universities; several E-Learning platforms are embedded into the same university at the same time. The selection of a single university to conduct the research may have biased the result. If further research can be extended to cover a variety of E-Learning development situations in different universities, findings will therefore be more comprehensive.

Secondly, there are several types of E-Learning application (due to different definitions of E-Learning) in higher education, and this research focused on the most popular type, which applies E-Learning as a traditional teaching assistance/supplement, implying that, in this environment, the traditional style of teaching and learning still exists. Most of the E-Learning development at the UoN belongs to this type. There is another application type which uses E-Learning to provide a fully virtual teaching and learning environment. Although few institutes of higher education apply this kind of E-Learning, it is a potential pattern, and further study may take this type of E-Learning application into account.

Thirdly, while in the main the author considered the management's viewpoint, he is aware that every stakeholder is deemed to be equally important. In particular, the student viewpoint was not a strong focus point in this thesis, and it is recommended that this should be addressed in future research.

Fourthly, the period of E-Learning development in higher education is usually quite long; for example, E-Learning was first officially embedded at the UoN in 2000 and to date, the first generation of development has not yet been completed, especially the technological innovation cycle. Many higher education institutions are in the same situation, as illustrated in the pilot study of this research. In order to develop a more comprehensive E-Learning development process with the three innovation

aspects, the employment of a longitudinal approach will enable future research to observe the changes in E-Learning development in higher education. In particular, the technology innovation cycle is the most unpredictable issue in E-Learning research. In this area, technology is developing quickly. Consequently, it is necessary to declare that the research has some limitations and the findings may only be valid for a certain time period.

Finally, the research mainly focused on mapping the E-Learning innovation process and the interactions between the three sub-processes using qualitative methods. It is also possible to adopt quantitative methods to study and validate the process. This research contributes the interaction model of innovation process in E-Learning to the literature. It is also a potential research topic for quantitative researchers to work on in order to verify the factors the research found and modify the framework in the light of findings and present a comprehensive innovation interaction model.

REFERENCE

(2001) E-Learning User Survey. *E-learning Magazine [internet]available at <http: www.elearningmag.com/elearning/article/articlelist.jsp?categoryId=774_ <http://www.elearningmag.com/elearning/article/articlelist.jsp?categoryId= 774>> accessed 9 April 2002.*

(2007) MediaTec Publishing. Available at: <http://www.clomedia.com/in-the-news/2007/September/1916/index.php> [Accessed 18 July, 2008]

Abbott, A. (1988) Transcending General Linear Reality. *Sociological Theory,* 6(Fall), pp.169-186.

Abdomerovic, M. & Blakemore, G. (2002) Project Process Interactions. *International Journal of Project Management,* 20(4), pp.315-323.

Abernathy, W. J. & Clark, K. B. (1985) Innovation, Mapping the Winds of Creative Destruction. *Research Policy,,* 14(1), pp.54-69.

Alam, I. (2006) Service Innovation Strategy and Process: A Cross-National Comparative Analysis. *International Marketing Review,* 23(3), pp.234-254.

Alam, M., Gale, A., Brown, M. & Kidd, C. (2008) The Development and Delivery of an Industry Led Project Management Professional Development Programme: A Case Study in Project Management Education and Success Management. *International Journal of Project Management,* 26(3), pp.223-237.

Alavi, M. & Leidner, D. E. (2001a) Research Commentary: Technology-Mediated Learning--a Call for Greater Depth and Breadth of Research. *Information Systems Research,* 12(1), pp.1-10.

Alavi, M. & Leidner, D. E. (2001b) Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly,* 25(1), pp.107-136.

Albino, V., Garavelli, A. C. & Schiuma, G. (1999) Knowledge Transfer and Inter-Firm Relationships in Industrial Districts: The Role of the Leader Firm. *Technovation,* 19, pp.53-63.

Aldrich, H. E. (2001) Who Wants to Be an Evolutionary Theorist? Remarks on the Occasion of the Year 2000 Omt Distinguished Scholarly Career Award Presentation. *Journal of Management Inquiry,* 10(2), pp.115.

Ali, A., Krapfel, R., Jr & Labahn, D. (1995) Product Innovativeness and Entry Strategy: Impact on Cycle Time and Break-Even Time. *Journal of Product Innovation Management,* 12(1), pp.54-69.

Allen, J. P. (2000) Information Systems as Technological Innovation. *Information Technology & People,* 13(3), pp.210-221.

Allen, M. W. (2008) Addressing Diversity in (E-) Learning: In Conversation with Michael W. Allen, Available at: <http://suppes-corpus.stanford.edu/article.html?id=426> [Accessed

Alonso, F., López, G., Manrique, D. & Viñes, J. M. (2005) An Instructional Model for Web-Based E-Learning Education with a Blended Learning Process Approach. *British Journal of Educational Technology,* 362, pp.217-235.

Alshara, O. & Alsharo, M. (2007) E-Learning and the Educational Organizations Structure Reengineering (Eosr). *International Journal of Emerging Technologies in Learning,* 2(3).

Altheide, D. & Johnson, J. (1997) Ethnography and Justice. In Miller, G. & Dingwall, R. (Eds.), *Context & Method in Qualitative Research.* London, Sage.

Andersson, B. & Wallin, A. (2006) On Developing Content-Oriented Theories Taking Biological Evolution as an Example *International Journal of Science Education.* Routledge.

Arabasz, P. & Baker, M. (2003) Respondent Summary: Evolving Campus Support Models for E-Learning Courses, Available at: <http://www.educause.edu/ir/library/pdf/EKF/ekf0303.pdf> [Accessed 26/08/2009]

Ardito, C., Costabile, M., Marsico, M., Lanzilotti, R., Levialdi, S., Roselli, T. & Rossano, V. (2006) An Approach to Usability Evaluation of E-Learning Applications. *Universal Access in the Information Society,* 4(3), pp.270-283.

Arnold, M. (2003) Intranets, Community, and Social Capital: The Case of Williams Bay. *Bulletin of Science Technology Society,* 23(2), pp.78-87.

Atkinson, R. (1999) Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria *International Journal of Project Management,* 17(6), pp.337-342.

Avlonitis, G. J., Papastathopoulou, P. G. & Gounaris, S. P. (2001) An Empirically-Based Typology of Product Innovativeness for New Financial Services: Success and Failure Scenarios. *Journal of Product Innovation Management,* 18(5), pp.324-342.

Bacsich, P. (2005) Lessons to Be Learned from the Failure of the Uk E-University, Available at: <http://www.naec.org.uk/links/lessons-to-be-learned-from-the-failure-of-the-uk-e-university> [Accessed 10 Sep, 2009]

Banker, R. D. & Kauffman, R. J. (2004) The Evolution of Research on Information Systems: A Fiftieth-Year Survey of the Literature In "Management Science". *Management Science,* 50(3), pp.281-298.

Barker, P. G. & Yeates, H. (1985) *Introducing Computer Assisted Learning,* Englewood Cliffs Prentice-Hall.

Barki, H. & Hartwick, J. (2001) Interpersonal Conflict and Its Management in Information System Development. *MIS Quarterly,* 25(2), pp.195-228.

Barras, R. (1986) New Technology and the New Services. *Futures,* 18(6), pp.679-688.

Barson, J. & Debski, R. (1996) Calling Back Call: Technology in the Service of Foreign Language Learning Based on Creativity, Contingency and Goal-Oriented Activity. IN Warschauer, I. M. (Ed.) *Telecollaboration in foreign language learning.* Honolulu HI, Second Language Teaching and Curriculum Center, University of Hawaii.

Bates, T. (2001) National Strategies for E-Learning in Post-Secondary Education and Training.United Nations Educational, Scientific and Cultural Organization

Becker, H. (1992) *Cases, Causes, Conjunctures, Stories and Imagery 1992, in Ragin E Becker, What Is a Case? Exploring the Foundations of Social Inquiry,* LA, Cambridge University Press.

Becker, M. C., Lazaric, N., Nelson, R. R. & Winter, S. G. (2005) Applying Organizational Routines in Understanding Organizational Change. *Ind Corp Change,* 14(5), pp.775-791.

Becker, M. C. & Zirpoli, F. (2008) Applying Organizational Routines in Analyzing the Behavior of Organizations. *Journal of Economic Behavior & Organization,* 66(1), pp.128-148.

Belassi, W. & Tukel, O. I. (1996) A New Framework for Determining Critical Success/Failure Factors in Projects. *International Journal of Project Management,* 14(3), pp.141-151.

Belout, A. & Gauvreau, C. (2004) Factors Influencing Project Success: The Impact of Human Resource Management. *International Journal of Project Management,* 22(1), pp.1-11.

Berge, Z. (2002) Obstacles to Distance Training and Education in Corporate Organisations. *Journal of Workplace Learning,* 14(5/6), pp.182-190.

Bitzer, D. L., Braunfeld, P. G. & Lichtenberger, W. W. (1962) Plato Ii: A Multiple-Student, Computer-Controlled, Automatic Teaching Device. In Coulson, J. (Ed.) *Programmed Learning and Computer-Based Instruction.,* New York, John Wiley.

Bitzer, D. L. & Skaperdas, D. (1968) Plato Iv - an Economically Viable Large Scale Computer-Based Education System.National Electronics Conference (Dec, 1968).

Bitzer, D. L. & Skaperdas, D. (1969) The Design of an Economically Viable Large-Scale Computer Based Education System.Illinois Univ., Urbana. Computer-Based Education Research Lab.

Blackler, F. & Brown, C. (1985) Evaluation and the Impact of Information Technologies on People in Organizations. *Human Relations,* 38(3), pp.213-231.

Blaikie, N. (1993) *Approaches to Social Enquiry,* Cambridge., Polity Press.

Blalock, H. M. (1972) *Social Statistics,* New York, McGraw-Hill.

Bloodgood, J. M. & Salisbury, W. D. (2001) Understanding the Influence of Organizational Change Strategies on Information Technology and Knowledge Management Strategies. *Decision Support Systems,* 31(1), pp.55-69.

Boehrer, J. & Linsky, M. (1990) *Teaching with Cases: Learning to Question. The Changing Face of College Teaching (Ed. M.D. Svinicki),* San Francisco, Jossey-Bass, Inc.

Boeker, W. (1989) Strategic Change: The Effects of Founding and History. *Academy of Management Journal.* Academy of Management.

Booz, A. & Hamilton (1982) *New Product Management for the 1980s',* New York, Booz, Allen and Hamilton Inc.

Bowers, M. R. (1989) Developing New Services: Improving the Process Makes It Better. *Journal of Services Marketing,* 3(1), pp.15.

Bowes, J. E. (1997) Communication and Community Development for Health Information: Constructs and Models for Evaluation. Available at: <http://nnlm.gov/evaluation/pub/bowes/> [Accessed 26, Oct, 2008]

Box, K. (1999) Human Interaction During Teacher Training Courses Delivered Via the Internet.Society for InformationTechnology&Teacher Education Conference, San Antonio.

Branon, R. F. & Essex, C. (2001) Synchronous and Asynchronous Communication Tools in Distance Education. *TechTrends* 45(1), pp. 41-42.

Brewer, S. (1998) Online Connections. *Home PC,* 5(4), pp.117.

Britain, S. & Liber, O. (2004) A Framework for the Pedagogical Evaluation of eLearning Environments. Bolton Institute of Higher Education

Brittain, S., Glowacki, P., Ittersum, J. V. & Johnson, L. (2006) Podcasting Lectures. *Podcasting lectures,* 3, pp.24-31.

Brown, S. L. & Eisenhardt, K. M. (1997) The Art of Continuous Change: Linking Complexity Theory and Time-Paced Evolution in Relentlessly Shifting Organizations. *Administrative Science Quarterly.* Administrative Science Quarterly.

Bruner, J. (1991) *Acts of Meaning,* Cambridge, MA, Harvard University Press.

Bryant, T. & Charmaz, K. (2007) *The Sage Handbook of Grounded Theory,* London, SAGE.

Bryman, A. (1989) *Research Methods and Organisation Studies,* London, UNWIN HYMAN Ltd.

Bryman, A. & Burgess, R. (1999) Introduction: Qualitative Research Methodology- a Review. In Bryman, A. & Burgess, R. (Eds.), *Qualitative Research Volume I.* London, Sage.

Burns, R. (2007) Supporting Staff Development through Change in Learning Technologies in Higher Education. Nottingham, University of Nottingham.

Burton Swanson, E. (1994) Information Systems Innovation among Organizations. *Management Science,* 40(9), pp.1069-1092.

Buzzacchi, L., Colombo, M. G. & Mariotti, S. (1995) Technological Regimes and Innovation in Services: The Case of the Italian Banking Industry. *Research Policy,* 24(1), pp.151-168.

Campanella, S., Dimauro, G., Ferrante, A., Impedovo, D., Impedovo, S., M. G. Lucchese, Modugno, R., Pirlo, G., Sarcinella, L., Stasolla, E. & Trullo, C. A. (2008) E-Learning Platforms in the Italian Universities: The Technological Solutions at the University of Bari. *Wseas Transactions on Advances in Engineering Education* (5), pp.12-19.

Campbell, D. (1975) Degrees of Freedom and the Case Study. *Comparative Political Studies,* 8, pp.178-185.

Campbell, D. T. (1966) Pattern Matching as an Essential in Distal Knowing. In Hammond, K. R. (Ed.) *The Psychology of Egon Brunswick.* New York, Holt, Rinehart and Winston.

Campbell, L. M., Blinco, K. & Mason, J. (2004) Repository Management and Implementation available at < http://www.jisc.ac.uk/uploaded_documents/Altilab04-repositories.pdf > [accessed 13 April, 2007]

Carnevale, A. P. (1991) *America and the New Economy.* San Francisco, CA. Jossey-Bass,

Cassell, C. & Symon, G. (1994) *Qualitative Methods in Organizational Research: A Practical Guide.* , London, Sage.

Chakravarthy, B. S. & White, R. E. (2001) *Strategy Process: Making, Shaping and Validating Strategic Decisions,* Sage Publications.

Chan, A. P. C., Scott, D. & Lam, E. W. M. (2002) Framework of Success Criteria for Design/Build Projects. Journal of Management in Engineering, 18, pp.120.

Charmaz, K. (2006) *Constructing Grounded Theory : A Practical Guide through Qualitative Analysis,* London, Sage Publications.

Charp, S. (1997) Some Reflections. (the 30-Year History of Computers in Education). *T H E Journal (Technological Horizons In Education),* 24(1), pp.8-11.

Checkland, P. & Holwell, S. (1998) *Information, Systems, and Information Systems: Making Sense of the Field,* Chichester., John Wiley & Sons,.

Chen, P. & Partington, D. (2004) An Interpretive Comparison of Chinese and Western Conceptions of Relationships in Construction Project Management Work. *International Journal of Project Management,* 22(5), pp.397-406.

Cleary, K., Danaher, P. A. & Harreveld, R. E. (2006) Engaging Pedagogies and Facilitating Pedagogues: Communities of Practice among Novice Online Tutors and Secondary Vocational Teachers at the Forefront of Systemic Tensions and Change.the annual AARE conference, (November 27-30), Adelaide.

Clegg, S., Alison, H. & Steel, J. (2003) The Emperor's New Clothes: Globalisation and E-Learning in Higher Education. *British Journal of Sociology of Education,* 24(1), pp.39-53.

Cochran, D. & Dolan, J. (1984) Qualitative Research: An Alternative to Quantitative Research in Communication. *The Journal of Business Communication,* 21(4), pp.25-32.

Columbia, T. U. O. B. (2004) Ubc Computer Scientist Wins $100,000 Award for Popular Course Software Http://Www.E-Strategy.Ubc.Ca/News/Update0409/040929-Goldberg.Html. Vancouver: Available at: <http://www.e-strategy.ubc.ca/news/update0409/040929-goldberg.html> [Accessed 10 Aug, 2009]

Connolly, T. M. & Stansfield, M. (2007) From E-Learning to Games-Based E-Learning: Using Interactive Technologies in Teaching an Is Course. *International Journal of Information Technology & Management,* 6(2-4), pp.1-1.

Cook, J. A. & Fonow, M. M. (1990) *Feminist Research Methods: Exemplary Readings in the Social Sciences,* McCarl Nielsen, Westview Press.

Cooper, R. B. (2000) Information Technology Development Creativity: A Case Study of Attempted Radical Change. *MIS Quarterly,* 24(2), pp.245-276.

Cooper, R. B. & Zmud, R. W. (1990) Information Technology Implementation Research: A Technological Diffusion Approach. *Management Science,* 36(2), pp.123-139.

Corbin, J. M. & Strauss, A. L. (2008) *Basics of Qualitative Research : Techniques and Procedures for Developing Grounded Theory,* Los Angeles, Calif., Sage Publications, Inc.

Cormican, K. & O'sullivan, D. (2004) Auditing Best Practice for Effective Product Innovation Management. *Technovation,* 24(10), pp.819-829.

Crawford, L., Hobbs, B. & Turner, J. R. (2005) *Project Categorization Systems.* , Project Management Institute, Newton Square, PA, USA.

Crossan, M., Lane, H. W. & White, R. E. (1999) An Organizational Learning Framework: From Intuition to Institution. *Academy of Management Review,* 24(3), pp.522-538.

Curtain, R., Gough, R. & Rimmer, M. (1992) Progress at the Workplace: Workplace Reform and Award Restructuring. AGPS, Canberra.

Czarniawska, B. (1997) *Narrating the Organization: Dramas of Institutional Identity,* Chicago, University of Chicago Press.
Czarniawska, B. (1998) *A Narrative Approach to Organisation Studies,* Newbury Park, Sage.
Dalziel, J. (2003) Open Standards Versus Open Source in E-Learning-the Easy Answer May Not Be the Best Answer. *Educause Quarterly,* 4, pp.4-7.
Damanpour, F. (1991) Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators. *Academy of Management Journal,* 34(3), pp.555-590.
Damanpour, F. & Evan, W. M. (1984) Organizational Innovation and Performance: The Problem Of "Organizational Lag". *Administrative Science Quarterly,* 29(3), pp.392-409.
Damanpour, F. & Gopalakrishnan, S. (2001) The Dynamics of the Adoption of Product and Process Innovations in Organizations. *Journal of Management Studies,* 38(1), pp.45-65.
Damsgaard, J. & Lyytinen, K. (1998) International Trade at the Speed of Light: Building an Electronic Trading Infrastructure in Denmark, Finland, and Hong Kong. The IFIP WG8.2 and 8.6 Joint Working Conference on Information Systems: Current Issues and Future Challenges, Helsinki, Finland.
Das, S. S. & Ven, A. H. V. D. (2000) Competing with New Product Technologies: A Process Model of Strategy. *Management Science,* 46(10), pp.1300-1316.
Datta, L.-E. (1990) *Case Study Evaluations.*, U.S. General Accounting Office, Washington, DC.
Davis, R. & Wong, D. (2007) Conceptualizing and Measuring the Optimal Experience of the Elearning Environment. *Decision Sciences Journal of Innovative Education,* 5(1), pp.97-126.
Dawson, P. (1997) In at the Deep End: Conducting Processual Research on Organizational Change. *Scandinavian Journal of Management,* 13(4), pp.389-405.
De Bakker, K., Boonstra, A. & Wortmann, H. (2009) Does Risk Management Contribute to IT Project Success? A Meta-Analysis of Empirical Evidence. *International Journal of Project Management,* In Press.
De Freitas, S. & Oliver, M. (2005) Does E-Learning Policy Drive Change in Higher Education?: A Case Study Relating Models of Organisational Change to E-Learning Implementation. *Journal of Higher Education Policy and Management,* 27(1), pp.81 - 96.
De Wit, A. (1988) Measurement of Project Success. *International Journal of Project Management,* 6(3), pp.164-170.
Debackere, K., Looy, B. V. & Papastathopoulou, P. (1998) Managing Innovation in a Service Environment. In Dierdonck, R. V., Looy, B. V., Gemmel, P. (Eds) (Ed.) *Service Management: An Integrated Approach.* London, Pitman Publishers.
Debevc, M. & Bele, J. L. (2008) Usability Testing of E-Learning Content as Used in Two Learning Management Systems. *European Journal of Open and Distance Learning,* 14(1).
Delcloque, P. (2000) The History of Call. Available at: <http://www.history-of-call.org> [Accessed 29 June, 2007]

Delone, W. H. & Mclean, E. R. (2003) The Delone and Mclean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems.* M.E. Sharpe Inc.

Denzin, N. (1989) *The Research Act: A Theoretical Introduction to Sociological Methods. (3rd Ed.),* Englewood Cliffs, NJ, Prentice Hall.

Denzin, N. K. & Lincoln, Y. S. (2000) *Handbook of Qualitative Research (2nd Ed.).* London, Sage.

Dietrich, G. B. & Walz, D. B. (1997) The Failure of SDT Diffusion: A Case for Mass Customization. *IEEE Transactions on Engineering Management,* 44(4), pp.390.

Doppler, K., Fuhrmann, H., Lebbe-Waschke, B. & Voigt, B. (2002) *Unternehmenswandel Gegen Widerstände: Change Management Mit Den Menschen* Frankfurt am Main, Campus Verlag.

