Experiences of Technology Enhanced Learning: What Went Wrong?

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Abstract.

The e-learning community is beginning to amass a great deal of experience of successful practice, but typically final project reports and associated papers concentrate only on the successful outcomes. There has been very little published on the innovations that failed or the unexpected and unwanted outcomes of such projects. This experiences paper presents four case studies of projects in which the the authors have been involved over the last 15 years. The contribution of this paper is to focus on the aspects of the projects that were not successful or were unwanted, analyzing the causes. The paper concludes by suggesting that most projects have both successful and unsuccessful components, and that the community would be better informed if they were more often provided with the complete picture.

Keywords: e-learning, project failure, institutional change management, higher education

1 Introduction

The authors have worked together on many projects introducing technology into learning at the University of Southampton, UK since the early 1990's. The first author has worked primarily as an educational developer while the second author has worked primarily as a Computer Scientist. This experiences paper revisits some of the projects they have worked on, all of which were successes in the eyes of the funders. Outputs were produced, results were published, changes were made and the budget was accounted for. In this second examination we consider those aspects of the project that did not go as planned, or even if they did go as planned they did not necessarily result in the consequences we had anticipated.

In order to analyze these results we have examined them using a framework which considers the context of the project and the expected technical and pedagogical outputs, as represented in Figure 1. The Learners are at the centre (of course) and the project environment; its processes and objectives (shaded grey) will make technical and pedagogical innovations which will, hopefully, impact upon the learning. These project managers, and the innovations they make, will be affected by the context in which the project is carried out; the local (institutional) environment and the wider (external) environment. Together these establish strategic priorities and influence the way the institution manages change and the culture in the organization. Ideally the

organizational learning which results from the project will also feed back into the institutional culture and management – leading to some change.

In this paper we use case studies to explain why projects can indeed be both successes and failures; we are all aware of cases where a project has produced some excellent technical innovations, but learning has not been changed. Similarly we see projects where student learning has clearly been improved but the lessons have not been learned by the institution/environment, so the change does not benefit a wider community. For these reasons funding bodies such as JISC[1] in the UK are now putting great store onto "embedding" project results.

We now present four case studies of real e-learning projects their successes, the problems they encountered, their shortcomings and failures which we will evaluate against this framework.

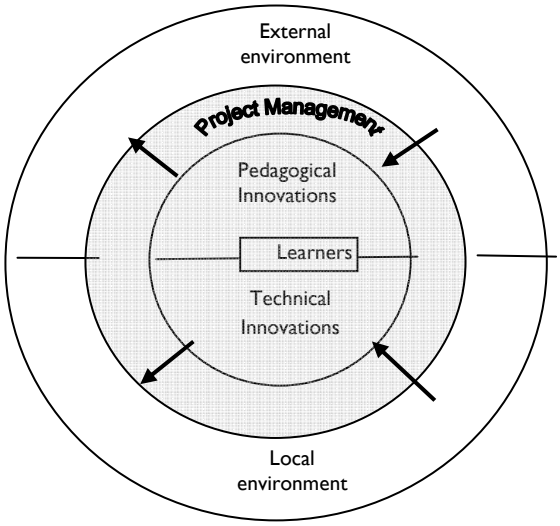

Figure 1: The Framework used for Technology Enhanced Learning Project evaluation.

Microcosm and the Scholar Project

These were two separate but inter-related projects. Microcosm was an educationally oriented hypermedia system while The Scholar Project developed e-learning applications for institutional change using Microcosm as its e-learning platform.

The Microcosm project was a pre-web Open Hypermedia System (OHS) [2, 9].It was developed within the department of Electronics and Computer Science (ECS) at

[1] JISC funds technology infrastructure for UK universities and has an extensive development programme primarily managed via competitively awarded projects addressing agreed strategic priorities. http://www.jisc.ac.uk/

the University of Southampton. It was designed as a testbed for novel and emerging ideas in hypertext and hypermedia presentation and implementation. The project was active between 1988 and 1998. The technical innovations in Microcosm were important, earning ECS a world leading reputation within the hypertext research community; the system won the BCS software prize in 1996 and it earned venture capital investment for a spin-off company. The second author managed the Microcosm research team.

The Scholar Project began in 1993. It was funded by an initiative of the UK Universities Funding Council (UFC) designed to promote "effectiveness and efficiency" in Universities by stimulating growth in the use of technology for learning through the Teaching and Learning Technology Programme (TLTP) [13]. Institutions and consortia of subject specialists were encouraged to apply for funding for using technology in learning. In those pre-web days a number of consortia became interested in using Microcosm as the engine for their delivery engine. Amongst the projects that received funding was the University of Southampton's institution wide Scholar Project, which was managed by the first author. This project set out to "shift the culture of the university" by creating a campus-wide network for multimedia learning. The project sponsored the design, development and implementation of computer-based learning resources. It used the device of creating an Interactive Learning Centre to assist a number of early adopters from a range of academic disciplines to have the necessary educational and technical assistance to prepare Microcosm based learning materials [16].