Draper, A. K. (2004) The Principles and Application of Qualitative Research. *Proceedings of the Nutrition Society,* 63, pp.641-646.

Drazin, R. & Schoonhoven, C. B. (1996) Community, Population, and Organization Effects on Innovation: A Multilevel Perspective. *Academy of Management Journal,* 39(5), pp.1065-1083.

Drucker, P. F. (1985) *Innovation and Entrepreneurship,* New York, Harper & Row.

Easterby-Smith, M., Thorpe, R. & Lowe, A. (1991) *Management Research: An Introduction,* London, Sage.

Edgett, S. & Jones, S. (1991) New Product Development in the Financial Services Industry: A Case Study. *Journal of Marketing Management,* 7, pp.271-284.

Edmondson, A. C., Bohmer, R. M. & Pisano, G. P. (2001) Disrupted Routines: Team Learning and New Technology Implementation in Hospitals. *Administrative Science Quarterly,* 46(4), pp.685-716.

Eisenhardt, K. & Tabrizi, B. (1995) Accelerating Adaptive Process: Product Innovation in the Global Computer Industry. *Administrative Science Quarterly,* 40(1), pp.84-110.

Eisenhardt, K. M. (1989) Building Theories from Case Study Research. *Academy of Management Review,* 14(4), pp.532-550.

Eisenhardt, K. M. & Graebner, M. E. (2007) Theory Building from Cases: Opportunities and Challenges. *Academy of Management Journal,* 50(1), pp.25-32.

Elgort, I. (2005) E-Learning Adoption: Bridging the Chasm.Ascilite 2005 Conference, (4-7, December), Brisbane, Australia.

Ellen, P., Bearden, W. & Sharma, S. (1991) Resistance to Technological Innovations: An Examination of the Role of Self-Efficacy and Performance Satisfaction. *Journal of the Academy of Marketing Science,* 19(4), pp.297-307.

Ellis, R. A., Jarkey, N., Mahony, M. J., Peat, M. & Sheely, S. (2007) Managing Quality Improvement of Elearning in a Large, Campus-Based University. *Quality Assurance in Education,* 15(1), pp.9-23.

Ettlie, J. E., Bridges, W. P. & O'keefe, R. D. (1984) Organization Strategy and Structural Differences for Radical Versus Incremental Innovation. *Management Science,* 30(6), pp.682-695.

Felin, T. & Hesterly, W. S. (2007) The Knowledge-Based View, Nested Heterogeneity, and New Value Creation: Philosophical Considerations on the Locus of Knowledge. *Academy of Management Review,* 32(1), pp.195-218.

Fetaji, B. & Fetaji, M. (2007) E-Learning Indicators Approach to Developing E-Learning Software Solutions.EUROCON, 2007. The International Conference on "Computer as a Tool", 9-12 Sept. , Warsaw, Poland.
Fichman, R. G. (Ed.) (2000) *The Diffusion and Assimilation of Information Technology Innovations*, Pinnaflex Publishing.
Fichman, R. G. (2001) The Role of Aggregation in the Measurement of It-Related Organizational Innovation. *MIS Quarterly,* 25(4), pp.427-455.
Fichman, R. G. (2004) Real Options and It Platform Adoption: Implications for Theory and Practice. *Information Systems Research,* 15(2), pp.132-154.
Fishbein, M. & Ajzen, I. (1975) *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research,* Reading, Addison-Wesley.
Fitz, J. (1994) Implementation Research and Education Policy: Practice and Prospects. *British Journal of Educational Studies,* 42(1), pp.53-69.
Fitzsimmons, J. & Fitzsimmons, M. (2001) *Service Management: Operations, Strategy and Information Technology 3rd Ed.,* , New York, McGraw-Hill.
Fletcher, J. D. & Rockway, M. R. (1986) Computer-Based Training in the Military. In Ellis, J. A. (Ed.) *Military Contributions to Instructional Technology.* New York, Praeger.
Franceschi, K., Lee, R. M., Zanakis, S. H. & Hinds, D. (2009) Engaging Group E-Learning in Virtual Worlds. *Journal of Management Information Systems.* M.E. Sharpe Inc.
Freeman, C. (1989) *The Nature of Innovation and the Evolution of the Productive System* Maastricht, MERIT.
Frohman, A. L. (1982) Technology as a Competitive Weapon. *Harvard Business Review,* January-February, pp.97-104.
Fulford, H. & Rizzo, A. (2009) A Conceptual Model for the Strategic Orientation of Small Firms. *Journal of Enterprising Culture,* 17(1), pp.25-54.
Fullan, M. (2001) *The New Meaning of Educational Change,* London, Routledge Falmer.
Gallick, S. (1998) *Technology in Higher Education: Opportunities and Threats,* Los Angeles, Faculty Association of the University of California- Los Angeles.
Gamoran, A., Goldring, E. & Robinson, W. (1997) Background and Training of Teachers in Jewish Schools: Current Status and Levers for Change. *Religious Education,* 92(4), pp.534-550.
Garro, A., Palopoli, L. & Ricca, F. (2006) Exploiting Agents in E-Learning and Skills Management Context. *AI Communications,* 19(2), pp.137-154.
Gatignon, H. & Robertson, T. S. (1989) Technology Diffusion: An Empirical Test of Competitive Effects. *Journal of Marketing,,* 53(1), pp.35-49.
Gersick, C. J. G. (1988) Time an Transition in Work Teams: Toward a New Model of Group Development. *Academy of Management Journal,* 31(1), pp.9-41.
Gibbons, P. (2001) Schools Get Deeper into the Web. *BRW,* 23(10), pp.86.
Gilbert, C. (2005) Unbundling the Structure of Inertia: Resource Versus Routine Rigidity. *Academy of Management Journal,* 48(5), pp.741-763.
Gilbert, M. & Cordey-Hayes, M. (1996) Understanding the Process of Knowledge Transfer to Achieve Successful Technological Innovation. *Technovation,* 16(6), pp.301-312.
Gladieux, L. & Swail, W. (1999) *The Virtual University and Educational Opportunity: Issues of Equity and Access for the Next Generation,* New York,, College Board Publications.

Glaser, B. G. & Strauss, A. (1967) *A Discovery of Grounded Theory. Strategies for Qualitative Research*, Sociology Press
Glesne, C. & Peshkin, A. (1992) *Becoming Qualitative Researchers: An Introduction,* New York, Longman.
Gold, B. (1981) Technological Diffusion in Industry: Research Needs and Shortcomings. *The Journal of Industrial Economics,* 29(3), pp.247-269.
Goodyear, P., Banks, S., Hodgson, V. & Mcconnell, D. (2004) *Advances in Research on Networked Learning* Springer.
Gosain, S. (2004) Enterprise Information Systems as Objects and Carriers of Institutional Forces: The New Iron Cage? *Journal of the Association for Information Systems,* 5(4), pp.151-182.
Govindasamy, T. (2001) Successful Implementation of E-Learning: Pedagogical Considerations. *The Internet and Higher Education,* 4(3-4), pp.287-299.
Grailey, D. (2009) Popping out Perfect Podcasts. *e.learning age*, pp.22-23.
Greasley, A., Bennett, D. & Greasley, K. (2004) A Virtual Learning Environment for Operations Management: Assessing the Student's Perspective. *International Journal of Operations & Production Management,* 24(10), pp.974 - 993.
Greenagel, F. L. (2002) The Illusion of E-Learning:Why We're Missing out on the Promise of Technology, Available at: <http://www.guidedlearning.com/illusions.pdf> [Accessed 07 Aug, 2009]
Grönroos, C. (1990) *Service Management and Marketing: Managing the Moments of Truth in Service Competition.,* Lexington, Lexington Books.
Gummesson, E. (1991) *Qualitative Methods in Management Research,* London, Sage.
Gupta, A. K., Tesluk, P. E. & Taylor, M. S. (2007) Innovation at and across Multiple Levels of Analysis. *Organization Science,* 18(6), pp.885-897.
Guterman, E., Alberton, Y., Brickner, R. & Sagi, R. (2009) Course Coordinators' Beliefs, Attitudes and Motivation and Their Relation to Self-Reported Changes in Technology Integration at the Open University of Israel. *Interdisciplinary Journal of E-Learning and Learning Objects,* 5, pp.291-306.
Gyambrah, M. K. (2007) E-Learning Technologies and Its Application in Higher Education: A Descriptive Comparison of Germany, United Kingdom and United States.
Hage, J. (1980) *Theories of Organizations: Form, Process, and Transformation,* New York, Wiley.
Hage, J. T. (1999) Organizational Innovation and Organizational Change. *Annual Review of Sociology,* 25, pp.597-622.
Hakim, C. (1987) *Research Design. Strategies and Choices in the Design of Social Research,* London, Allen and Unwin.
Halawi, L. A., Mccarthy, R. V. & Pires, S. (2009) An Evaluation of E-Learning on the Basis of Bloom's Taxonomy: An Exploratory Study. *Journal of Education for Business.* Taylor & Francis Ltd.
Hammersley, M. & Atkinson, P. (1995) *Ethnography: Principles in Practice,* London, Routledge.
Hansen, M. (1999) The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits. *Administrative Science Quarterly,* 44(1), pp.82-111.

Hardaker, G. & Smith, D. C. (2000) E-Learning Innovation through the Implementation of an Internet Supported Learning Environment. *Educational technology and society,* 3(3), pp.422-432.
Hardgrave, B. C. & Johnson, R. A. (2003) Toward an Information Systems Development Acceptance Model: The Case of Object-Oriented Systems Development. *IEEE Transactions on Engineering Management,* 50(3), pp.322-336.
Harris, G. (2009) Church Historians Provide an Important Link to the Past. *The Christian Index.* Duluth, The Christian Index.
Hart, J. (2009) Top 100 Tools for Learning 2009 Available at: <http://www.c4lpt.co.uk/recommended/index.html> [Accessed 12 Aug, 2009]
Hartley, J. F. (1994) *Case Studies in Organizational Research", in Casell, C., Symon, G. (Eds),Qualitative Methods in Organizational Research,,* London, Sage.
Henderson, R. (1993) Underinvestment and Incompetence as Responses to Radical Innovation: Evidence from the Photolithographic Alignment Equipment Industry. *The RAND Journal of Economics,* 24(2), pp.248-270.
Henry, G. T., Dickey, K. C. & Areson, J. C. (1991) Stakeholder Participation in Educational Performance Monitoring Systems *Educational Evaluation and Policy Analysis* 13(2), pp.177-188.
Herriott, R. E. & Firestone, W. A. (1983) Multisite Qualitative Policy Research: Optimizing Description and Generalizability. *Educational Researcher,* 12(2), pp.14-19.
Hersen, M. & Barlow, D. H. (1976) *Single-Case Experimental Designs : Strategies for Studying Behavior Change,* New York ; Oxford, Pergamon.
Hess, D. & Rothaermel., F. (2007) Promising Research Directions for Research on Organizational Innovation.*Organ. Sci. Winter Conf.* Steamboat Springs, (February 8-11).
Hinings, C. R., Thibault, L., Slack, T. & Kikulis, L. M. (1996) Values and Organizational Structure. *Human Relations,* 49(7), pp.885-916.
Ho, W., Higson, H. E., Dey, P. K., Xu, X. & Bahsoon, R. (2009) Measuring Performance of Virtual Learning Environment System in Higher Education. *Quality Assurance in Education,* 17(1), pp.6-29.
Hodgson, V. E. (2002) The European Union and E-Learning: An Examination of Rhetoric, Theory and Practice. *Journal of Computer Assisted Learning,* 18, pp.240-252.
Hofstede, G. (1998) Identifying Organizational Subcultures: An Empirical Approach. *Journal of Management Studies,* 35(1), pp.1-12.
Holland, J. (1959) A Teaching Machine Program in Psychology. In Galanter, E. (Ed.) *Automatic Teaching: The State of the Art* New York, John Wiley.
Holliday, A. (1999) Small Cultures. *Applied Linguistics,* 20(2), pp.237-264.
Holmqvist, M. (2003) A Dynamic Model of Intra-and Interorganizational Learning. *Organization Studies,* 24(1), pp.95-123.
Hsui-Ping, Y. & Shihkuan, H. (2008) Designing a Learning Management System to Support Instruction. *Communications of the ACM,* 51(4), pp.59-63.
Huang, Z. & Palvia, P. (2001) ERP Implementation Issues in Advanced and Developing Countries. *Business Process Management,* 7, pp.276-284.
Huber, G. (1991) Organizational Learning: The Contributing Processes and the Literatures. *Organization Science,* 2(1), pp.88-115.

Huddlestone, J. & Pike, J. (2008) Seven Key Decision Factors for Selecting E-Learning. *Cogn Tech Work* 10, pp.237-247.

Hunt, S. & Benford, R. (1997) Dramaturgy and Methodology. In Miller, G. & Dingwall, R. (Eds.), *Context & Method in Qualitative Research.* London, Sage.

Hutchins, H. M. & Hutchison, D. (2008) Cross-Disciplinary Contributions to E-Learning Design: A Tripartite Design Model. *Journal of Workplace Learning,* 20(5), pp.364-380.

Huynh, M. Q., Umesh, U. N. & Valacich, J. S. (2003) E-Learning as an Emerging Entrepreneurial Enterprise in Universities and Firms. *Communications of AIS.* Association for Information Systems.

Ibbs, W. C. & Kwak, Y. H. (1997) *The Benefits of Project Management* Project Management Institute, Newton Square, PA, USA.

Iivari, J., Hirschheim, R. & Klein, H. K. (2000) A Dynamic Framework for Classifying Information Systems Development Methodologies and Approaches. *Journal of Management Information Systems,* 17(3), pp.179-218.

Janesick, V. (1994) The Dance of Qualitative Research Design: Metaphor, Methodolatry, and Meaning. In Denzin, N. & Lincoln, Y. (Eds.), *Handbook of Qualitative Research.* London, Sage.

Jawahar, I. M. & Mclaughlin, G. L. (2001) Toward a Descriptive Stakeholder Theory: An Organizational Life Cycle Approach. *The Academy of Management Review,* 26(3), pp.397-414.

Jean, G., Faiz, G. & Olivier, W. (1995) New Modes of Innovation: How Services Benefit Industry. *International Journal of Service Industry Management,* 6(3), pp.4.

Jebeile, S. & Reeve, R. (2003) The Diffusion of E-Learning Innovations in an Australian Secondary College: Strategies and Tactics for Educational Leaders. *The Innovation Journal,* 8(4).

Jennifer Gilbert, S. M. J. R. (2007) E-Learning: The Student Experience. *British Journal of Educational Technology,* 38(4), pp.560-573.

Jick, T. D. (1979) Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly,* 24, pp.602-611.

Johne, A. & Storey, C. (1997) New Service Development: A Review of the Literature and Annotated Bibliography. London, City University Business School

Johnson, S. P., Larry J. Menor, Aleda V. Roth & Chase, R. B. (2000) *"A Critical Evaluation of the New Service Development Process: Integrating Service Innovation and Service Design," In New Service Development: Creating Memorable Experiences,* Thousand Oaks, Sage Publications.

Jones, A. J. (2003) ICT and Future Teachers: Are We Preparing for E-Learning? the IFIP Working Groups 3.1 and 3.3 Conference: ICT and the Teacher of the Future, (January 27-31), Melbourne, Australia.

Jones, E. R. (2002) Implications of Scorm and Emerging E-Learning Standards on Engineering Education. *Proceedings of the 2002 ASEE Gulf-Southwest Annual Conference.* Lafayette.

Jones, N. & O'shea, J. (2004) Challenging Hierarchies: The Impact of E-Learning. *Higher Education,* 48(3), pp.379-395.

Jones, S. (1985) The Analysis of Depth Interviews. In Walker, R. (Ed.) *Applied Qualitative Research.* Hants, Gower.

Joyes, G. & Frize, P. (2005) Valuing Individual Differences within Learning: From Face-to-Face to Online Experience. *International Journal of Teaching and Learning in Higher Education,* 17(1), pp.33-41.

Kahn, K. B., Castellion, G. & Griffin, A. (2004) *The Pdma Handbook of New Product Development*, Wiley, John & Sons, Inc.

Karelis, C. (1999) Education Technology and Cost Control: Four Models. *Syllabus Magazine.*

Katchen, J. E. (2008) Using E-Learning to Teach Linguistics Courses. pp.1-11.

Kayte O'neill, Singh, G. & O'donoghue, J. (2004) Implementing Elearning Programmes for Higher Education: A Review of the Literature. *Journal of Information Technology Education,* 3, pp.313-323.

Kelly, A. E. (1998) *Technology in American Schools: Seven Dimensions for Gauging Progress.A Policymaker's Guide.,* Santa Monica, Milken Family Foundation.

Kerstetter, K. (2009) Educational Applications of Podcasting in the Music Classroom. *Music Educators Journal,* 95(4), pp.23-26.

Khan, B. H. (2004) The People–Process–Product Continuum in E-Learning: The E-Learning P3 Model. *Issue of Educational Technology,* 44(5), pp.33-40.

Kieslinger, B., Wild, F. & Arsun, O. (2006) Icamp: The Educational Web for Higher Education 1st European Conference on Technology Enhanced Learning (October 1-4), Crete, Greece.

Kimberly, J. R. & Evanisko, M. J. (1981) Organizational Innovation: The Influence of Individual, Organizational, and Contextual Factors on Hospital Adoption of Technological and Administrative Innovations. *Academy of Management Journal,* 24(4), pp.689-713.

King, N. & Anderson , N. (1995) *Innovation and Change in Organizations,* London, UK, Routledge.

Kirby, E. (1999) Building Interaction in Online and Distance Education Course.Technology & Teacher Education Conference, TX.

Koberg, C. S., Uhlenbruck, N. & Sarason, Y. (1996) Facilitators of Organizational Innovation: The Role of Life-Cycle Stage. *Journal of Business Venturing,* 11(2), pp.133-149.

Koo, S. & Sandars, J. (2008) Podcasting for Undergraduate Healthcare Education. *Education for Primary Care,* 19(1), pp.13-17.

Koohang, A. & Harman, K. (2005) Open Source: A Metaphor for E-Learning. *Informing Science Journal,* 8, pp.75-86.

Kruse, K. (2002) The Benefits and Drawbacks of E-Learning. Available at: <http://www.e-learningguru.com/articles/art1_3.htm> [Accessed 18th, June, 2008]

Kwon, T. & Zumd, R. (1987) Unifying the Fragmented Models of Information Systems Implementation. In Boland, R. & Hirschheim, R. (Eds.), *Critical Issues in Information Systems Research.* Chichester, John Wiley & Sons.

Kwon, T. H. & Zmud, R. W. (1987) Unifying the Fragmented Models of Information Systems Implementation. In Boland, R. J. & Hirschheim, R. A. (Eds.), *Critical Issues in Information Systems Research.* Chichester, John Wiley & Sons.

Lam, A. (2004) Organizational Innovation. *Brunel University Working Paper.*

Langley, A. (1999) Strategies for Theorizing from Process Data. *Academy of Management Review,* 24(4), pp.691-710.
Langley, A. (2005) Qualitative Methods for Analyzing Process Data. *AOM PDW.* Honolulu.
Lather, P. (1992) Critical Frames in Educational Research: Feminist and Post-Structural Perspectives. *Theory Into Practice,* 31(2), pp.87.
Laurillard, D. (2005) *E-Learning in Higher Education. E-Learning in Higher Education.,* London, Routledge.
Lee, A. S. (1991) Integrating Positivist and Interpretive Approaches to Organizational Research. *Organization Science,* 2(4), pp.342-365.
Lee, M. K. O., Cheung, C. M. K. & Chen, Z. (2005) Acceptance of Internet-Based Learning Medium: The Role of Extrinsic and Intrinsic Motivation. *Information and Management,* 42(8), pp.1095 -1104.
Lee, W. W. & Owens, D. (2001) A Systematic Approach to Media Selection, Available at: <http://www.astd.org/NR/rdonlyres/900E19EF-121E-40BC-BBBC-CD15BD25F47F/0/WhitePaperMediaAnalysisFinal.pdf> [Accessed
Leifer, R., Mcdermott, C. M., O'connor, G. C., Peters, L. S., Rice, M. & Veryzer, R. W. (2000) *Radical Innovation: How Mature Companies Can Outsmart Upstarts,* Boston, MA: Harvard Business School Press.
Leonard-Barton, D. & Kraus, W. A. (1985) Implementing New Technology. *Harvard Business Review,* 63(November-December), pp.102-110.
Leonardi, P. M. (2007) Activating the Informational Capabilities of Information Technology for Organizational Change. *Organization Science,* 18(5), pp.813-831.
Lepak, D. P., Smith, K. G. & Taylor, M. S. (2007) Value Creation and Value Capture: A Multilevel Perspective. *Academy of Management Review,* 32(1), pp.180-194.
Li, F. W. B. & Leung, H. (2009) Advanced E-Learning Technologies and Applications. *International Journal of Distance Education Technologies,* 7(2), pp.1-1.
Lievens, A. & Moenaert, R. K. (2001) Communication Flows During Financial Service Innovation. *International Journal of Bank Marketing,* 19(2), pp.68-88.
Lijnse, P. & Klaassen, K. (2004) Didactical Structures as an Outcome of Research on Teaching–Learning Sequences? *International Journal of Science Education,* 26(5), pp.537 - 554.
Lin, C.-C., Pawar, K., Ma, Z. & Chen, J. W. (2008) The Process Innovation for E-Learning Implementation: A Case Study of a Taiwan University. *Web-Based Education - 2008* Innsbruck, Austria.
Lin, W.-J., Yueh, H.-P., Liu, Y.-L., Murakami, M., Kakusho, K. & Minoh, M. (2006) Blog as a Tool to Develop E-Learning Experience in an International Distance Course.Proceedings of the Sixth International Conference on Advanced Learning Technologies, Kerkrade, Netherlands
Locke, K. & Golden-Biddle, K. (1997) Constructing Opportunities for Contribution: Structuring Intertextual Coherence And "Problematizing" In Organizational Studies. *Academy of Management Journal,* 40(5), pp.1023-1062.
Lofland, J. & Lofland., L. (1995) *Analyzing Social Settings*, Wadsworth.

Lohr, L. L. & Heng-Yu, K. (2003) Development of a Web-Based Template for Active Learning. *Quarterly Review of Distance Education,* 4(3), pp.213-226.
Looy B. V., Dierdonck R. V. & P., G. (2003) *Services Management: An Integrated Approach,* London, Prentice Hall,.
Loucks-Horsley, S. (1996) The Design of Templates as Tools for Formative Evaluation. *New Directions for Program Evaluation,* 1996(72), pp.5-24.
Lozada, H. R. & Calantone, R. J. (1996) Scanning Behavior and the Process of Organizational Innovation. *Journal of Managerial Issues,* 8(3), pp.310.
Lynn, D. (1991) The Application of Case Study Evaluations. Eric/Tm Digest. .ERIC Clearinghouse on Tests, Measurement, and Evaluation, Washington, DC.
March, J. G. (1991) Exploration and Exploitation in Organizational Learning. *Organization Science,* 2(1), pp.71-86.
Markus, M. L. & Robey, D. (1988) Information Technology and Organizational Change: Causal Structure in Theory and Research. *Management Science,* 34(5), pp.583-598.
Marshall, S. & Mitchell, G. (2002) An E-Learning Maturity Model?ASCILTE 2002, (December 8-11 2002), Auckland, New Zealand.
Martínez-Torres, M. R., Toral Marín, S. L., García, F. B., Vázquez, S. G., Oliva, M. A. & Torres, T. (2008) A Technological Acceptance of E-Learning Tools Used in Practical and Laboratory Teaching, According to the European Higher Education Area. *Behaviour & Information Technology.*
Martinsuo, M., Hensman, N., Artto, K., Kujala, J. & Jaafari, A. (2006) Project-Based Management as an Organizational Innovation: Drivers, Changes, and Benefits of Adopting Project-Based Management. *Project Management Journal,* 37(3), pp.87-97.
Mason, J. & Lefrere, P. (2003) Trust, Collaboration, E-Learning and Organisational Transformation. *International Journal of Training and Development,* 7(4), pp.259-270.
Masrom, M., Zainon, O. & Rahiman, R. (2008) Critical Success in E-Learning: An Examination of Technological and Institutional Support Factors.The 2008 International Joint Conference on e-Commerce, e-Administration, e-Society, and e-Education (e-CASE 2008), (March 27-29), Bangkok, Thailand.
Masterman, L. & Lee, S. D. (2005) Evaluation of the Practitioner Trial of Lams: Final Report.Learning Technologies Group, Oxford University Computing Services
Mccollum, J. K. & Sherman, J. D. (1991) The Effects of Matrix Organization Size and Number of Project Assignments on Performance. *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT,* 38(1), pp.75-78.
Mccormack, C. & Jones, D. (1997) *Building a Web-Based Education System,* New York, John Wiley and Sons.
Mcfarlane, A. (2007) Learning and Lessons from the World of Games and Play. In Andrews, R. & Haythornthwaite, C. (Eds.), *The Sage Handbook of E-Learning Research.* Sage Publications Ltd.
Mclean, N. & Sander, H. (2003) Libraries and the Enhancement of E-Learning, Available at: <http://www5.oclc.org/downloads/community/elearning.pdf> [Accessed 10/09/2009]
Mcpherson, M. & Nunes, M. B. (2006) Organisational Issues for E-Learning: Critical Success Factors as Identified by He Practitioners. *International Journal of Educational Management,* 20(7), pp.542-558.

Menor, L. J., Tatikonda, M. V. & Sampson, S. E. (2002) New Service Development: Areas for Exploitation and Exploration. *Journal of Operations Management,* 20, pp.135-157.

Mentzas, G., D. Apostolou, R, Y. & Abecker, A. (2001) Knowledge Networking: A Holistic Solution for Leveraging Corporate Knowledge. *Journal of Knowledge Management,* 5(1), pp.94-107.

Mesher, D. (1999) Designing Interactivities for Internet Learning. *Syllabus,* 12(7).

Mexias, S. J. G., M.A. (1993) The Three Faces of Corporate Renewal: Institution, Revolution, and Evolution. *Strategic Management Journal,* 14, pp.77-101.

Miles, M. & Huberman, M. (1984) *Qualitative Data Analysis,* California, Sage.

Miles, M. B. & Huberman, A. M. (1994) *Qualitative Data Analysis : An Expanded Sourcebook, Second Edition,* Thousand Oaks, Calif. ; London, Sage.

Milosevic, D. & Patanakul, P. (2005) Standardized Project Management May Increase Development Projects Success. *International Journal of Project Management,* 23(3), pp.181-192.

Minnis, J. R. (1985) Ethnography Case Studies, Grounded Theory and Distance Education Research. *Distance Education,* 6(2).

Mintzberg, H. & Waters, J. A. (1982) Tracking Strategy in an Entrepreneurial Firm. *Academy of Management Journal,* 25(3), pp.465-499.

Mohr, L. B. (1982) *Explaining Organizational Behavior* San Francisco, Jossey-Bass.

Molnar, A. (1997) Computers in Education: A Brief History *T H E Journal (Technological Horizons In Education),* 24(11), pp.63-69.

Moon, S., Birchall, D., Williams, S. & Vrasidas, C. (2005) Developing Design Principles for an E-Learning Programme for Sme Managers to Support Accelerated Learning at the Workplace. *The Journal of Workplace Learning,* 17(5-6), pp.370-384.

Morrison, D. (2003) *E-Learning Strategies: How to Get Implementation and Delivery Right First Time*, Wiley.

Müller, R. & Turner, R. (2007) The Influence of Project Managers on Project Success Criteria and Project Success by Type of Project. *European Management Journal,* 25(4), pp.298-309.

Mustonen-Ollila, E. & Lyytinen, K. (2004) How Organizations Adopt Information System Process Innovations: A Longitudinal Analysis. *European Journal of Information Systems,* 13(1), pp.35-51.

Muzio, J. A., Heins, T. & Mundell, R. (2002) Experiences with Reusable E-Learning Objects: From Theory to Practice. *The Internet and Higher Education,* 5(1), pp.21-34.

Naidu, S. (2006) *E-Learning -- a Guidebook of Principles, Procedures and Practices,* New Delhi, Aishi Creative Workshop, India.

Neumann, F. (1997) Organizational Structures to Match the New Information-Rich Environments: Lessons from the Study of Chaos. *Public Productivitiy & Management Review,* 21(1), pp.86-100.

Ngai, E. W. T., Law, C. C. H. & Wat, F. K. T. (2008) Examining the Critical Success Factors in the Adoption of Enterprise Resource Planning. *Computers in Industry* 59, pp. 548-564.

Ngai, E. W. T., Poon, J. K. L. & Chan, Y. H. C. (2007) Empirical Examination of the Adoption of Webct Using Tam. *Computers & Education,* 48(2), pp.250-267.

Nicholson, P. (2007) A History of E-Learning *Computers and Education, E-Learning, from Theory to Practice.* Springer Netherlands.
Nikos Mattheos, Anders Nattestad, Martin Schittek & Rolf Attström (2001) A Virtual Classroom for Undergraduate Periodontology: A Pilot Study. *European Journal Of Dental Education,* 5(4), pp.139-147.
Nonaka, I. (1994) A Dynamic Theory of Organizational Knowledge Creation. *Organization Science,* 5(1), pp.14-37.
Nunan, T., George, R. & Mccausland, H. (2000) Rethinking the Ways in Which Teaching and Learning Are Supported: The Flexible Learning Centre at the University of South Australia. *Journal of Higher Education Policy and Management,* 22(1), pp.85-98.
Nystrom, P. C., Ramamurthy, K. & Wilson, A. L. (2002) Organizational Context, Climate and Innovativeness: Adoption of Imaging Technology. *Journal of Engineering & Technology Management,* 19(3/4), pp.221.
O'connor, E. J., Parsons, C. K., Liden, R. C. & Herold, D. M. (1990) Implementing New Technology: Management Issues and Opportunities. *The Journal of High Technology Management Research,* 1(1), pp.69-89.
Oblinger, D. & Kidwell, J. (2000) Distance Learning: Are We Being Realistic. *Educause Review,* May/June 2000, pp.31-39.
Oblinger, D. G. & Hawkins, B. L. (2005) The Myth About E-Learning. *EDUCAUSE review,* pp.14-15.
Oblinger, D. G. & M.K. Maruyama (1996) Distributed Learning. .
Oerlemans, L. A. G., Meeus, M. T. H. & Boekema, F. W. M. (1998) Do Networks Matter for Innovation? The Usefulness of the Economic Network Approach in Analysing Innovati. *Tijdschrift voor economische en sociale geografie (Journal of Economic and Social Geography).* 89(3), pp.298-309.
Oke, A. (2007) Innovation Types and Innovation Management Practices in Service Companies. *International Journal of Operations & Production Management,* 27(6), pp.564-587.
Orlikowski, W. J. (1993) Case Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development. *MIS Quarterly,* 17(3), pp.309-340.
Orlikowski, W. J. (2000) Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science,* 11(4), pp.404-428.
Panesar, S. S. & Markeset, T. (2008) Development of a Framework for Industrial Service Innovation Management and Coordination. *Journal of Quality in Maintenance Engineering,* 14(2), pp.177-193.
Paton, C. (2009) Dunedin School of Medicine Calt Report. Otago: University of Otago. Available at: <http://www.hein.otago.ac.nz/index.php?cat=research&researchtopic=medelearn&page=definitions> [Accessed 08 Oct]
Patton, M. Q. (1990) *Qualitative Evaluation and Research Methods (2nd Ed.).* Newbury Park,, Sage Publications, Inc.
Patton, M. Q. (2002) *Qualitative Research and Evaluation Methods (3rd Ed.),* Thousand Oaks, Sage Publications.
Paulsen, M. F. (2003) *Online Education and Learning Management Systems,* Bekkestua, NKI Forlaget.

Paulson, K. (2002) Reconfiguring Faculty Roles for Virtual Settings. *The Journal of Higher Education* 73(1), pp.123-140.
Payr, S. (2005) Not Quite an Editorial: Educational Agents and (E-)Learning. *Applied Artificial Intelligence,* 19(3/4), pp.199-213.
Pearson, A. W. (1991) *Managing Innovation: An Uncertainty Reduction Process,* London, Sage.
Peffers, K., Gengler, C. E. & Tuunanen, T. (2003) Extending Critical Success Factors Methodology to Facilitate Broadly Participative Information Systems Planning. *Journal of Management Information Systems.* M.E. Sharpe Inc.
Peng, K.-F., Fan, Y.-W. & Hsu, T.-A. (2004) Proposing the Content Perception Theory for the Online Content Industry -- a Structural Equation Modeling. *Industrial Management & Data Systems.*
Pentland, B. T. (1999) Building Process Theory with Narrative: From Description To. Explanation. *Academy of Management Review,* 24(4), pp.711-724.
Pettigrew, A. (1988) Longitudinal Field Research on Change: Theory and Practice.National Science Foundation Conference on Longitudinal Research Methods in Organizations, Austin.
Pettigrew, A. (1990) Longitudinal Field Research on Change: Theory and Practice. *Organization Science,* 1(3), pp.267-292.
Pettigrew, A. (1992) The Character and Significance of Stratgy Process Research. *Strategic Management Journal,* 13(Special Issue), pp.5-16.
Pettigrew, A. M. & Fenton, E. M. (2000) *The Innovating Organization,* London, Sage.
Philliber, S., Schwab, M. & Samsloss, G. (1980) *Social Research: Guides to a Decision-Making Process,* NY, Peacock.
Piccoli, G., Ahmad, R. & Ives, B. (2001) Web-Based Virtual Learning Environments: A Research Framework and a Preliminary Assessment of Effectiveness in Basic It Skills Training. *MIS Quarterly,* 25(4), pp.401-426.
Pinto, J. K. (2006) *Project Management: Achieving Competitive Advantage*, Prentice Hall Professional Technical Reference.
Pinto, J. K. & Mantel, S. J. J. (1990) The Causes of Project Failure. *IEEE Transactions on Engineering Management,* 37(4), pp.269~276.
Poole, M. S., Van De Ven, A. H., Dooley, K. & Holmes, M. E. (2000) *Organizational Change and Innovation Processes: Theory and Methods for Research* New York, Oxford University Press.
Porras, J. I. & Silvers, R. C. (1991) Organization Development and Transformation. *Annual Review of Psychology,* 42(1), pp.51-78.
Porter, D. (1959) Some Effects of Year Long Teaching Machine Instruction. In Galanter, E. (Ed.) *Automatic Teaching; the State of the Art.,* New York, John Wiley
Powney, J. & Watts, D. M. (1987) *Interviewing in Educational Research London,* London, Routledge & Kegan Paul.
Prensky, M. (2001) Digital Natives, Digital Immigrants. *On the Horizon,* 9(5), pp.1-6.
Prescott, M. B. & Conger, S. A. (1995) Information Technology Innovations: A Classification by It Locus of Impact and Research Approach. *Data Base Advances,* 26(2-3), pp.20-41.

Rajagopalan, N. & Spreitzer, G. M. (1996) Towards a Theory of Strategic Change: A Multi-Lens Perspective and Integrative Framework. *Academy of Management Proceedings.* Academy of Management.
Reid, I. C. (1999) Beyond Models: Developing a University Strategy for Online Instruction *Journal of Asynchronous Learning Networks,* 3(1), pp.19-31.
Reidenbach, R. E. & Moak, D. L. (1986) Exploring Retail Bank Performance and New Product Development: A Profile of Industry Practices. *Journal of Product Innovation Management,* 3(3), pp.187-194.
Reiss, B. (1993) *Project Management* London, Demystified. E and FN Spon.
Riesz, P. C. (1980) Revenge of the Marketing Concept. *Business Horizons,* 23(3), pp.49-53.
Robson, C. (1993) *Real World Research: Resource for Social Scientists and Practitioner-Researchers,* Malden, MA., Blackwell Scientists Inc,.
Rodriguez-Repiso, L., Setchi, R. & Salmeron, J. L. (2007) Modelling IT Projects Success: Emerging Methodologies Reviewed. *Technovation,* 27(10), pp.582-594.
Rogers, E. M. (1995) *Diffusion of Innovations,* New York, The Free Press.
Rohner, R. P. (1977) Advantages of the Comparative Method of Anthropology. *Behavior Science Research,* 12, pp.117-144.
Romiszowski, A. & Mason, R. (2004) Computer-Mediated Communication. In Jonassen, D. H. (Ed.) *Handbook of Research on Educational Communications and Technology.* New Jersey Lawrence Erlbaum.
Romiszowski, A. J. (2004) How's the E-Learning Baby? Factors Leading to Success or Failure of an Educational Technology Innovation. *Educational Technology,* 44(1), pp.5-27.
Rosenberg, M. J. (2001) *E-Learning: Strategies for Delivering Knowledge in the Digital Age,* Columbus, OH, McGraw-Hill Professional.
Rossiter, D. (2007) Whither E-Learning? Conceptions of Change and Innovation in Higher Education. *Journal of Organisational Transformation & Social Change,* 4(1), pp.93-107.
Ruiz, J. G., Mintzer, M. J. & Leipzig, R. M. (2006) The Impact of E-Learning in Medical Education. *Academic Medicine,* 81(7), pp.207.
Rukanova, B., Van Stijn, E., Henriksen, H. Z., Baida, Z. & Tan, Y.-H. (2009) Understanding the Influence of Multiple Levels of Governments on the Development of Inter-Organizational Systems. *European Journal of Information Systems,* 18(5), pp.387-408.
Rungtusanatham, M., Ellram, L. M., Siferd, S. P. & Salik, S. (2004) Toward a Typology of Business Education in the Internet Age. *Decision Sciences Journal of Innovative Education,* 2(2), pp.101-120.
Sabherwal, R. & Robey, D. (1993) An Empirical Taxonomy of Implementation Processes Based on Sequences of Events in Information System Development. *Organization Science,* 4, pp.548-576.
Salmeron, J. L. (2009) Augmented Fuzzy Cognitive Maps for Modelling Lms Critical Success Factors. *Knowledge-Based Systems,* 22, pp.275-278.
Salmon, G. (2005) Flying Not Flapping: A Strategic Framework for E-Learning and Pedagogical Innovation in Higher Education Institutions. *ALT-J,* 13(3), pp.201 - 218.
Salter, B. & Tapper, T. (2000) The Politics of Governance in Highereducation: The Case of Quality. *POLITICAL STUDIES,* 48, pp.66-87.

Samarawickrema, G. & Stacey, E. (2007) Adopting Web-Based Learning and Teaching: A Case Study in Higher Education. *Distance Education,* 28(3), pp.313-333.

Sandars, J. (2007) The Potential of Blogs and Wikis in Healthcare Education. *Education for Primary Care,* 18(1), pp.16-21.

Scalise, K., Bernbaum, D. J., Timms, M., Harrell, S. V., Burmester, K., Kennedy, C. A. & Wilson, M. (2007) Adaptive Technology for E-Learning: Principles and Case Studies of an Emerging Field. *Journal of the American Society for Information Science & Technology.*

Scheuing, E. Z. & Johnson, E. M. (1989) A Proposed Model for New Service Development. *Journal of Services Marketing,* 3(2), pp.25.

Schramm, W. (1971) *The Process and Effect of Mass Communication,* Urbana, University of Illinois Press.

Schwartz, H. & Jacobs, J. (1979) *Qualitative Sociology: A Method of the Madness,* New York, Free Press.

Scott, D. (1997) Qualitative Approaches to Data Collection and Analysis. In Mckenzie, G., Powell, J. & Usher, R. (Eds.), *Understanding Social Research: Perspectives on Methodology and Practice.* London, The Falmer Press.

Scott, R. K. (2004) Assessing the Impact of High-Performance Computing on the Drug Discovery and Development Process. *Drug Discovery Today: BIOSILICO,* 2(5), pp.175-179.

Selim, H. M. (2007) Critical Success Factors for E-Learning Acceptance: Confirmatory Factor Models. *Computers & Education,* 49(2), pp.396-413.

Senge, P. (1990) The Leader's New Work: Building Learning Organisations. *Sloan Management Review,* 32(1), pp.7-23.

Sharpe, R., Benfield, G. & Francis, R. (2006) Implementing a University E-Learning Strategy: Levers for Change within Academic Schools. *Research in Learning Technology,* 14(2), pp.135-151.

Shenhar, A. J. & Levy, O. (1997) Mapping the Dimensions of Project Success. *Project Management Journal,* 28(2), pp.5.

Shim, J. P., Shropshire, J., Sungmin, P., Harris, H. & Campbell, N. (2007) Podcasting for E-Learning, Communication, and Delivery. *Industrial Management & Data Systems.*

Shurville, S. & Brown, T. (2006) Introduction: ICT-Driven Change in Higher Education: Learning from E-Learning. *Journal of Organisational Transformation & Social Change,* 3(3), pp.245-250.

Sife, A. S., Lwoga, E. T. & Sanga, C. (2007) New Technologies for Teaching and Learning: Challenges for Higher Learning Institutions in Developing Countries. *International Journal of Education and Development using ICT,* 3(2), pp.57-67.

Skolits, G. J. & Boser, J. A. (2008) Using an Evaluation Hotline to Promote Stakeholder Involvement. *American Journal of Evaluation,* 29(1), pp.58-70.

Sminia, H. (2009) Process Research in Strategy Formation: Theory, Methodology and Relevance. *International Journal of Management Reviews,* 11(1), pp.97-125.

Smith, P. L. & Ragan, T. J. (2005) *Instructional Design (3rd Ed.).* Hoboken, NJ: John Wiley & Sons, Inc.

Smith, T. M. (1983) On the Validity of Inferences from Non-Random Samples. *Journal of the Royal Statistical Society,* 146, pp.131-49.

Somekh, B. (1998) Supporting Information and Communication Technology Innovations in Higher Education *Technology, Pedagogy and Education,* 7(1).
Soong, M. H. B., Chan, H. C., Chua, B. C. & Loh, K. F. (2001) Critical Success Factors for on-Line Course Resources. *Computers & Education,* 36(2), pp.101-120.
Spencer, D. H. & Hiltz, S. R. (2003) A Field Study of Use of Synchronous Chat in Online Courses. *36th Annual Hawaii International Conference on System Sciences (HICSS'03).* Hawaii, IEEE Computer Society.
Spinello, E. F. & Fischbach, R. (2004) Problem-Based Learning in Public Health Instruction: A Pilot Study of an Online Simulation as a Problem-Based Learning Approach. *Education for Health,* 17(3), pp.365-373.
Squires, D. & Preece, J. (1996) Usability and Learning: Evaluating the Potential of Educational Software. *Computers & Education,* 27(1), pp.15-22.
Sridharan, B., Deng, H. & Corbitt, B. (2008) Evaluating Intertwined Critical Success Factors for Sustainable E-Learning.19th Australasian Conference on Information Systems, (3-5 Dec 2008), Christchurch.
Stake, R. E. (1986) *Quieting Reform: Social Science and Social Action in an Urban Youth Program.,* Urbana, University of Illinois Press.
Stake, R. E. (1995) *The Art of Case Study Research.,* London, SAGE Publications.
Staudenmayer, N., Tyre, M. & Perlow, L. (2002) Time to Change: Temporal Shifts as Enablers of Organizational Change. *Organization Science,* 13(5), pp.583-597.
Stefl-Mabry, J. (1999) Professional Staff Development: Lessons Learned from Current Usability Studies. *Journal of Information Technology Impact,* 1(2), pp.81-104.
Stephen, M. & Geoff, M. (2004) Applying Spice to E-Learning: An E-Learning Maturity Model?Proceedings of the sixth conference on Australasian computing education - Volume 30, Dunedin, New Zealand.
Stevens, E. & Dimitriadis, S. (2005) Managing the New Service Development Process: Towards a Systemic Model. *European Journal of Marketing,* 39(1/2), pp.175-198.
Stoecker, R. (1991) Evaluating and Rethinking the Case Study. *Sociological Review,* 39(1), pp.88-112.
Stoltenkamp, J., Kies, C. & Njenga, J. (2007) Institutionalising the Elearning Division at the University of the Western Cape (Uwc): Lessons Learnt. *International Journal of Education and Development using Information and Communication Technology,* 3(4), pp.143-152.
Strauss, A. & Corbin, J. (1990) *Basics of Qualitative Research. Grounded Theory, Procedures and Techniques,* London, Sage Publications.
Strauss, A. L. & Corbin, J. M. (1998) *Basics of Qualitative Research : Techniques and Procedures for Developing Grounded Theory,* Thousand Oaks, Sage Publications.
Suppes, P. (1964) Modern Learning Theory and the Elementary-School Curriculum. *American Educational Research Journal* 1, pp.79-93
Suppes, P. (1966) The Uses of Computers in Education. *Scientific American,* 215, pp.206-220.
Suppes, P. (1971) Technology in Education. In Brownell, S. M. (Ed.) *Issues in Urban Education.* New Haven, Yale University Press.

Suppes, P. (1972) Alternatives through Computers. In Rusk, B. (Ed.) *Alternatives in Education.* London, University of London Press.

Suppes, P. (1986) Computers and Education in the 21st Century. In Neilson, W. & Gaffield, C. (Eds.), *Universities in Crisis: A Mediaeval Institution in the Twenty-First Century.* Toronto, The Institute for Research on Public Policy.

Svetcov, D. (2000) The Virtual Classroom Vs. The Real One. *Forbes,* Sept 11, pp.50.

Szulanski, G. (1996) Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm. *Strategic Management Journal,* 17(special edition), pp.27-43.

Takeuchi, H. & Nonaka, I. (1995) The New New Product Devleopment Game. In Clark, K. & Wheelwright, S. (Eds.), *The Product Development Challenge: Competing through Speed, Quality and Creativity.* Boston, Harvard Business School Publishing.

Taudes, A., Feurstein, M. & Mild, A. (2000) Options Analysis of Software Platform Decisions: A Case Study. *MIS Q.,* 24(2), pp.227-243.

Tavales, S. & Skevoulis, S. (2006) Podcasts: Changing the Face of E-Learning. Available at: <http://ww1.ucmss.com/books/LFS/CSREA2006/SER4351.pdf> [Accessed 09, May, 2010]

Taylor, J. C. (2001) Fifth Generation Distance Education. *e-Journal of Instructional Science and Technology (e-JIST),* 4(1), pp.1-14.

Te'eni, D. (2001) Review: A Cognitive-Affective Model of Organizational Communication for Designing It. *MIS Quarterly,* 25(2), pp.251-312.

Teece, D., Pisano, G. & Shuen, A. (1997) Dynamic Capabilities and Strategic Management. *Strategic Management Journal,* 18(7), pp.509-533.

Tellis, G. J. (2008) Important Research Questions in Technology and Innovation. *Industrial Marketing Management,* 37(6), pp.629-632.

Teo, C. B. & Gay, R. K. L. (2006) A Knowledge-Driven Model to Personalize E-Learning. *ACM Journal of Educational Resources in Computing,* 6(1), pp.1-15.

Testa, M. G. & Freitas, H. M. R. D. (2004) Critical Success Factors of E-Learning Programmes: An Exploratory Study in the Brazilian Context.the 8th Association of Information and Management Conference on New e-usage? Their Integration in Companies and the Society, (May 21st - 23rd 2003), Grenoble, France.

Thompson, A., Iii, A. J. S. & Gamble, J. (2006) *Crafting and Executing Strategy: Text and Reading*, New York: McGraw-Hill/Irwin.

Tidd, J., Bessant, J. & Pavitt, K. (2005) *Managing Innovation: Integrating Technological, Market and Organizational Change,* West Sussex, John Wiley & Sons Ltd.

Toffler, A. (1985) *The Adaptive Corporation,* New York, McGraw-Hill.

Tripsas, M. & Gavetti, G. (2000) Capabilities, Cognition, and Inertia: Evidence from Digital Imaging. *Strategic Management Journal,* 21(10/11), pp.1147-1161.

Trochim, W. (1989) Outcome Pattern Matching and Program Theory. *Evaluation and Program Planning,* 12, pp.355-366.

Trochim, W. M. K. (1985) Pattern Matching, Validity, and Conceptualization in Program Evaluation. *Evaluation Review,* 9(5), pp.575-604.

Tse, M. M. Y., Lo, L. W. L. & Chan, M. F. (2007) The Use of Health Technology and Information: E-Learning Technological Approach. *CyberPsychology & Behavior,* 10(6), pp.821-826.

Tsoukas, H. (1989) The Validity of Idiographic Research Explanations. *Academy of Management Review.* Academy of Management.

Tsoukas, H. (2005) *Complex Knowledge. Studies in Organizational Epistemology,* Oxford, Oxford University Press.

Tyre, M. J. & Hauptman, O. (1992) Effectiveness of Organizational Responses to Technological Change in the Production Process. *Organization Science,* 3(3), pp.301-320.

Upton, D. (2006) Online Learning in Speech and Language Therapy: Student Performance and Attitudes. *Education for Health,* 19(1), pp.22.

Uta, I. A. (2006) Developing E-Learning System.International Conference on Computer Systems and Technologies - *CompSysTech'06,* Bulgaria.

Uttal, W. R. (1962) On Conversational Interaction. In Coulson, J. E. (Ed.) *Programmed Learning Andcomputer-Based Instruction.* New York, John Wiley.

Vaast, E. & Levina, N. (2006) Multiple Faces of Codification: Organizational Redesign in an IT Organization. *Organization Science,* 17(2), pp.190-201.

Van De Ven, A. (1993) *Managing the Process of Organizational Innovation,* Oxford, Oxford University Press.

Van De Ven, A. (2007) Engaged Scholarship: A Guide to Organizational and Social Research. *Oxford University Press.*

Van De Ven, A. & Huber, G. P. (1990) Longitudial Field Research Methods for Studying Processes of Organizaitional Change. *Organization Science,* 1(3), pp.213-219.

Van De Ven, A. & Poole, M. (1995) Explaining Development and Change in Organizations. *Academy of Management Review,* 20(3), pp.510-540.

Van De Ven, A. H. (1986) Central Problems in the Management of Innovation. *Management Science,* 32(5), pp.590-607.

Van De Ven, A. H. (1992) Suggestions for Studying Strategy Process: A Research Note. *Strategic Management Journal.*

Van De Ven, A. H., Angle, H. L. & Poole, M. S. (1989) *Research on the Management of Innovation : The Minnesota Studies,* New York.

Van Maanen, J. (1979) Reclaiming Qualitative Methods for Organizational Research. *Administrative Science Quarterly,* 24(4), pp.520-526.

Van Maanen, J. (1988) *Tales of the Field: On Writing Ethnography,* Chicago, University of Chicago Press.

Van Maanen, J., Dabbs, J. M. & Faulkner, R. (1982) *Varieties of Qualitative Research,* Beverly Hills, Sage.

Vatnal, R. M., Mathapati, G. C. & K.Prakash (2004) Developing Library and Information Services for E-Learning Environment.2nd International CALIBER-2004, (11-13 February, 2004), New Delhi.

Vaughn, T. (1994) *Multimedia: Making It Work. 2nd Ed.*, Osborne McGraw-Hill

Veal, W., Brantley, J. & Zulli, R. (2004) Developing an Online Geology Course for Preservice and Inservice Teachers: Enhancements for Online Learning. . *Contemporary Issues in Technology and Teacher Education,* 3(4), pp.382-411.

Ven, A. H. V. D. & Rogers, E. M. (1988) Innovations and Organizations *Communication Research,* 15(5), pp.632-651.
Viorres, N., Xenofon, P., Stavrakis, M., Vlachogiannis, E., Koutsabasis, P. & Darzentas, J. (2007) Major Hci Challenges for Open Source Software Adoption and Development. *Online Communities and Social Computing.*
Volery, T. & Lord, D. (2000) Critical Success Factors in Online Education. *International Journal of Educational Management,* 14(5), pp.216 -223.
Volkoff, O., Strong, D. M. & Elmes, M. B. (2007) Technological Embeddedness and Organizational Change. *Organization Science,* 18(5), pp.832-848.
Wagner, N., Hassanein, K., & Head, M. (2008) Who is Responsible for E-Learning Success in Higher Education? A Stakeholders' Analysis. *Educational Technology & Society,* 11(3), pp.26-36.
Wang, X. & Huang, J. (2006) The Relationships between Key Stakeholders' Project Performance and Project Success: Perceptions of Chinese Construction Supervising Engineers. *International Journal of Project Management,* 24(3), pp.253-260.
Wateridge, J. (1995) IT Projects: A Basis for Success. *International Journal of Project Management,* 13(3), pp.169-172.
Watson, T. (2000) Ethnographic Fiction Science: Making Sense of Managerial Work and Organizational Research Processes with Caroline and Terry. *Organization,* 7(3), pp.489-510.
Weick, K. E. (1979) *The Social Psychology of Organizing,* Reading, Mass., Addison-Wesley Pub. Co.
Weick, K. E. & Quinn, R. E. (1999) Organizational Change and Development. *Annual Review of Psychology,* 50, pp.361-386.
Weigelt, C. & Sarkar, M. B. (2009) Learning from Supply-Side Agents: The Impact of Technology Solution Providers' Experiential Diversity on Clients' Innovation Adoption. *The Academy of Management Journal,* 52(1), pp.37-60.
Weiss, R. S. (1968) *Statistics in Social Research: An Introduction,* New York, John Wiley.
West, J. (2003) How Open Is Open Enough?: Melding Proprietary and Open Source Platform Strategies. *Research Policy,* 32(7), pp.1259-1285.
Westerveld, E. (2003) The Project Excellence Model®: Linking Success Criteria and Critical Success Factors. *International Journal of Project Management,* 21(6), pp.411-418.
White, K. B. & Leifer, R. (1986) Information Systems Development Success: Perspectives from Project Team Participants. *MIS Quarterly,* 10(3), pp.215-223.
White, S. (2007) Critical Success Factors for E-Learning and Institutional Change - Some Organisational Perspectives on Campus-Wide E-Learning. *British Journal of Educational Technology,* 38(5), pp.840-850.
Wild, R. H., Griggs, K. A. & Downing, T. (2002) A Framework for E-Learning as a Tool for Knowledge Management. *Industrial Management & Data Systems,* 102(7), pp.371 - 380.
Williams, J. B. & Goldberg, M. (2005) The Evolution of E-Learning.Ascilite 2005:Balance, Fidelity, Mobility: maintaining the momentum?, (December 4-7), Brisbane, Australia.

Wilson, E. J. & Vlosky, R. P. (1997) Partnering Relationship Activities: Building Theory from Case Study Research. *Journal of Business Research,* 39(1), pp.59-70.

Winn (2002) Current Trends in Educational Technology Research: The Study of Learning Environments. *Educational Psychology Review,* 1(3), pp.331-351.

Winne, P. H., Nesbit, J. C., Kumar, V., Hadwin, A. F., Lajoie, S. P., Azevedo, R. & Perry, N. E. (2006) Supporting Self-Regulated Learning with Gstudy Software: The Learning Kit Project. *Tech., Inst., Cognition and Learning,* 3, pp.105-113.

Woodill, G. (2004) Where Is the Learning in E-Learning?:A Critical Analysis of the E-Learning Industry, Available at: <http://www.e-learningguru.com/wpapers/e-Learning_analysis.pdf> [Accessed 15 Sep, 2009]

Woods, P. A., Bagley, C. & Glatter, R. (1998) *School Choice and Competition: Markets in the Public Interest,* London, Routledge.

Woolley, D. R. (1994) Plato: The Emergence of Online Community. Available at: <http://www.thinkofit.com/plato/dwplato.htm> [Accessed 10, June, 2009]

Wright, J. N. (1997) Time and Budget: The Twin Imperatives of a Project Sponsor. *International Journal of Project Management,* 15(3), pp.181-186.

Yen, H. R., Li, E. Y. & Niehoff, B. P. (2008) Do Organizational Citizenship Behaviors Lead to Information System Success?: Testing the Mediation Effects of Integration Climate and Project Management. *Information & Management,* 45(6), pp.394-402.

Yin, R. K. (2003a) *Applications of Case Study Research (Applied Social Research Methods Volume 34)* Thousand Oaks, London, New Delhi, Sage Publicaitons.

Yin, R. K. (2003b) *Case Study Research: Design and Methods (3nd Ed.),* Beverly Hills, CA, Sage Publishing.

Yu, A. G., Flett, P. D. & Bowers, J. A. (2005) Developing a Value-Centred Proposal for Assessing Project Success. *International Journal of Project Management,* 23(6), pp.428-436.

Zaltman, G., Duncan, R. & Holbek, J. (1973) *Innovations and Organizations,* New York, Wiley.

Zammuto, R. F. & O'connor, E. J. (1992) Gaining Advanced Manufacturing Technologies' Benefits: The Roles of Organization Design and Culture. *Academy of Management Review,* 17(4), pp.701-728.

Zhang, D. & Nunamaker, J. F. (2003) Powering E-Learning in the New Millennium: An Overview of E-Learning and Enabling Technology *Information Systems Frontiers,* 5(2), pp.207-218.

Zhang, D., Zhou, L., Briggs, R. O. & Jr., J. F. N. (2006) Instructional Video in E-Learning: Assessing the Impact of Interactive Video on Learning Effectiveness. *Information & Management,* 43(1), pp.15-27.

Zhang, L., Lee, M., Zhang, Z. & P. Banerjee (2003) Critical Success Factors of Enterprise Resource Planning Systems Implementation Success in China. The 36th Hawaii International Conference on System Sciences, (January 6-9), Big Island, HI, USA.

Zhou, X. (1993) The Dynamics of Organizational Rules. *The American Journal of Sociology,* 98(5), pp.1134-1166.

APPENDIX

Appendix 1. Emails of Communicating Email and Finding Results

• Examples of Communicating Email

The general template of email which applied to inquire the inclination for interview.

Dear XXX:

I was given your name by XXXX(or somewhere else). I am a research student from Business School. I plan to conduct my data collection from the member of staffs who are participant with our E-Learning development within the university.

The purpose and aims of the research:

Numerous researchers devote their enthusiasm to the area of E-Learning which also provided traditional universities with an opportunity to meet the changing worldwide demand for education. However, higher education institutions stressed the ultimate dangers by jumping on the E-Learning bandwagon too soon without crucial considerations. In the other words, a high quality E-Learning solution might increase the reputation of a university. The early days of E-Learning were product-driven, and the dialogue about E-Learning took place primarily among vendors who were heavily funded by investment capital with dot-com boom. Most of the E-Learning vendors promoted their technology, but less attention was paid to the issues surrounding implementation or to the usage of E-Learning by the end users.

Included in a changed management strategy should be a detailed analysis and action plan to obtain a thorough organizational innovation process, ensure the IS (information system) implementation process, and secure linkages within organizations, technology applications and course development. A successful E-Learning launch should pay close consideration to all these processes.

You have ample experiences and knowledge. May I have an opportunity to talk to you?

Please check the attachment (interview questions) for more details about the research.

- **Example Email of Confirmation Finding Results (MELEES)**

From: Stephen Hibberd [mailto:Stephen.Hibberd@nottingham.ac.uk]

Sent: Tue 22/12/2009 11:32

To: Lin Chih-Cheng

Subject: RE: Hello Prof. Stephen from Patrick in Business School

Patrick:

Apologies for not responding earlier but Autumn Term has been manic – and I wanted time to read through your report.

This has been very interesting for me – it has helped me greatly in a reflective overview – perhaps not appreciated by me in working with MELEES on a week-by-week basis.

Having a skilled person with an external viewpoint to more clearly identify the 'process' is great for me. The 3 stages Initiation, Implementation and Expansion are familiar but you give me more hindsight vision.

The technological process separating the platform and tool and also process also helps me reflect more.

I very much appreciated you sending your Case study on MELEES.

Best wishes for the future.

Stephen

Appendix 2. Interview Questions

1. Case Study Protocol Details

The researcher prepared a check list before each scheduled interview:

- Prerequisites – Researcher's Case Study Preparation Check List
- Collection of relevant background information of the next interviewees
- Update status and presentation of this research work to the scheduled interviewees(including introduction slides of the research project)
- Review current status on conducted interviews and prepare preliminary results of the research work for the next interviewees, if required
- Update, optimisation, and extension of the case study questionnaires

2. Interview Questions

There are four types of interview questions which for different interviewees:

Type 1— Interview Questions for Higher Management Interviewees:

Introduction by the Researcher:

- Research topic and objectives
- Briefly introduce the 3 processes
- Suggestions
- Measurement of performance and design process
- Future plan

Initial question in order to clarify your setting in the organization: When did you join the E-Learning team and what are your response areas?

University Strategy:

1. Why E-Learning? Each university has its own purpose, can you talk about the background of Nottingham E-Learning development. How it begins, why, who is involved?

2. From the very beginning (the earliest literature I can find for Nottingham E-Learning is from 2000), during 2000~2001. Do you have any idea what happened at that period?

3. There are some players especially within Russell groups, is there any influence from them or, who is the leader, how about our university's position?

Decision making level

1. How do top level members make decision/ strategy/ and plan? After the decisions were made, how to deliver the suggestions? Who is going to response the suggestions? (politics and resources reallocation)
2. School level: Can you talk about what schools are more likely to be involved, how did the different school behave? Is there any particular reason or motivation encourage them to adopt E-Learning into their schools.
3. Can you give me the overview involvement of different school, how to arrange the resources? There are still some schools seem no activity at all, why?

Technological level

1. When did the university adopt Blackboard/ WebCT?
2. Do you know why the university used two VLEs for a while until 2004?
3. Is there any E-Learning platform been used before Blackboard/ WebCT?
4. How does IS department support the E-Learning projects for different schools? How do you know their requirement?
5. Do you usually go to the other universities to visit their E-Learning achievements? Is there any particular idea from the other university?

Project level

1. Can you give me the overview about project level? How many projects are currently running?
2. Generally speaking, if there is an idea, who used to bring up the idea into consideration?
3. How to value the idea/ make decision?
4. Who has the responsibility to overlook all the projects (performance, effectiveness), if there is a project, where is the support (funding, how the IS members involved, give some example)? Besides you, is there anyone looking after the project from higher management level?
5. Do you have the project management methodology?
6. Who is managing the interrelationship between projects? (Y/N) why?

Type 2— Interview Question for Project Manager (Example: MELEES Project)

1. Where does the funding come from?

2. Is there any other partner? I saw "The Helm Project" in the Melees website. Is there any relationship between each other?

3. What is the structure of Melees research team? Is there any change from beginning to the end? How it changed?

4. What is your role in the project? How many people in UoN are involved with Melees project? Definition of the roles.

5. What are the aims and objectives?

6. From the archive I found that Melees original was implementing on Blackboard (why Blackboard been choosen?). Can you explain when the IS learning team moved support to single VLE (WebCT) what the situation at that time and how can you sort out the problems?

7. Do you have any information about the Melees time table and milestone?

8. What is the route for technological development which involved platform development (selection or buy in), developing new techniques..... etc.

9. Did you implement some new tools? Did the tools be design when you requested to do from course development feedback? How they integrated?

10. How many courses have you produced? Are they on the same platform? Can you give me one/two example?

11. Is there any further plan for this project?

Type 3— Interview Question for Technician Role (Example: School of Geography E-Learning Project)

1. Please introduce yourself e.g. background, position (just in case).
Opening questions:

Geography E-Learning project

2. Please give a brief talk about School of Geography E-Learning Project (who did raise the idea and approve it?) Is there any other existing project or currently project running now?
3. What is the structure of Geography School E-Learning team? What is your role in the project? How many people in graduate School are involved with the E-Learning Project? Definition of the roles.
4. Is there any change from beginning till current? How it changed?
5. Where does the funding come from? Can you get any support when you met any difficulty such as the technological barriers, low responds and miserable targets .....etc?
6. It can be argued that the history of School of Geography E-Learning project is quite new; however, do you have any information about the milestone? (e.g. when did you finish the pilot project, and extended)
7. What is the route for technological development such as developing new techniques ..... etc? The School of Geography E-Learning project launched later than the WebCT became the official university E-Learning platform. However, is there any member of staff has question about platform selecting? If the course convenor doesn't have the sufficient computing knowledge, how can you sort the problems out?
8. At the beginning, where do you gain the experiences for implementing the E-Learning project? Did you visit to any other universities which also doing E-Learning to gain some ideas?
9. Can you tell me the process about the course implementation, from idea validation, course selecting (input may from students), course design, course scripts (piloting), until deliver to the students? Do you have any particular model apply for that?
10. Did you implement or apply some new tools? How do you get the feedback? Can you tell me some student responses?
11. Is there any further plan for this project?

Type 4 — Academic Writer (Example: School of Geography E-Learning Project)

1. Please introduce yourself e.g. background, position.
2. Please give a brief talk about School of Geography E-Learning development history.
3. Is there any E-Learning team in School of Geography? What is the structure of Geography School E-Learning team? What is your role in the project? How many people in graduate School are involved with the E-Learning Project? Definition of the roles.
4. How do you cooperate with the E-Learning coordinator? e.g. process about the course implementation, from idea validation, course selecting(input may from students), course design , course scripts(piloting), until deliver to the students? Do you have any particular model apply for that?
5. What is your opinion about the platform?
6. At the beginning, where do you gain the experiences for implementing the E-Learning project? Did you visit to any other universities which also doing E-Learning to gain some ideas? For example,
7. Can you tell me the process about the course implementation, from idea validation, course selecting (input may from students), course design, course scripts (piloting), until deliver to the students? Do you have any particular model apply for that?
8. Did you implement or suggest some new tools (e.g. audience response system)?
9. How many modules have you initiated (any document can give)? Can you give me one/two example?
10. Are you satisfied with the current E-Learning situation? Is there any direction can be improved?
11. Is there any further plan for this project? Could you also give me the big picture of E-Learning in Nottingham University in your mind?

Appendix 3. Archive List- Documentation & Interview Schedule

3.1 Documentation

Archive source can be categorized into public and non-public documentation. The non-public documentation which the researcher collected over time can be categorized into emails, meeting minutes (IS Strategy Board minutes and eLeK minutes), presentations, observation notes, informal interview notes, formal interview transcriptions. Besides non-public documentation, public documentation includes internet content and official published documents.

The following table are the categorization of important archive sources with labelled number by the researcher.

Public Documentation	Data Source Nr.
E-Learning Community presentation files * 19	PD 1-19
E-Learning Initiatives in China, Pedagogy, Policy and Culture, Hong Kong University Press (2007).	PD 20
Mathematics for Engineers – the HELM Project	PD 21

Non-Public Documentation	Data Source Nr.
eLeK minutes (2005~2008)*11	NPD 1-11
E-Learning Community minutes *32	NPD 12-43
Learning & Teaching Director Survey Dec 2004 *1	NPD 44
Assessment Software Overview	NPD 45
E-Learning Community Questionnaire feedback *1	
Update of e-assessment steering group E-Learning platform comparison report *1	NPD 46
Informal interview notes *40	NPD 46-85
Report from the E-Learning Strategy Group 2001	NPD 86

MELEES Funding Proposal	NPD 87
University Plan 2007~2010	NPD 88

The list evolved over time.

3.2 Case Study Interview Schedule and status

Data Source Nr.	Name	Role/Responsibilities	Date collected	Researcher Remark
IV 1	Andy Beggan	E-Learning team leader	11th Dec 2007	Transcribed
IV 2	Wyn Morgan	Director of Teaching and Learning	16th July 2008	Transcribed
IV 3	David Greenway	Vice Chancellor	9th Feb 2008	Note
IV 4	Alan Dorson	PVC	19thSep 2008	Note
IV 5	Christine Ennew	PVC	19th June 2008	Transcribed
IV 6	Patrick Lockly	Learning Technologies	29th Aug 2008	Transcribed
IV 7	Julian Tenney	Learning Technologies	2nd May 2008	Transcribed
IV 8	Nigel Owen	Learning Technologies	21st April 2008	Note
IV 9	Gill Fourt	Learning Technologies	27th May 2008	Note
IV 10	Quang-Nghi Loung	Learning Technologies	6th Dec 2007	Transcribed
IV 11	Carol Hall	Higher management(Former head of Education)	11 June 2008	Note, email
IV 12	Gordon Joyes	eELT Project Leader	3rd Sep 2008	Transcribed
IV 13	Bonjoe	Student	22nd Nov 2008	Transcribed

	Chou			
IV 14	Matthew Smith	eELT Project Administrator	24th Nov 2008	Note
IV 15	Rebecca Chen	Student	11th June 2008	Transcribed
IV 16	Charles Crook	Academic Writer	26th June 2008	Transcribed
IV 17	Barbara Sinclair	Academic Writer	14th April 2008	Note
IV 18	Michèle Clarke	Academic Writer	9th July 2008	Transcribed
IV 19	Stephen Hibberd	Project Leader	18th Dec 2007	Transcribed
IV 20	Cliff Litton	Senior teaching staff	31st Feb 2008	Transcribed
IV 21	Clair Chambers	Learning Technologies	8th May 2008	Transcribed
IV 22	Peter Rowlett	Learning Technologies and student	6th June 2008	Transcribed
IV 23	Janet Nicholson	Admin, MELEES	31st Jan 2008	Research note
IV 24	Clair Parnell	Academic Writer		Note
IV 25	Kao Han-Kun	Student	13th June 2008	Transcribed
IV 26	Matt Robinson	Student	19th, July, 2008	Note
IV 27	Pat Wei	Student	14 June 2008	Transcribed in Chinese
IV 28	Nick Mount	Academic Writer	3rd March 2008	Transcribed
IV 29	Richard Field	Academic Writer	28th May 2008	Transcribed
IV 30	Meng	Higher Management	9th June 2008	Transcribed

	Xiaolin			
IV 31	Michele Clark	Academic Writer	9th July 2008	Transcribed
IV 32	Gary Priestnall	Academic Writer	4th April 2008	Note
IV 33	Bob Abrahart	Academic Writer	1st Sep 2008	Transcribed
IV 34	Chris Gratton	Academic Writer	26th Feb 2008	Transcribed
IV 35	Matthew Donaghy	Project leader	3rd July 2008	Transcribed
IV 36	Suzanne Wright	Academic Writer	21st March 2008	Note
IV 37	SuiRan Yu	Shanghai Jiao Tong University, China	14th July 2008	Transcribed in Chinese
IV 38	Ming Yu	Tsinghua University, China	9th July 2006	Transcribed in Chinese
IV 39	Quan-Lin Li	Tsinghua University, China	13th July 2006	Note in Chinese
IV 40	Chien-Chun Su	Head of Computer and Information Network Centre, Southern Taiwan University	20th Nov 2006	Transcribed in Chinese
IV 41	Xin-Xiong Chang	Chancellor ,Southern Taiwan University	12th Nov 2006	Note in Chinese
IV 42	Jing-Wei Chen	Head of Information Systems Division, Southern Taiwan University	14th Nov 2006	Transcribed in Chinese
IV 43	Pao-Ta Yu	CCU	17th Nov 2006	Transcribed in Chinese
IV 44	Ren-Hung Hwang	CCU	15thNov 2006	Transcribed in Chinese

IV 45	Lo Jen-Chuan	CCU	15th Nov 2006	Note in Chinese
IV 46	Gilly Salmon	University of Leicester	LSRI Launch Event, 2008	Note during LSRI launch event
IV 47	Jonathan Vinoskey	Adjunct Faculty at University of Phoenix and Oracle	20th, Aug, 2008	Note
IV 48	Karen Hyder	The eLearning Guild speaker coach	20th , Aug, 2008	Note
IV 49	Robin Lin	National Hsinchu University of Education, Taiwan	17th June 2007	Transcribed in Chinese
IV 50	John Henn	University of West England	19th, Aug, 2008	Note during a conference
IV 51	Simon Price	University of Bristol	19th , Aug ,2008	Note during a conference

Appendix 4. Glossary – Acronyms

Acronym	Description
BFSU	Beijing Foreign Studies University
BNU	Beijing Normal University
CAL	Computer-assisted Learning (CAL) covers a range of computer-based packages, which aim to provide interactive instruction usually in a specific subject area, and many predate the Internet.
CAI	Computer-assisted Instruction: Using the computer for training and instruction.
eELT	English Language Teacher Training
ERP	Enterprise resource planning (ERP) is a method of using computer technology to link various functions—such as accounting, inventory control, and human resources—across an entire company. ERP is intended to facilitate information sharing, business planning, and decision making on an enterprise-wide basis.
GCSE	General Certificate of Secondary Education
HEFCE	Higher Education Funding Council for England
HELM	Helping Engineers Learn Mathematics
HTML	Hyper Text Markup Language (HTML) is the predominant markup language for web pages.
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
JISC	The Joint Information Systems Committee
LaTeX	LaTeX is a document markup language and document preparation system for the TeX typesetting programme.
LMS	A learning management system (LMS) is a software application for the administration, documentation, tracking, and reporting of training programs, classroom and online events, e-learning

	programs, and training content.
MELEES	Mathematical Electronic Learning Environment in Engineering and Science
MOE	Ministry of Education, Taiwan
PDF	Portable Document Format, a file format developed by Adobe Systems
Podcast	A podcast is a series of digital media files that are distributed over the Internet for playback on portable media players and computers. The term podcast, like broadcast, can refer either to the content itself or to the method by which it is provided.
QMP	Question Mark Perception
SCORM	The Sharable Content Object Reference Model (SCORM) integrates a set of related technical standards, specifications, and guidelines designed to meet SCORM's high-level requirements—accessible, interoperable, durable, and reusable content and systems. It is a collection of standards and specifications for E-Learning.
UoN	University of Nottingham
VLE	A virtual learning environment (VLE) is a software system designed to support teaching and learning in an educational setting.

Appendix 5. Ethic Procedure

During the data collection phase, the missions were roughly going smoothly. However, the researcher got the responds form eELT members who required the ethic approval in order to carry out the following interview procedure. At that moment, the researcher realized he may inevitably face ethical dilemmas which arise out of competing obligations and conflicts of interest. Especially, the eELT project was an international project with several partners involved. Nevertheless, the researcher found there was no mechanism for ethic procedure for the Business School researchers. Thus, the Director of Doctoral Programmes (Prof. Andy Lockett) did quick set up the mechanism for the researcher which is also useful for the future applications.

The following information is the documents associated with ethic approval including 1) Introduction to the Research, 2) Research Participant Consent Form and 3) Ethic Approval Form.

5.1 Ethic Procedure Approval

- **Research Idea**

After 2000, follow by dot com bubble, UK government announced the e-University project (UKeU). In that circumstance, many traditional universities jumped into e-learning bandwagon without holistic considerations and ended up with serious failures e.g. UKeU failure in 2004. Majority of Educational scholars do the e-learning researches may focus on pedagogy and educational psychology or how to engage IT with learners. However, if you look e-learning system from a macro level that is from a strategy viewpoint, the focus may different.

In Information Systems study, ERP (enterprise resources planning[58]) was a hot topic especially in 80' until late 90'. ERP research is focus on organization changes and Information systems implementation; the products themselves remain the same. However, we need to notice that product level (e-learning courses), had been changed when you compare with traditional teaching method. It can be quite interesting if you study e-learning systems implementation (Information Systems innovation) in higher educational institutions as a context (organization change), then e-learning course (product innovation) would be the output.

[58] http://en.wikipedia.org/wiki/Enterprise_resource_planning

Yet, to date most innovation researchers have tended to focus at one level of analysis, and it is rare that their contributions operate at different levels or are considered in combination. As reported by Hess and Rothaermel (2007) only 10% of all articles on innovation published during 1990~2006 in five key management journals conducted any type of multilevel empirical analysis. There is even rare to see the researchers who study the interactions among triple levels innovation.

- **Research area**

I am looking for the **interaction patterns** among organizations, IT and course innovation processes. In the other words, I am not going to touch neither course materials nor pedagogical innovations. I am using University of Nottingham as a research body, e-learning systems as a context to explore the issues among those three levels of innovation processes. In the product innovation level, I choose four cases into my study.

1. MELEES (Mathematics Electronic Learning Environment in Engineering and Science),
2. eELT, part of E-china Project
3. Geography school e-learning project
4. Graduate school e-learning project

There are some reasons underpinning that e-china project as one of the case in my study. First, e-china project is the most formal project with huge funding, the integrated research team and successful outcomes. Secondly, e-china project can be quite a good example to explain Strategic Aliment model (Henderson and Venkatraman , 1992). The last, I am also doing some researches on culture comparisons with NPD (New product development) teams.

- **Research Questions**

What is the nature of e-learning innovation process in higher educational institutions and what are the key factors for e-learning implementation?

Objectives

- To understand the nature of innovation in e-learning from organizational, technological and product innovation perspectives.

- To investigate the interactions between these three strengths (organizational innovation, technological innovation and product innovation) of processes.

• Reference

Henderson, J. C., N. Venkatraman (1992) "Strategic Alignment: A model for organizational transformation through technology." T.A. Kochan, M. Useem, eds. *Transforming Organizations*. Oxford University Press, New York, pp. 97 – 116.

Hess, D., F. Rothaermel. (2007)." Promising research directions for research on organizational innovation." *Organ. Sci. Winter Conf.* Steamboat Springs, CO (February 8–11).

5.2 Research Participant Consent Form

Research topic: The Process of an innovation: e-learning innovations in higher institutions context

Name: Chih-Cheng Lin

Phone: 07738766206

Email: lixccl1@nottingham.ac.uk

Operation Management division, Nottingham University Business School

Thank you for agreeing to participate in this study. This form outlines the purposes of the study, provides a description of your involvement, and rights as a participant.

- **The purposes of research**

Numerous researchers devote their enthusiasm to the area of e-learning which also provided traditional universities with an opportunity to meet the changing worldwide demand for education. In the other words, a high quality e-learning solution might increase the reputation of a university. However, higher education institutions stressed the ultimate dangers by jumping on the e-learning bandwagon too soon without crucial considerations. The early days of e-learning were product-driven, and the dialogue about e-learning took place primarily among vendors who were heavily funded by investment capital with dot-com boom. Most of the e-learning vendors promoted their technology, but less attention was paid to the issues surrounding implementation or to the usages of e-learning by the end users.

Included in a changed management strategy should be a detailed analysis and action plan to obtain a thorough organizational innovation process, ensure the IS (information system) implementation process, and secure linkages within organizations, technology applications and course development. A successful e-learning launch should pay close consideration to all these processes.

The study employs a qualitative methodology to explore the implementation of e-learning in Nottingham University. The main method is interviews, which involves

face-to-face conversations between the interviewee and the researcher. In order to investigate the e-learning innovation processes in higher educational context, the questions are open-ended.

You are encouraged to ask any questions at any time about the nature of the study and the methods that I am using. Your suggestions and concerns are important to me; please contact me at any time at email/phone number listed above.

I will use the information from this study to write a case report about the project you are involved with (the respondent). This case report will be read by you, my supervisor Prof. Kulwant Pawar, and optionally, by one other person if you give permission, in order to check on the accuracy of the case report. The case report will not be available to any other person to be read without your permission.

I guarantee that the following conditions will be met:

1. Your real name will not be used if you object, instead, you and any other person and place names involved in your case will be given pseudonyms that will be used in all verbal and written records and reports.
2. Your participation in this research is voluntary; you have the right to withdraw at any time, for any reason, and without any prejudice.
3. You will receive a copy of case report before it is finalised, so that you have the opportunity to suggest changes to the researcher, if necessary
4. The information I record, written and any audio recording will be kept confidential and only use by myself.

Do you grant permission to be quoted directly?

Yes _____ No _____

Do you grant permission to be audio recorded?

Yes _____ No _____

I agree to the terms

Respondent _____ Date _____

I agree to the terms:

Researcher _____ Date _____

- **Ethic Approval Form**

UNIVERSITY OF NOTTINGHAM

RESEARCH ETHICS REVIEW CHECKLIST

NOTE: This checklist is appended only as an exemplar of an internal system for the review of the ethical implications of research. The checklist is adapted from that of the ESRC, but may apply more widely (with the exception of medical research).

- This checklist should be completed for every research project that involves human participants.
- This checklist must be completed before potential participants are approached to take part in any research.
- **Before completing this form, please refer to the University of Nottingham Research code of conduct, which can be found at:** http://www.nottingham.ac.uk/ris/policy/code_of_conduct.pdf
- The principal investigator or, the supervisor, if the principal investigator is a student, is responsible for exercising appropriate professional judgment in this review.

Section I: Project Details

1. Project Title:	Analysis of e-learning triple innovation process in the higher education

Section II: Applicant Details

2. Name:	Chih-Cheng Lin
3. Status: *delete as appropriate*	Research postgraduate Undergraduate Student / Postgraduate Student / Staff
4. Email address:	Lixccl1@nottingham.ac.uk

Section III: For Students Only

5. Module name and number, or MA/MSc/MPhil course and department:	Ph.D in Business Studies
6. Supervisor's / Module leader's name:	Prof. Kulwant S Pawar
7. Email address:	Kul.pawar@nottingham.ac.uk

Supervisor: please tick the appropriate boxes. This study should not begin until all boxes are ticked or

appropriate provision for training made:

The student has read the University's Code Of Practice	˅
The topic merits further research	˅
The student has the skills to carry out the research	˅
The participant information sheet or leaflet is appropriate	˅
The procedures for recruiting and obtaining informed consent are appropriate	˅

Comments from supervisor:

Section IV: Research Checklist

Please answer each question by ticking the appropriate box:		Y	N
1.	Does the study involve participants who are particularly vulnerable or unable to give informed consent? (i.e. children, people with learning disabilities, prisoners, your own students?)		˅
2.	Will the study require the co-operation of a gatekeeper for the initial access to the groups of individuals to be recruited? (i.e. students at school, members of a self-help group, residents of a nursing home)		˅
3.	For research conducted in public, non-governmental and private organisations and institutions (such as schools, charities, companies and offices), will approval be gained in advance from the appropriate authorities?		˅
4.	Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (i.e. covert observation of people in non-public places)		˅
5.	Will the study involve the discussion of sensitive topics (i.e. sexual activity, drug use)?		˅
6.	Will participants be asked to discuss anything or partake in any activity that they may find embarrassing or traumatic?		˅
7.	Is it likely that the study will cause offence to participants for reasons of ethnicity, religion, gender, sexual orientation or culture?		˅
8.	Are drugs, placebos or other substances (i.e. food substances, vitamins) to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind?		˅

9.	Will blood or tissue samples be obtained from participants?		˅
10.	Is pain or more than mild discomfort likely to result from the study?		˅
11.	Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?		˅
12.	Will the study involve prolonged or repetitive testing?		˅
13.	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?		˅
14.	Will the study involve the recruitment of patients, staff, tissue samples, records or other data through the NHS or involve NHS sites and other property? If yes, NHS REC and R&D approvals from the relevant Trusts must be sought prior to the research being undertaken		˅
15.	Will data be recorded? If so, how?	˅	
16.	Will (written) consent be gained?	˅	
17.	Will participants be informed of their right to withdraw from the study at any time, without giving explanation?	˅	
18.	Will data be anonymised?		˅
19.	Will participants be assured of the confidentiality of the data?	˅	
20.	Will the data be stored in accordance with the Data Protection Act 1998?	˅	
21.	Will participants be asked permission for quotations (from data) to be used?	˅	

If you have answered 'no' to all questions, please send the completed and signed form to your Head of School, for their records. You should also keep a copy of this form for your records, as you may be asked to include it within your dissertation or research report.

If you have answered 'yes' to any of the questions in section IV, you will need to describe more fully how you plan to deal with the ethical issues raised by your research. This does not mean that you cannot do the research, only that your proposal will need to be approved by Head of School.

If you answered 'yes' to question 14, you will also need to submit an application to the appropriate external (NHS) ethics committee. The COREC website (www.corec.org.uk) outlines the process to be followed. Additionally you will need R&D approval from each Trust participating in the research. Useful guidance can be

found at www.rdforum.nhs.uk. Alternatively, you may wish to contact the R&D department at the Trust where you are hoping to undertake research.

Please note that it is your responsibility to follow the University of Nottingham's Code of Practice on Ethical Standards and any relevant academic or professional guidelines in the conduct of your study. **This includes providing appropriate information sheets and consent forms, and ensuring confidentiality in the storage and use of data.** Any significant change in the question, design or conduct over the course of the research should be notified to Head of School and may require a new application for ethics approval.

Please complete the required signatures / dates and submit the form to the designated person.

Section V: Agreement

Principal Investigator:	
Signed:	
Date:	
Supervisor/Module Leader where appropriate:	
Signed:	
Date:	

Section VI: Ethics Officer to complete

Date form received by Ethics Officer	

Ethics Officer's comments or suggestions:			
Ethics Officer's decision:	Approve	Revise	Reject
Signature:			
Date:			

- A copy of this form will now be sent back to the applicant, and his/her supervisor if applicable.
- This form will be kept by the research officer.

Appendix 6. Published Papers

Paper 1: Re-examining the Critical Success Factors of E-Learning from the EU Perspective

C-C, Lin, Z, Ma, *International Journal of Management in Education*, forthcoming 2010

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 summarizes the critical success factors 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

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 US 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 - critical success factors (Selim, 2007). In this paper, the author will try to bring the different dimensions together by clarifying critical E-Learning factors with management perspective.

- **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; Bliuc 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 utilization 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 organizations 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, 2004a).

	INDIVIDUAL SELF-STUDY Computer-Based Instruction/ Learning/Training	GROUP COLLABORATIVE Computer-Mediated Communication
ONLINE STUDY Synchronous Communication Real Time	Surfing the Internet, accessing Websites to obtain information or to learn (knowledge or skill)	Chat rooms with(out) video (IRC; Electronic Whiteboards) Audio/Video - conferencing
OFFLINE STUDY Asynchronous Communication Flexi Time	Using stand-alone courseware/ Downloading materials from the Internet for later local study	Asynchronous communication by e-mail, discussion lists or a Learning Management System (WebCT; Blackboard; etc.)

Table 1 A structured classification of E-Learning with examples

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).

- **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 organization. CSFs should be measurable, controllable, and few in number (Masrom et al., 2008).

Much of the current research summarizes three CSFs for E-Learning: IT, instructor and student. For example, Volery and Lord (2000) identified three main critical success factors (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 (Salmeron, 2009). 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 (Debevc and Bele, 2008). The need for usability has been recognized in web design and development literature as 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 programs (Masrom et al., 2008). One central point is the students' attitude to IT. If they are comfortably 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 recognized 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 formalized 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 ten 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 the LMS use in the long term (Salmeron, 2009). There are two main costs 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 critical success factor (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 programs. 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-leaning 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 jeopardize the success of a program under development, and among the several choices that must be made while establishing a strategy, it is important to keep the focus on the critical success factors (Testa and Freitas, 2004).

2 · Methodology

A qualitative approach was chosen to understand the critical factors of E-Learning implementation within the rich organizational 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 context. 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 to develop their own platform, which is very different from the Western approach. 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 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 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.

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.

	MELEES project	Geography E-Learning project	eELT project
background user	school of Mathematics students of Engineering and Science	school of Geography students of Geography school	school of education Chinese ELT teachers
Time	2002-2005	2004-2008	2003-2006
Core team	Project leader, co-ordinator, Technologist	Project co-ordinator	UoN, BNU and BFSU
Platform	WebCT	WebCT	Moodle
E-Learning	HTML with PDF	Podcasting, based on flash	Developed by flash

material	output	format (using Xerte)	engine and HTML format

Table 2 The main factors for the E-Learning projects

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 categorized 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 staffs 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 organizational 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 and 90 minutes 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

Case one— 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)[59]. 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[60]. After 1996, the growth of broadband capabilities became the major goal of Internet and served as a catalyst for distance learning (Khvilon and Patru, 2002).

- **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. At 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 decentralized 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.

- **Second stage: 2000-2004 (the pilot stage)**

[59] http://www.nottingham.ac.uk/

[60] http://wapedia.mobi/en/Internet_Explorer

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[61].

In April 2001, the E-Learning strategy group forwarded an initial report and recommendations to the Management Group[62]. 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).

- **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 Tenney[63]). 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 Beggan[64]). 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[65].

Case two—National Chung Cheng University, Taiwan

National Chung Cheng University (CCU), Taiwan, was the first public University established after Taiwan's economic boom in the 1980's. 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 effectively to deal with the complexity of life in the 21st century[66].

CCU Timetable of E-Learning

Starting in the early 90s, the timing of the initial E-Learning development is pretty much the same as that of western leading universities (Prof. Ren-Hung Hwang[67]). 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.

- **The first stage: 1995-2002 (the initial stage)**

National Chung Cheng University (CCU) 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 (Prof. Pao-Ta Yu[68]). During this period, the university treated distance learning as an extra workload for the IS department. From the organizational 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 SCORM1.2

---

[61] University of Nottingham E-Learning community presentation files
[62] Documents of E-Learning Community minutes
[63] Learning technologist, UoN
[64] E-Learning Team Leader, UoN
[65] University of Nottingham E-Learning community presentation files
[66] http://www.ccu.edu.tw/
[67] Department of Computer Science and Information Engineering, CCU
[68] Head of E-Learning centre, CCU

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 (Prof. Ren-Hung Hwang).

- **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 organizational 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[69].

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 (Prof. 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.

- **The third stage: 2005- present**

In order to maintain strength and remain competent, CCU gave the E-Learning centre a brand new organizational setting, "CyberCCU", which was established in September 2005[70]. 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 (Prof. 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 (Prof. Ren-Chuan Luo [71]). This brings 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 globalization that has occurred since the 1990s. For both the University of Nottingham and 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 one of the major agenda which are related to competitiveness. Another reason for the University of Nottingham adopting E-Learning is because of 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

[69] Documents of CCU E-Learning presentation
[70] Documents of CCU E-Learning presentation
[71] Former vice chancellor of CCU

Nottingham. For the CCU, it was because of "E-Learning pioneers" by 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 (information system) 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 Oct 2005). They were the main source for E-Learning platforms, occupying 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 didn't 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: organizational, technological, E-Learning content related, and general factors.

- ***Organizational 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 critical success factors. 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.

- ***Technological factors***

Three aspects of technological factors are crucial to the project success.
Platform support:
A platform is just 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 negotiation 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 are familiar with their courses, but not the E-Learning technology, they need support from the technicians when designing E-Learning courses.

- ***E-Learning Content Related Factors***

Normally, the content and style of E-Learning is restrained by organizational 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.

- ***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 unsurprising 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 critical success factors on Asia perspectives. Appositively, the weights of these four aspects of E-Learning CSFs are nearly equal on EU perspectives.

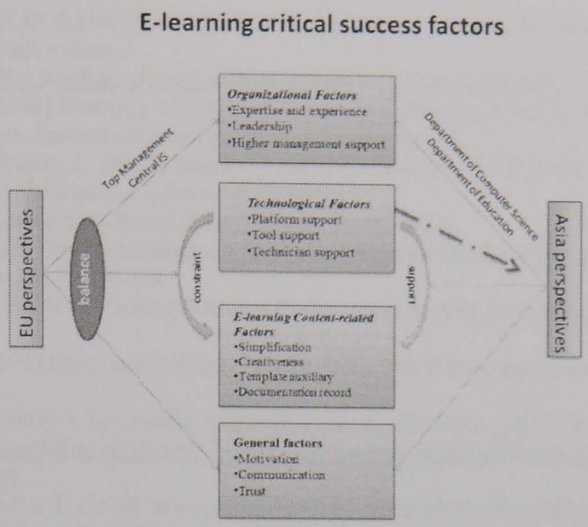

Figure 1 An initial framework of E-Learning success factors in a comparison of EU and Asia perspectives

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 are 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 emphasizes the lack of financial support for commercial E-Learning platforms (Prof. Pao-Ta Yu). This situation leads to some limitations for E-Learning development, such as internationalization and standardization. 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 organization 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 critical success factors 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.

8. References

Bliuc, A.-M., Goodyear, P. & Ellis, R. A. (2007) Research Focus and Methodological Choices in Studies into Students' Experiences of Blended Learning in Higher Education *The Internet and Higher Education,* 10, 231-244.

Branon, R. F. & Essex, C. (2001) Synchronous and Asynchronous Communication Tools in Distance Education. *TechTrends* 45, 41-42.

Cline, M. K. & Guynes, C. S. (2001) A Study of the Impact of Information Technology Investment on Firm Performance. *Journal of Computer Information Systems,* 41, 70-76.

Coen, M., Breslin, C., Nicol, D. & Howell, D. (2004) A Framework for Managing the Risk of E-Learning Investment. available online at <http://www.predict.strath.ac.uk/projects/risk/documents/framework.pdf>.

Debevc, M. & Bele, J. L. (2008) Usability Testing of E-Learning Content as Used in Two Learning Management Systems. *European Journal of Open and Distance Learning,* 14.

Harris, P., Connolly, J. & Feeney, L. (2009) Blended Learning: Overview and Recommendations for Successful Implementation. *Industrial & Commercial Training.*

Horton, W. K. (2000) *Designing Web-Based Training,* New York, Wiley.

Huang, Z. & Palvia, P. (2001) Erp Implementation Issues in Advanced and Developing Countries. *Business Process Management,* 7, 276-284.

Huddlestone, J. & Pike, J. (2008) Seven Key Decision Factors for Selecting E-Learning. *Cogn Tech Work* 10, 237-247.

Khvilon, E. & Patru, M. (2002) Open and Distance Learning -Trends, Policy and Strategy Considerations. UNESCO.

Lee, W. W. & Owens, D. (2001) A Systematic Approach to Media Selection. ASTD Vendor White Papers http://www.astd.org/NR/rdonlyres/900E19EF-121E-40BC-BBBC-CD15BD25F47F/0/WhitePaperMediaAnalysisFinal.pdf.

Martin, G., Massy, J. & Clarke, T. (2003) When Absorptive Capacity Meets Institutions and (E)Learners : Adopting, Diffusing and Exploiting E-Learning in Organizations. *International Journal of Training and Development,* 7, 228-244.

Masrom, M., Zainon, O. & Rahiman, R. (2008) Critical Success in E-Learning: An Examination of Technological and Institutional Support Factors.The 2008 International Joint Conference on e-Commerce, e-Administration, e-Society, and e-Education (e-CASE 2008), (March 27-29), Bangkok, Thailand.

Mcpherson, M. & Nunes, M. B. (2006) Organisational Issues for E-Learning: Critical Success Factors as Identified by He Practitioners. *International Journal of Educational Management,* 20, 542-558.

Mercer Management Consulting Study (IBM MindSpan) (1999) The Future of E-Learning: An Expanding Vision. Available at: <http://www.gila.de/gila/gilaconsult_de/com30.nsf/81DFD29CAB0E11F7C1256FC7005AC1DE/$FILE/TheFutureOfElearning.pdf?openelement> [Accessed 28th, Feb, 2007, 1999]

Ngai, E. W. T., Law, C. C. H. & Wat, F. K. T. (2008) Examining the Critical Success Factors in the Adoption of Enterprise Resource Planning. *Computers in Industry* 59, 548-564.

Romiszowski, A. (2004) How the E-Learning Baby? Factors Leading to Success or Failure of an Educational Technology Innovation. *Educational Technology,* 44, 5-27.

Rosenberg, M. J. (2001) *E-Learning: Strategies for Delivering Knowledge in the Digital Age*, McGraw-Hill Professional.

Sabherwal, R., Hirschheim, R. & Goles, T. (2001) The Dynamics of Alignment: Insights from a Punctuated Equilibrium Model. *Organization Science,* 12, 179-197.

Salmeron, J. L. (2009) Augmented Fuzzy Cognitive Maps for Modelling Lms Critical Success Factors. *Knowledge-Based Systems,* 22, 275-278.

Selim, H. M. (2007) Critical Success Factors for E-Learning Acceptance: Confirmatory Factor Models. *Computers & Education,* 49, 396-413.

Smith, P. L. & Ragan, T. J. (2005) *Instructional Design (3rd Ed.).* , Hoboken, NJ: John Wiley & Sons, Inc.

Soong, M. H. B., Chan, H. C., Chua, B. C. & Loh, K. F. (2001) Critical Success Factors for on-Line Course Resources. *Computers & Education,* 36, 101-120.

Sridharan, B., Deng, H. & Corbitt, B. (2008) Evaluating Intertwined Critical Success Factors for Sustainable E-Learning.19th Australasian Conference on Information Systems, (3-5 Dec 2008), Christchurch.

Testa, M. G. & Freitas, H. M. R. D. (2004) Critical Success Factors of E-Learning Programmes: An Exploratory Study in the Brazilian Context.the 8th Association of Information and Management Conference on New e-usage? Their Integration in Companies and the Society, (May 21st - 23rd 2003), Grenoble, France.

Van De Ven, A. & Huber, G. P. (1990) Longitudial Field Research Methods for Studying Processes of Organizaitional Change. *Organization Science,* 1, 213-219.

Volery, T. & Lord, D. (2000) Critical Success Factors in Online Education. *International Journal of Educational Management,* 14, 216 -223.

Yin, R. (1984) *Case Study Research: Design and Methods (1st Ed.),* Beverly Hills, Sage Publishing.

Zhang, L., Lee, M., Zhang, Z. & P. Banerjee (2003) Critical Success Factors of Enterprise Resource Planning Systems Implementation Success in China.the 36th Hawaii International Conference on System Sciences, (January 6-9), Big Island, HI, USA.

6.2 E-Learning Implementation from Strategic Perspective: A Case Study of Nottingham University

C-C, Lin, Z, Ma, *International Journal of Learning and Intellectual Capital*, forthcoming 2010

Abstract

E-learning is spreading not only in the USA but also in the UK. Most available literature concentrates on e-learning platforms, but do not explore the factors related to e-learning implementation from a strategic or organizational perspective. Many academic institutes and their IT departments are now facing the challenges of selecting and implementing the right e-learning solutions. In order to understand the entire process associated with e-learning implementation in higher institutes which has not yet been a linear process but came probably with top-down, bottom-up, or flowers blooming approach. However, the transform process is extremely complex. To make sense of this complexity, author adopted Strategic IS management profile (Sabherwal et al., 2003) into the research. To explore this speculation, the research uses a qualitative constructivist approach. Based on an exhaustive case study of one higher institute's experience, the paper shows that maintain the alignment is still a crucial issue but hard to achieve. The pressure of achieving alignment may be even more considerable with the implementation of e-learning systems.

Keywords: E-learning, strategic alignment.

1. Introduction

During last 30 years, Information Technology (IT) has become a raised constituent component of business activities (Cline and Guynes 2001). Universities have been confronted with numerous technological development in their external and internal environments since the 1990s (with the ascendancy of the Internet) and currently almost 90% percent of all universities in the US and most universities in the UK have their individual e-learning plan (Svetcov,2000). Nowadays, e-learning has provided an alternative way for higher institutes deliver knowledge to learners at a distance rather that the traditional way (Coen et al, 2004). Most available literature concentrates on e-learning platforms (e.g. VLE, technology), but do not explore the factors related to e-learning implementation from a strategic or organizational perspective. Many higher institutes and their IT departments are now facing the challenges of selecting and implementing the right e-learning solutions. These challenges are becoming more complex with the influx of new LMS vendors. Selecting the appropriate LMS and/or learning content management system (LCMS) for an academic institute and achieving a successful implementation is a daunting task. In order to understand and reduce the risk of E-learning implementation, a proper E-learning strategy is compulsory. The strategy alignment is used to identify the business and IT mission, objectives, and plans (Reich and Benbasat 2000). It has also been used more recently to examine how higher education institutions in Australia were managing the introduction of technology to deliver and administer education (Yetton, 1997). The importance of strategy alignment (business strategy and IS strategy) has been identified (Brancheau et al. 1996, 1987) and multiple papers also stated that strategy alignment as the major issue implanting IT (King 2003, Liebs 1992, Papp 1998). Earlier research also indicated the significance of the alignment between business and IS (information systems) structures (Derely and Doty, 1996; Javenpaa and Ives 1993, Nadler and Tushman 1980), and between business and information strategies (Broadbent and Weill, 1993; Henderson and Venkatraman, 1992). E-learning strategies for higher education, which contain business factors and IS variables are deemed crucial for institutes to translate their deployment of e-learning strategy into successful performance. Previous theoretical works have offered the methodological models for identifying the relationship between IS, strategy and structure.

This paper investigates two issues. First, given that strategic alignment is viewed as essential to e-learning strategy implementation success, does an alignment gap exist between E-learning strategy and IS strategy? Secondly, what is the impact of the e-learning system deployments for users (teachers and students) on strategic IS alignments?

To examine these research issues, a case study approach was used with a top class university.

2. Literature review

2.1 E-learning

E-learning is spreading not only in the USA but also in the UK. By analyzing the causes and the 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 a firm may gain from it (Rosenberg, 2001; Horton, 2000). The corporate added value obtained by reduction of costs, improvement in quality of the training, by saving time or increased flexibility in delivering courses, seem to be a determinant in the adoption of e-learning.

However, this economic-rational perspective on the adoption of e-learning does not take into account other aspects that may impact the decision, as highlighted by recent researches (Martin et al., 2003):

- **Paradox of a e-learning innovation**
- **Institutional pressures on adopting e-learning**
- **Competitive pressures on adoption of e-learning**

From the bandwagon perspective, these arguments about cost effectiveness and ease of delivery of a number of training courses can readily be communicated and are perceived as a competitive disadvantage. If this threat outweighs the perceived value of an equally large competitive advantage (Abrahamson and Rosenkopf, 1993) for universities, bandwagon pressures exceed the university's adoption threshold, that is, a firm's predisposition to innovation and change).

2.2 Strategic alignment

The strategy alignment is used to identify the business and IT mission, objectives, and plans (Reich and Benbasat 2000). It has also been used more recently to examine how higher education institutions in Australia were managing the introduction of technology to deliver and administer education (Yetton, 1997). The IS literature agrees that any investments in information technology (IT) should be closely linked with the strategic direction of the organization (Hackney, 1996; Ward et al., 1990; Earl, 1989; Wiseman, 1985). While decisions on IT were traditionally delegated to the IT professionals in the organisation, there has been an increasing recognition that the opinions of those with various backgrounds especially business strategy should be considered in the decision making process. Currently, IS strategy planning and implementation have received growing concern among academia and practitioners more so because of improved performance among information systems (Wiseman, 1985; Doherty et al, 1999; Segars and Grover, 1998; Baker, 1995; Earl, 1989). However, some of the key components such as IS structure and its relationship with strategy and business structure have not been clarified.

According to the strategic IS literature, there are several theories on the approach to delivering IS management system and they concentrate on improving the performances (e.g., Rackoff et al., 1985). It can be argued that these theories provide a general view of all situations, while also examining multiple approaches in alternative contexts. Hence, they could not propose a sufficiently mature view of various situations.

Some researchers argue that a contingency perspective can be taken to examine performance of the alignments between current debates of IS management and business management. The contingency literature (Chan et al. 1997; Sabherwal and Kirs, 1994; King, 1978) reveals the importance of alternative contexts and provides a comprehensive view of strategic IS management. Several other theories, such as the life-cycle (Van de Ven and Poole, 1995) theory take a more dynamic view of IS management. Nolan (1979) first suggested the stage hypothesis which assumes that the changes in all organisations take the same route.

According to the foundational theoretical view, the content and process should be involved in business (e.g., Blair and Boal 1991, Robinson and Pearce 1988) and IS strategy (e.g., Chan and Huff 1992, Das et al. 1991, Rackoff et al. 1985). With respect to the content, IS strategy is concerned with systems, decisions or business applications of IT, aligning them with business needs and generating strategic benefits (Earl 1989). Business strategy for institutions is concerned with the structures, goals, roles of IT, assessments and implementations.

2.3 Strategic alignment model

A few strategic alignment models have been addressed. The two representative models which have received plenty of attention from researchers are the MIT90s model (Scott Morton, 1991) and SAM (Henderson and Venkatrman, 1992). The strategic alignment model (SAM) which has been proposed by Henderson and Venkatraman is inspired by Parsons's (1983) articulation of the impact of IT on the market place; McFarlan's (1984) adaptation of Porter's competitive strategy framework to a context characterised by the deployment of IT applications; Rockart and Scott Morton's (1984) adaptation of Leavitt's (1965) organization theory model; and convenient dimensions (Wiseman, 1985).

This distinction implies two levels of integration: strategic integration between IT and the business strategy, which establishes the capability of the IT at a strategic level, and operational integration, the link between IT infrastructure and process and organizational internal infrastructure and processes. SAM has been widely applied to organizational transformation research.

Sabherwal et al. (2001 Fig.1) proposed the IS management profile adopted from prior comprehensive IS alignment models (Henderson and Venkatraman, 1992) and gave the alignments some new applications. They defined the alignment between business and IS strategy as 'strategy alignment', between business and IS structure as 'structure alignment', between business strategy and structure as 'business alignment', and between IS strategy and structure as 'IS alignment'. By applying the essence of Henderson and Venkatraman strategic alignment into the generic strategic information systems management profile it is possible to obtain a cross-dimension alignment between business strategy and IS structure, and between IS strategy and business structure.

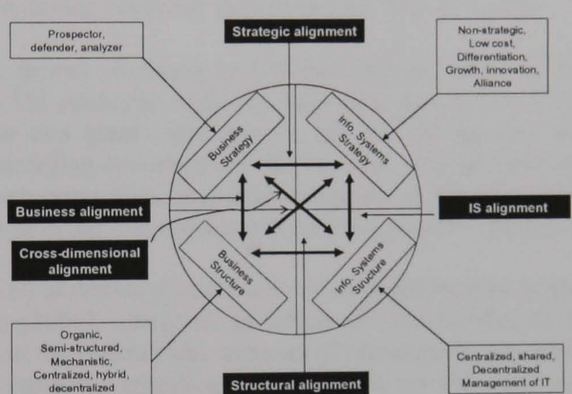

Figure 1 *Strategic IS management profile*
Source: Sabherwal et al. (2003)

Early literature focused on a single domain type. However, when applied to the present context, a holistic approach in investigating the impact of all four alignment domains within strategic alignment model is better suited. Table 1 shows a framework which defines six alignment types. Each alignment is complementary to a bivariate fit. Thus, theoretical patterns of alignment are derived from the constructs and the six alignment types constitute the concept of strategic IT management profile.

Alignment type	Alignment domain 1	Alignment domain 2
Business alignment	Business strategy	Business structure
strategic alignment	Business strategy	IT strategy
Structure alignment	Business structure	IT structure
IT alignment	IT strategy	IT structure
Cross-dimensional alignment 1	Business structure	IT strategy
Cross-dimensional alignment 2	Business strategy	IT structure

Table 1 strategic IT management profile-alignment types

3. Research methodology

To explore this speculation, the research undertaken for this study can be classified as a qualitative constructivist approach. Because of a lack of previous research on the dynamics of alignments for higher institutes, especially the implementation of e-learning, an exploratory, inductive qualitative (Glaser and Strauss, 1967) approach was adopted to understand the IS management profiles within the rich organisational context (Yin, 1984). To pursue the objectives, it was essential to understand the context and setting of the participants involved with the study. During the period of research, it was necessary to get well acquainted with the members of the focus group and gather the information personally. In order to understand the process underlying the major decisions, the researcher has been introduced to the e-learning focus group of the university as an observer. For example: if the focus group made some decisions, the initial emails, documents, communications and questionnaires will be the valuable information to analyze.

4. Case study

4.1 The Pressure of E-learning Bandwagon

Universities have been confronted with numerous technological development in their external and internal environments since the 1990s (with the ascendancy of the Internet). During this period, e-learning – identified with web-based learning – was taken up by pioneers and innovators. The discussion and development focused mostly on the technical possibilities and requirements for e-learning software. Universities are forced to react to some serious emerging challenges which have they never experienced before such as the continual developments in information and communication technology (ICT), industrial needs changing, a shift in leaner expectations, changing demographics of learners and competition among academic institutions but limited budget.

"In 1999, Jack Welch, former chairman of General Electric, declared the Internet to be the most important event in the US economy since the Industrial Revolution. John Chambers, CEO, Cisco Systems stated that the two great equalizers in life are the Internet and education. Sensing the economic potential of marrying education and the Internet, a variety of sites have recently sprung up, offering training in everything from end-user computer skills to multiple other skills. Recently, universities have joined in to tap into the distance learning market." (Clark and Mayer, 2003)

Almost 90% percent of all universities in the US and most universities in the UK have their individual e-learning plan (Svetcov,2000), nearly all of which use the Internet as the medium to deliver the knowledge. In addition to the Internet and websites of universities, private corporates and government organisations that are currently spending large amount on training have acknowledged that the e-learning courseware is the best alternative to classroom training.

Are the proliferating cyber courses harbingers of a new age in learning or just another overstatement of the expectations that have surrounded nearly everything associated with the World Wide Web? Is it an invisible pressure on the institutes and organisations to jump into the e-learning bandwagon with out ripe deliberation? Annual investments in online learning and training are dramatically growing, despite which there has been a lack of trained and experienced staff for development. Does e-learning offer a reliable opportunity to build skills and deliver knowledge effectively? The answer will probably depend on the quality of the instruction delivered, lectures and interactions in the e-learning products being designed, built, created or selected.

Many e-learning initiatives have been justified on the assumption that e-learning can improve the quality of learning, and maybe reduce the costs (Bates 1997). If we assume that technology can improve learning and teaching quality, can provide more opportunities for learners, can create a new and effective learning environments which can improve the learners' experience what is the next step? To re-organize, re-structure or re-group the university to assure success in teaching, learning quality and cost-effectiveness from e-learning?

Universities must adapt to the new trend. The University of Nottingham is known nationally and internationally for its excellence in research and teaching and attracts outstanding students. E-learning is a major agenda, related to the competitiveness of Nottingham University. Adopting e-learning forced innovations from the University. The empirical evidences indicated that the University's e-learning strategy is a top-down process. It believed that e-learning can bring huge benefits for teaching and learning activities. To gain maximum benefit, the university management group

endorsed an initial e-learning strategy. However, there are several issues that need to be taken into consideration; the foundational infrastructure guide is a key to the success of a comprehensive e-learning strategy.

4.2 Description of the Case

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

The Internet became popular in the 90s, and infrastructure progressively matured. In 1994, Mosaic was introduced, which is similar to Internet Explorer. After 1996, the growth of broadband capabilities became the major goal of Internet and served as a catalyst for distance learning.

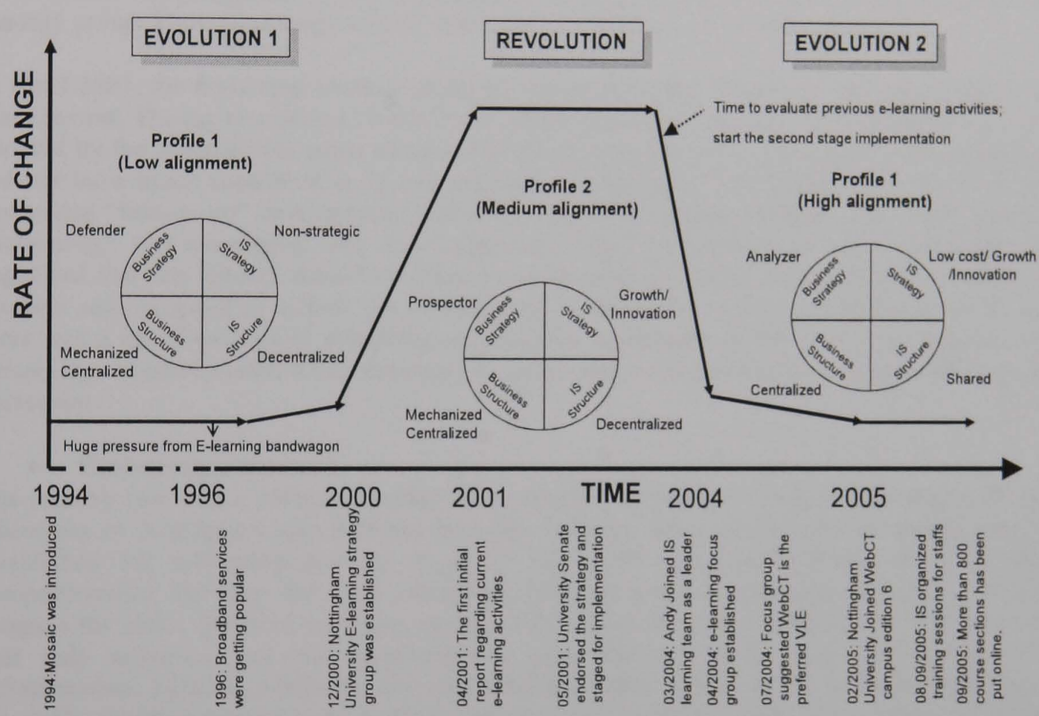

Table 4.1 Evolutionary and Revolutionary periods at the University of Nottingham

The case description is traces three periods: the revolutionary period, and the evolutionary periods before and after this revolution.

- **Evolutionary Period 1**

As shown in Figure 4.1, 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. At 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. IS management units functioned in a decentralised fashion, aiming to provide the direct support for each department. Each school within the University had a separate IS unit. However, IS played a non-strategic role here. Their activities were driven by the requirements of each school with little direction from the central management. Although the IS investment is remained high, there was lack

of control on specific activities. IS resources were mainly spent on maintaining old systems or updating computer hardware. Different schools had different requirements and each IS unit had its own purchasing strategy. Before 2000, some of the teachers had tried some computer assisted learning actives (CAL) which provided supplementary course materials and tutorials. However, the IS department could not support each and every technology that a staff member wanted to utilise.

- **Revolutionary Period 1**

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. At the same time, e-learning was becoming a trend that every institute wished to adopt. Due to the capabilities of the Internet, software and hardware matured, and many UK leading universities began their preliminary e-learning strategies. This caused a shift to prospector strategy for the University of Nottingham as it embraced greater competitiveness, borderless education and entry into the digital learning industry. The university management group sought the better practices of e-learning strategy following response from each school. Each e-learning activity was developed within its IS unit and reported to the central e-learning strategy group. Thus, IS strategy was to simultaneously seek growth and innovation.

In April 2001, the e-learning strategy group forwarded an initial report and recommendations to the management. During this period, WebCT and Blackboard (well-known VLE systems) were widely adopted by the schools with some success, but it was quite clear that the higher management group did not have much control of it. It was reported that the heads of the schools were in favour of supporting "bottom-up" developments rather than centrally imposed targets. The exact meaning of "bottom-up" was questioned with a concern that it may be implemented as laissez-faire. It was suggested that the schools should be asked to participate in a centrally-led review of their current position and requested to include the development of e-learning in their school plans. At this stage, there was a lot of wastage in e-learning investments. A majority of the staff were resistant to new technology. In other words, it was necessary to reconsider a comprehensive e-learning strategy for the university.

- **Evolutionary Period 2**

The primary risk with a defender strategy is the inability to respond to major bandwagon shifts. The University of Nottingham also suffered from this problem. To respond to the increasing pressure, it established the e-learning strategy group in late 2000 and sought better ways to improve competitiveness. Between late 2000 and spring 2004, the e-learning strategy has made considerable progress for initial activities, including extensive collection of views and opinions, staff development (not only academic but also administrative and technical staff), and foundational Internet infrastructures. In 2004, e-learning activities reached heights of popularity on the campus. However, the stable situation needed to be reconstructed in order to handle more complicated challenges, to ensure the direction of e-learning implementation and to work in coordination with different schools.

A new IS learning team leader, Andy Beggan, was recruited in March 2004. His mission was to carry out the e-Nottingham plan, structure, integrate e-learning activities, evaluate the previous e-learning strategy, and provide an insight on future developments. The university e-learning strategy shifted towards analyzer with greater attention to combine the resources and efforts to identify a better e-learning platform. He invited the academic users of both WebCT and Blackboard to take part in a focus group to examine the future direction of central VLE, looking at integration (with the Portal), pedagogic, and technical concerns. In late July 2004, WebCT was confirmed as the single preferred VLE by the e-learning focus group. Once this decision has been made, the task was to shift the IS structure from a centralised mode which was considered unsuitable for rapid changes, to shared IS structure. The central IS department was doing the basic implementation (e.g. provide training sessions for academics), and the IS unit in each school provided the essential support for staff creating the teaching material. The shared IS fashion is said to have a better performance style. The IS strategy also shifted from growth innovation fashion to low-cost and growth fashion by cutting unnecessary cost. Currently, the e-learning implementation progress is quite satisfactory with nearly 800 course sections available online.

5. Conclusions

The strategic IS management profile during Evolutionary Period 1 had high business alignment, but the other three types of alignment were low, and so the overall alignment was low. The pressure from the e-learning bandwagon continuously increased. However, certain schools started to create elementary e-learning materials and make them available online.

Revolution 1 was triggered by several factors, including e-learning bandwagon, the University's inability to respond the pressure via evolution, and maturing Internet facilities. The management were quick to change and established an e-learning strategy group. The University underwent changes in the strategy alignment of its strategic IS profile. Consequently, the overall alignment increased to medium, with three of six alignment measures being high and the other three being low. The increased alignment apparently improved both business and IS performance.

Following the revolution, the university went through considerable changes in three dimensions - business strategy, IS strategy and IS structure. At this time, the analyzer business strategy was well aligned with the other dimensions. It was no surprise that the overall performance was high. Short-term business performance seem to have improved as a result of this shift to analyzer business strategy.

A key contribution of this research is applying the strategic information systems management profile to examine the dynamics of alignment and its concomitant processes. This process meets the criteria of enabling the management to diagnose, achieve and maintain alignment. The research proposes a workable tool to appraise the e-learning implementation processes towards the footprints of each decision, event, and response. By examining the e-learning implementation over a period, the manager can recollect and determine the current alignment. It also can be used to monitor and track the alignment and predict a change in strategy by simulated reallocation of the resources.

In addition, this research also serves as a model for universities that wish to produce new e-learning plan. A combined strategic planning through all levels of the institute is essential to the alignment process. However, this research concerns only one institute and it is obvious that it would be enhanced by similar research in other institutes to enable comparisons.

References

Abrahamson, E., Rosenkopf, L. (1993), "Institutional and competitive bandwagons: using mathematical modelling as a tool to explore innovation diffusion", *Academy of Management Review,* Vol. 18 No.3, pp.487–517.

Baker, B. (1995) "The role of feedback in assessing information systems strategic planning effectiveness", *Journal of Strategic Information Systems*, Vol.4 No. 1, pp. 61–80.

Bates, A T. (1997) "Restructuring the university for technological change". Available online at http://bates.cstudies.ubc.ca/carnegie/carnegie.html

Blair, John D. and Boal, Kimberly B. (1991), "Strategy Formation Processes in Health Care Organizations: A Context-Specific Examination of Context-Free Strategy Issues", *Journal of Management*, Vol. 17, No. 2, pp. 305–344

Brancheau, J.C., B.D. Janz, and J.C. Wetherbe. (1996) "Key Issues in Information Systems Management: 1994-95 SIIM Delphi Results", MIS Quarterly, June 1996, pp 225-242

Brancheau, J.C. and J.C. Wetherbe. (1987) "Key Issues in Information Systems Management", MIS Quarterly, March 1987, pp. 22-45

Broadbent, M. and Weill, P (1993). "Improving Business and Information Strategy Alignment: Learning from the Banking Industry", IBM Systems Journal, 32(1), p 162.

Chan, Y. E, Huff, S. L, Barclay, D. W and Copeland, D. G. (1997) "Business Strategic Orientation, Information Systems Strategic Orientation, and Strategic Alignment", *Information Systems Research*, vol. 8, no. 2, pp. 125–150

Chan, Y. E., & Huff, S. L. (1992), "An information systems research perspective", Journal of strategic information systems Vol. 1 Issue 4, pp. 191–201.

Clark, R.C., & Mayer, R.E. (2003) *E-learning and the science of instruction,* Jossey-Bass/ Pfeiffer, San Francisco, CA.

Cline, M.K. and Guynes, C.S. "A study of the impact of information technology investment on firm performance", *Journal of Computer Information Systems*, 41(3), p 15.

Coen, M., Breslin, C., Nicol, D. and Howell, D (2004) "A Framework for Managing the risk of e-learning investment" available online at http://www.predict.strath.ac.uk/projects/risk/documents/framework.pdf

Das, S. R, Zahra, S. A and Warkentin, M. E (1991) "Integrating the Content and Process of Strategic MIS Planning with Competitive Strategy" Decision Science, 22(5), p. 953
Delery, John E. And D. Harold Doty (1996), "Modes of Theorizing in Strategic Human Resource Management: Tests of Universalistic, Contingency, and Configurational Performance Predictions", *Academy of Management Journal*, 1996. 39, No. 4, pp. 802–835.
Doherty, N.F., Maroles, C.G. and Suhaimi, A. (1999). "The relative success of alternative approaches to strategic information systems planning: an empirical analysis", *Journal of Strategic Information Systems*, Vol. 8, pp. 263–83.
Earl, M., (1989) *Management Strategies for Information Technology*, Prentice-Hall, Hemel Hempstead.
Glaser, B.G. and Strauss, F. "*Discovery of Grounded Theory: The Strategies for Qualitative Research*", Aldine de Gruyter, New York.
Hackey, R.A., (1996) "Sustaining an information System strategy", Proceedings UK AIS Cranfield School of Management, April.
Henderson, J. C., N. Venkatraman (1992) "Strategic Alignment: A model for organizational transformation through technology." T.A. Kochan, M. Useem, eds. *Transforming Organizations*. Oxford University Press, New York, pp. 97 – 116.
Horton, W. (2000), *Designing Web-Based Training*, Wiley, New York, NY .
Jarvenpaa, S. L., B. Ives. (1993) "Organization for global competition: the fit of information technology", Decision science, 24(3), pp. 547–580.
King. W. R. (1978), "Strategic planning for management information systems", *MIS Quartly*, 2(1), pp. 27–37
King, J. (1995) "Re-engineering Focus Slips", *Computerworld*, March 13, 1995 available online at http://www.computerworld.com/news/1995/story/0,11280,2227,00.html
Liebs, S. "We are all in this Together" *Information Week*, 8, October, 1992
Martin, G., Massy, J., Clarke, T. (2003), "When absorptive capacity meets institutions and (e)learners : adopting, diffusing and exploiting e-learning in organizations", *International Journal of Training and Development, 7,(4),* pp. 228–244
McFarlan, F. W. (1984) "Information Technology changes the way you compete", *Harvard Business Review*, 62, pp. 98–103
Nadler, D. and Tushman, M. L. (1980), "A congruence model for diagnosing organizational behaviour". *Resource Book in Macro Organizational Behaviour*. Goodyear, Santa Clara, CA. pp. 30–49.
Nolan. R. L. (1979), "Managing the crises in data processing", *Harvard Business Review*, 57(2), pp. 115–126
Papp, R. (1998)"Alignment of Business and Information Technology Strategy: How and Why", *Information Management*, 11(3), pp. 6-11.
Parsons, G. L. (1983). "Information technology: A new competitive weapon". *Sloan Management review* 24:pp. 3–14
Rackoff, N; Wiseman, C; Ullrich, W. (1985), "Information Systems For Competitive Advantage: Implementation of a Planning Process", *MIS Quarterly*, , Vol. 9 Issue 4, p.285, 10P
Reich, B.H. and Benbasat, I. (2000), "Factors that influence the social dimension of alignment between business and information technology objectives", *MIS Quarterly*, 24(1), pp. 81-113
Rockart, J.F & M. S. Scott Morton (1984), "Implications of changes in information technology for corporate strategy". *Interfaces* 14, pp. 84–95
Robinson, R. & Pearce, J. (1988). "Planned patterns of strategic behaviour and their relationships to business-unit performance", *Strategic Management Journal* 9: pp. 43–60
Rosenberg, M.J. (2001), *E-learning. Strategies for Delivering Knowledge in the Digital Age*, McGraw Hill, New York, NY.
Sabherwal, R., P. Kirs. (1994) "The alignment between organizational critical success factors and information technology capability in academic institutions" *Decision Science,* Vol 25, 2, p. 301.
Sabherwal, R. hirchheim, R., Goles, T., (2001). "The dynamics of alignment: Insights from a Punctuated Equilibrium Model" *Organisational Science*, 12(2), pp 179–192
Scott Morton, M.S.,(1991) "*The Corporation of the 1990s : information technology and organizational transformation* ", Oxford University Press, New York.
Segars, A.H and Frover, V. (1998), "Strategic information systems planning success: and investigation of the construct and its measurement". *MIS Quarterly*, June, pp. 139–63.
Svetcov, D. (2000). "The Virtual Classroom Versus" *The Real One*. Forbes .
Van de Ven, A. H and Poole, M. S. (1995). "Explaining Development and Change in Organizations", *Academy of Management Review*, 20(3) , pp. 510-540
Wiseman, C. (1985); *Strategy and computers*. Dow Jones-Irwin New York, NY, USA.
Yetton, P. (1997). "*Managing the introduction of technology in the delivery and administration of higher education*". Canberra.
Yin, R. K. (1984) *Case Study Research: Design and Method*. Sage, Beverly Hills, CA.

Paper 3: The Process Innovation for E-Learning Implementation: a Case Study of A Taiwan University

Lin, C-C., Ma Z., Pawar, K., and Chen, J. W. (2008), the Seventh IASTED International Conference on Web-based Education Innsbruck, Austria

Abstract

This paper explores the process of the implementation of e-learning strategies in higher educational institutions. It determines that the adoption and implementation of e-learning strategies occur in accordance with a combination of methods employed to diffuse the innovations. Key elements of the diffusion of innovations theory were used to identify the ways in which e-learning activities are being integrated into practices. The study employs the qualitative method to illustrate the e-learning implementation panorama. The researcher attended as an ob-server the meetings of the top management groups, leaders and strategic planners, hardware and software experts, instructional designers, participants from different schools, as well as course participants.

Keywords: Innovation process, e-learning, technology adoption, implementation process.

1. Introduction

During the last three decades, Information Technology (IT) has become a constituent component of business activities [1]. Universities have been confronted with numerous technological developments since the 1990s (with the ascendancy of the Internet) and, currently, almost all universities in the US and most universities in the UK have their own e-learning development plans. Nowadays, e-learning provides an alternative method by which higher educational institutes can deliver knowledge to learners from a distance rather that in the traditional way [2]. Most of the available literature concentrates on the e-learning platforms (e.g. VLE, technology), but fails to explore the factors related to e-learning implementation from a strategic or organizational perspective. Many higher educational institutions and their IT departments are now facing the challenge of selecting and implementing the correct e-learning solutions. There is no discussion about whether or not e-learning should be applied, and the discussion focuses solely on how and when it should be applied. In this paper, the author at-tempts to bring together the different dimensions by clarifying the e-learning innovation process by using three sub-innovation processes. The aim in using this framework is to reveal the key elements of successful e-learning practice at different stages.

2. Paradox of e-learning

2.1 E-learning

Many higher educational institutions have recognised that e-learning will form a major component of their strategy for further development. By analysing the underlying causes and forms of this diffusion process at the sector level, some of the managerial literature maintains that the main factors in adopting an e-learning solution are the economic benefits that a university may gain from it [3]. The corporate added value obtained by the reduction of costs, improvement in the quality of the teaching, and the saved time or increased flexibility in delivering courses; seem to be a determinant in the adoption of e-learning.

However, this economic-rational perspective of the adoption of e-learning fails to take into account other aspects that may impact the decision, as highlighted by recent researches [4]:

The paradox of the e-learning innovations

Institutional pressures to adopt e-learning

Competitive pressures to adopt e-learning

From the bandwagon perspective, these arguments about the cost effectiveness and ease of delivery of a number of training courses can readily be communicated, and so are perceived as a competitive disadvantage. If this threat outweighs the perceived value of an equally large competitive advantage [5] for universities, then bandwagon pressures exceed the university's adoption threshold; that is, an organization's predisposition to innovation and change.

2.2 Organizational innovation

2.2.1 Theoretical background

Innovation is studied in many disciplines and has been defined from different perspectives. Little information exists about innovation in higher educational institutes, which is the focus of this research. Despite the prior concern, organizational innovation has been defined as "the adoption of an idea or behaviour that is new to the organization adopting it" [6]. This broad definition permits many possibilities regarding what it means for an organization to innovate. A better understanding of organizational innovation can contribute to the practice of management [7][8]. From the managers' perspective, the primary purpose of innovation is to introduce change into an organization in order to create new opportunities or take advantage of the existing ones [9]. In the technology diffusion literature, researchers have usually conceptualized innovation as pertaining to the organizational initiation, adoption, and/or implementation of one or more emerging technologies [10] [11] such as e-learning. In other words, technological innovation has a close relationship with organizational innovation. Organizations have been viewed as more innovative when they exhibit this sort of behaviour earlier, more frequently, and/or more intensively. Useful additional discussions on measurement issues can be found in [12], [13], [14], [15], and [16]. The process of innovation is frequently described as consisting of four essential steps, starting with the conception of an idea, which is proposed, then a decision is made to adopt it, and, finally, the innovation is implemented.
Who proposes innovation ideas for adoption? Most new ideas probably arise with organization members who cross the boundary between organizations and the technological environment. Little attention has been paid to bandwagon pressure, especially rival competition. [5], [18] and [19] have theorized that higher managements and lower members both initiate innovations, depending upon the type of innovation proposed.

2.2.2 The path of organizational innovation

An important turning point in the history of innovation in organizations could be referred to [20]. Until this point, most of the studies of innovations and organizations have focused on organizational innovativeness, which is a scale for a sample organization regarding adoption. After the early 1970s, research on innovations in organizations often studied innovation as a whole single process in an organization. Much of the literatures at this stage considered innovation studies as a new communication technology, management information system or some kind of computer technology innovation [21]. Several studies on organizational innovation appeared after the 1980s. Another remarkable factor that increased research attention towards innovation in organizations was the variety of computer-related phenomena introduced into the organizations. However, many of these failed, which brought more attention to finding the causes of this [22].
Roger proposes that the innovation process usually consists of a sequence of five stages (figure1), two during the initiation sub-process and three during the implementation sub-process. The later stages of the innovation process cannot be undertaken until the earlier stages have been completed, either explicitly or implicitly [23], and also appear similar to the simple linear organizational innovation model.

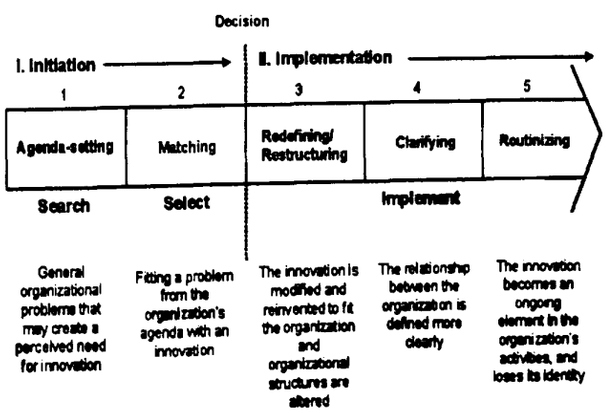

Figure 1. The Innovation Process in an organization (Adopted from Roger 1995)

2.3 Technological innovation process

2.3.1 The definition of technological innovation process

In order to begin to identify the different innovation types, it is important to define the term 'technological innovation'. The fields of engineering, marketing, management and even economics provide unique spins regarding what is considered an innovation. Freeman [24] proposes that technological innovations best capture the essence of innovations from an overall perspective: 'Innovation' is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology based invention which leads to the development, production, and marketing tasks striving for the commercial success of the invention.
Current interest in innovation and its relationship to economic growth has resulted in a body of literature on the various facets of the process of technological innovation. In recent years, technology has been identified as an important competitive weapon for research-intensive firms, and is seen as a vital ingredient in these firms' long-term strategies. For successful technological innovation to occur, it is important that the process of technological innovation is effectively managed. Without a comprehensive knowledge of the innovation process, it is difficult for managers both to manage the process and also to implement the relevant strategies.

2.3.2 Technological innovation as evolution of Information systems

In this research, technological innovation includes the e-learning platform development, course delivery method and e-learning infrastructure development, etc, which are the elements of e-learning technology innovation. However, the Information System (IS) departments are where the organizations make the decisions about acquiring and deploying new technologies. From this perspective, Information Systems (IS) innovations are technology-based innovations that are created and used by individuals, organizations, and societies. In other words, IT lies at the heart of information systems research. Generally speaking, ideally, the major mission of Information Systems is to integrate the IT [28]. The popularity of the technological approach in the IS literature has been used to explain the adoption and diffusion of technological innovation processes in organizations. [19] [22]

2.4 Product innovation process

This research would like to define the "E-learning courses" that are involved in the E-learning innovation process as a product innovation process. The following section will introduce the "E-learning course development and process".

2.4.1 Purpose of the e-learning course:

The objectives of the proposed e-learning course were as follows

During the e-learning process, a complete rethink of the educational system is required and, when it comes to quality, integrated e-learning courses that meet these challenges and live up to very high standards. Developing integrated e-learning courses is not a job for one individual. It is an industrial process, which requires teamwork, cooperation between different specialists and a systematic workflow [32].
The most effective e-learning, whether it is delivered as an e-learning solution or conventional face-to-face instruction, occurs as a result of careful planning derived from the needs of the organisation and learner [33]. The students and teaching staff have different expectations of e-learning courses. The students expect the courses to be attractive, effective and efficient. The teaching staff expects the courses to be user-friendly, easy to adapt and update, and to decrease their teaching load.

2.4.2 E-learning Course development process

There are some articles talking about E-learning course process (e.g. table 1). According to Jochems et al [32], the **whole instructional process** can be divided into five phases (Figure 2). These phases include the course definition (the task), whereby the course is developed, and there is an implementation phase between development and delivery. Here, the tutors are trained, the authorization issues are resolved, and the course is incorporated into the curriculum. During the delivery phase, the students study the course, write assignments and sit exams. The tutors give feedback and assess the students' progress. During the evaluation phase, the quality of the whole

course, including tutoring and support, are assessed. However, the course development process is focused on four phases: analysis, design, construction and developmental testing.

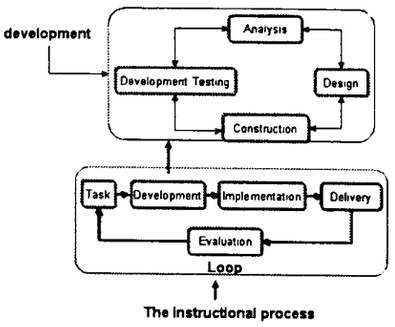

Figure 2 Development and the instructional process [32]

3. Methodology

The research undertaken for this study can be classified as a qualitative constructivist approach. Previous studies lack research on the innovation process for higher educational institutes, especially the implementation of e-learning. Hence, an exploratory, inductive qualitative approach was adopted in order to understand the IS management profiles within the rich organisational context. To pursue the research objectives, it was essential to understand the context and setting of the participants involved in the study. During the period of research, it was necessary to become well acquainted with the members of the IS department and gather information about them in person. The researcher participated in the e-learning focus group of the university as an observer in order to understand the process underlying the major decisions. For example, if the focus group made certain decisions, the initial emails, documents, communications and questionnaires provided valuable, first-hand information on the innovation process that could then be analysed. After the initial data were collected, the author also interviewed several members of the focus group who were selected as the representatives of the various schools and departments in an effort to address specific critical events.

4. Case Study

The National Chung Cheng University (CCU), Taiwan, was the first public University established after Taiwan's economic boom in the 1980s. It was founded as a research-oriented University which aims to provide students with necessary skills in the humanities, science, technology, law and management. It is this type of lieral arts education that allows students effectively to deal with the complexity of life in the 21st century.

4.1 The Reason for e-learning adoption

Generally speaking, before 2000, universities around the world perceived the pressures of e-learning adoption in a relatively similar way. The majority of the pressure is from the universities' competition, such as:

- Since the 1990s, e-learning implementation was taken dramatically as a new style of teaching channel because of the rapid internet development.
- Strong e-learning software development in Taiwan
- The height of the dotcom era
- According to Taiwan's exceptional political situation, it joined the WTO (World Trade Organization) in 2001. The implication is huge and had a great impact on the original closed education market which needed to be opened up.

Some motivations are from government support:

- Jul, 1995: Participated in the plan of "e-learning pioneers" by the Minister of Education, Taiwan.
- Sep, 2006: "the methods for Universities' e-learning implementation" by MOE
- Oct, 2006: Got the certification by MOE for "The e-learning vocational education on master degree". 15 universities and 17 courses applied, with 3 universities and 5 courses obtaining permission

4.2 CCU Timetable of e-learning

Starting in the early 90s, the timing of the initial e-learning development is pretty much the same as that of leading western universities. 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 at the heart of IT hardware development, producing cheaper and more reliable IT products, although the Taiwanese education market it-self is small and does not have a close connection with western countries. Thus, they desired to create a route to make a better connection with other universities in order to recruit more new students.

4.2.1 The first stage: 1995-2002 (the initial stage)

The National Chung Cheng University can be identified as a pioneer, providing distance learning courses in Taiwan since 1995 by participating in certain distance learning projects. There were significant results from the projects, e.g. 45 courses online and over 6000 students enrolled. During this period, the university treated distance learning as an extra workload for the IS department. From the organizational viewpoint, this foundation has not changed since that time. After the university decided to participate in the pioneering dis-tance learning course with MoE, it started to develop its own platform (conforming to the SCORM1.2 stan-dard) in 1999, instead of buying the platform from LMS vendors. The teachers were keen to put the courses online but their quality can be argued to be relatively low.

4.2.2 The second stage: 2002-2004

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

In August 2004, the e-Learning centre (figure. 3) was renamed and upgraded as the e-Learning studio, which was established in January 2002 and was independent of the library, in order to solve two key bottlenecks.

(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 remains 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 subjected to the advanced Linux system and PC which are not suitable for making video-based materials. During this stage, the CCU completed the evolution of the technological requirements and obtained much valuable experience to

Prepare for the next stage.

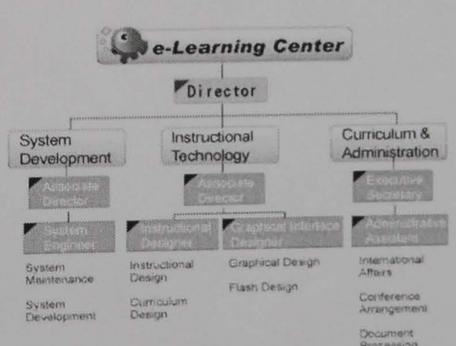

Figure 3: CCU e-learning centre

To break through the bottlenecks described above in making e-Learning courses, the CCU needed to establish a professional team for producing multimedia instructional materials and arranging appropriate multimedia facilities. To exploit the lecturers' teaching principles effectively, e-learning materials are produced according to the needs of the lecturers. In other words, lecturers only have to focus on preparing teaching materials and do not have to worry about their technical skills. As expected, the number of lecturers who are willing to be involved in creating e-learning courses will increase.

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 subjected to the advanced Linux system and PC which are not suitable for making video-based materials. Besides, the video and audio server is

merely replaced by a PC with a real video server installed and this will not be able to meet the increasing need for the quality and quantity of video-based materials in the near future. The system server and video and audio server will need to be upgraded and a comprehensive scheme will need to be planned in advance if the service to be available to a large number of users simultaneously. In this stage, the CCU completed the evolution of the technological requirements and obtained much valuable experience to prepare for the next stage.

4.2.3 The third stage: 2005- present

In order to maintain strength and remain competent, the CCU gave the e-learning centre a brand new organizational 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, Cyber-uni is promoting its platform service by using its own re-sources. In the near future, CyberCCU will be expected to be self-supporting financially. 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 credits for courses will be delivered online. This brings great benefits for part-time students who have jobs but wish to improve their abilities and obtain an advanced degree.

5. Preliminary Findings

From the e-learning literature, we find that the e-learning phenomenon happened at a similar time all over the world, because of the dramatic technological development and world globalization that has occurred since the 1990s. The major reason for CCU to adopt e-learning is the pressure of the e-learning bandwagon. They believed that e-learning can bring huge benefits for teaching and learning, as well as increase the university's reputation. Generally speaking, most of innovations are lead by organizational innovation, al-though it can be argued that the CCU has strong abilities in e-learning platform development which causes technological innovation to became a locomotive to success.

The CCU has its own platform for achieving their goals. The author has investigated many universities both in China and Taiwan. Most of these prefer to develop their own e-learning platform which seems to be the main approach among Asian universities. The reason for them to develop their own platform rather then to buy one is that buying an e-learning platform requires huge copyright and maintenance fees. Also, most of the western e-learning platform development companies do not include an Asian languages package in their software, so the language barrier is a big issue for Asian universities when adopting these e-learning platform. With the powerful computer technology, the CCU has developed their own platform from 1999, and version 6 has already been released (2007).

6. Conclusion

This research proposes a workable tool for appraising the e-learning implementation processes 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. It also can be used to monitor and track the development process and predict changes in an organization 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 strategic planning at all levels of the institution is essential to the successful e-learning model. However, this research concerns only one institution and it is obvious that it would be enhanced by similar research in other institutions in order to make comparisons.

6. References

[1] Cline, M.K. and Guynes, C.S. "A study of the impact of information technology investment on firm performance", *Journal of Computer Information Systems*, 41(3), p 15

[2] Coen, M., Breslin, C., Nicol, D. and Howell, D "A Framework for Managing the risk of e-learning investment" available online at http://www.predict.strath.ac.uk/projects/risk/documents/framework.pdf , 2004.

[3] Horton, W. Designing Web-Based Training, Wiley, New York, 2000

[4] Martin, G., Massy, J., Clarke, T., "When absorptive capacity meets institutions and (e)learners : adopting, diffusing and exploiting e-learning in organizations", *International Journal of Training and Development, 7,(4),* pp. 228–244, 2003
[5] Abrahamson, E., Rosenkopf, L., "Institutional and competitive bandwagons: using mathematical modelling as a tool to explore innovation diffusion", *Academy of Management Review,* Vol. 18 No.3, pp.487–517, 1993.
[6] Daft, R.L., "A Dual-Core Model of Organizational Innovation," *Academy of Management Journal*, Vol 21, (2), pp. 193-210, 1978.
[7] Leifer, R., McDermott, C.M., O'Connor, G.C., Peters, L.S., Rice, M., Veryzer, R.W. "Radical Innovation: How Mature Companies Can Outsmart Upstarts". Harvard Business School Press, Boston MA, 2000.
[8] Van de Ven, A. "Central problems in the management of innovation". Management Science, Vol (32), 590–607, 1986.
[9] Drucker, P.F. "The discipline of innovation". Harvard Business Review , pp. 72–76, 1985.
[10] Fichman, R. G, "The Diffusion and Assimilation of Information Technology Innovations," in Framing the Domains of IT Management: *Projecting the Future Through the Past*, R. B. Zmud (ed.), Pinnaflex Educational Resources, Inc., Cincinnati, OH, 2000.
[11] Prescott, M. B., and Conger, S. A, "Information Technology Innovations: A Classification by IT Locus of Impact and Research Approach," *Databas*, Vol 26 (20), pp. 20-41, 1995
[12] Downs, G. W., and Mohr, L. B, "Conceptual Issues in the Study of Innovation," *Administrative Science Quarterly*, Vol (21), 4, pp. 700-714, 1976
[13] Massetti, B., and Zmud, R. W, "Measuring the Extent of EDI Usage in Complex Organizations: Strategies and Illustrative Examples," *MIS Quarterly* Vol, 20 (3), 1996, pp. 331-345, 1996.
[14] Saga, V.L. and Zmud, R.W, "The Nature and Determinants of IT Acceptance, Routinization, and Infusion," Proceedings of the International Federation for Information Processing Conference on Diffusion, Transfer & Implementation of Information Technology, Champion, Pennsylvania, pp. 67-86, 1993.
[15] Tornatzky, L.G. and Klein, K., J, "Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings," *IEEE Transactions on Engineering Management* Vol(29),1, 1982, pp. 28-45, 1982.
[16] Zmud, R.W. and Apple, L.E, "Measuring Technology Incorporation/Infusion," *Journal of Product Innovation Management*, Vol(9), 2, pp. 148-155, 1992.
[17] Abrahamson, E., Rosenkopf, L., "Social network effects on the extent of innovation diffusion: a computer simulation", *Organization Science*, 8(3), pp.289–309, 1997.
[18] Evan, W. M., "Organizational Lag," *Human Organization,* Vol. 25, pp 51-53, 1966.
[19] Swanson, E,B, "Information Systems Innovation among Organizations", *Management Science*, Vol. 40, No. 9, pp. 1069-1092, 1994.
[20] Zaltman, G., Duncan, R., Holbek, J. " Innovation and Organizations" - New York: Wiley, 1973.
[21] Van de Ven, A. and Rogers, E, M, " Innovations and Organizations: Critical Perspectives", *Communication Research,* Vol 15, (5), pp: 632-651, 1988.
[22] Rogers, E.M., "*Diffusion of Innovations*",, The Free Press, New York, 1995.
[23] Tedd, J, "Innovation management in context: environment, organization and performance" , *International Journal of Management Reviews* 3 (3), 169–183, 2001.
[24] Freeman, C. (1989) "The nature of innovation and the evolution of the productive system ", Maastricht : MERIT.
[25] Abernathy, W.J. and Clark, K.B. (1985), "Innovation, mapping the winds of creative destruction". *Research Policy*, Vol (14), 1, pp. 3-22
[26] Ali, A., Krapfel, R. Labahn, D. (1995) "Product innovativeness and entry strategy: impact on cycle time and break-even time.", *Journal of Product Innovation Management.* Vol (12), pp 54-69.
[28] Checkland, P. and Holwell, S.," Information, Systems, and Information Systems: Making Sense of the Field", John Wiley & Sons, Chichester, 1998.
[29] Allen, J. P. "Information systems as technological innovation". *Information Technology* & People, 13(3), 210-221, 2000.
[30] Drazin, R., and Schoonhoven, C.B. (1996), Community, population, and organization effects on innovation: a multilevel perspective', *Academy of Management Journal,* Vol. 39, pp. 1065-83.
[31] Kwon, T.H. and Zmud, R.W. (1987), Unifying the fragmented models of information systems implementation, in Boland, R. and Hirschheim, R. (Eds), Critical Issues in Information Systems Research, John Wiley & Sons, Chichester, UK.
[32] Jochems W, Merriënboer J. V. and Koper R. (2004), Integrated e-learning : implications for pedagogy, technology and organization, London : RoutledgeFalmer
[33] Hoffman P. S. (2002) The development and evolution of a university-based online library instruction course, Reference Services Review, Vol. 30 No. 3, pp. 198-211