Almost as soon as the Scholar project began the World Wide Web started to make its appearance felt within the academic community, and some consortia that were using Microcosm transferred their development to the Web. However others, including The Scholar Project and the consortium formed to develop Physics teaching resources (SToMP) argued for the pedagogic merits of using Microcosm. History of course now shows that those who changed made the right decision, and it became necessary for those who wished to maintain their investment in learning materials to move to some internet based delivery [1, 4]. This points us to our first, and for these projects the most important cause of failure: the external environment changed radically and this meant that their choice of technical platform was inappropriate.

There were good outputs from The Scholar Project, many related to individual and organizational learning which resulted from the activities which the project undertook. A number of people around the university became familiar with the use of technology in teaching. The focus and intensity of project activities created a climate where they gained sophisticated insights into appropriate technology use in their disciplines, they networked together and formed professional and friendship bonds. Many of these people have now reached senior positions we see that they are indeed using their experience to change the culture of the university – even if somewhat later than anticipated!

But even without the advent of the web, we would have to confess that there were a number of flaws in the Scholar/Microcosm project, both from a technical viewpoint and from the institutional context.

Microcosm, as an open system which interconnected many different media types and commercial applications was technically robust. It has a very small and specialized user base, but it had none of the strengths that Morris et al attribute as

"worldware" [12].It was a system in perpetual beta, not ready for mainstream use. The fundamental problem was that this software was being produced by a research lab, who tended to concentrate on solutions to interesting new problems rather than on code maintenance, thorough documentation and resolving uninteresting limitations. The academic user-base actually made things worse as they continually fed the research lab with a stream of interesting feature requests . By the time the code was put into the hands of a commercial team there were so many options and features it was impossible to document or test systematically. The resulting product became extremely difficult to describe – it was really a framework allowing users to tailor their own hypertext system – and it became far too complex for an average teacher to understand how they were supposed to use it [3].

From an institution point of view, it became clear that while the funding council required the University to sign-up for full institutional commitment to the project, as soon as the funding ceased the University management took a close look at the Interactive Learning Centre and significantly changed its brief, bringing it in line with core institutional objectives. Consequently there was effectively no longer any cost free support within the university centre for teachers wishing to use learning technology. As the result of this the individual Schools within the University have subsequently tended to develop their own approaches and support.

The Modular MSc

In 1994 a senior management of a large computer manufacturer, with development premises near Southampton, understood the need for change in their organization, and the need to move their emphasis from selling their own hardware and software towards selling software services. The staff of this company tended to by highly skilled in a particular area of the organization's overall portfolio, and had previously shown little interest in tracking technological development elsewhere. The senior management realized that if they were to start to change the culture within the company they would need to start an education programme to make the staff aware of the emerging world of internet based, open source, multimedia interoperable open software. The senior management of the UK branch approached the University of Southampton and asked them to run an MSc, using a mode of delivery suitable for full time employees, that would be designed to broaden their understanding of current computer science. The company would guarantee 12 new students per year, but the University was free to advertise the course elsewhere.

The second author was appointed course leader; the solution we adopted was to produce a highly modular course.. Modules represented the leading edge of that time and reflected the research strengths of ECS, for example

- Open Distributed Systems
- The Multimedia Revolution
- Object Oriented Technology
- Networking in the '90s: The Information Superhighway
- The Social Impact of the Information Revolution
- Interactive Entertainment Systems

Each module would require one week of attendance at the University for teaching, followed by 6 weeks to complete some coursework which would be assessed. All the course materials would be on the Web, and the once off campus the students would be supported by on-line tutoring, both synchronously (chat) and asynchronously via email and course forums.

A charging structure was introduced whereby the cost of the first module was at commercial rates, but each subsequent module that a student elected to take would cost less. Any student who completed the necessary number of modules would receive free supervision for their project. This charging structure was designed to encourage those who had started to complete, and also to enable us to advertise the courses to industry at commercial rates – with the expectation that such attendees might only be interested in the one week taught component.

This solution presented some significant challenges; in 1995 the internet was not standard issue, particularly at this company where they had a long history of developing their own proprietary network protocols and communication software, and although the senior management had specifically encouraged this solution to expose employees to these new technologies, the middle management were enormously concerned about security issues. In the end we needed to set up a small network of internet connected PCs not only outside the companies firewall, but also outside the regular working premises, so that there could be no possibility, for example, of a disk being accidentally moved from a company machine to one of these PCs. Without the technology on the employees' desktops, Web based learning was significantly hindered, and mostly the learners simply printed the notes.

A more significant problem was that of recruitment to the MSc. Although the course started well with a full cohort of students, mostly recruited from the company but also some recruited from other companies and occasional attendees using the modules as short courses. Once the first batch of modules had been run over a period of two years, we discovered that there was very much reduced attendance (single figures) when the modules were run again – so the courses had become financially unviable. The reason for this turned out to be quite straightforward; although the senior management wanted the up-and-coming middle management to broaden their education, when they offered a sponsored place on the MSc, the manager of the unit was inevitably too busy and more interested in acquiring skills very specifically aligned to their current project and problems. In the first instance they offered their place to a junior colleague, some of whom were barely qualified to participate in an MSc course. They then found they resented the loss of time of that colleague, and when asked to recommend further participants they refused to do so.

The course, which had been designed for industry leaders was thus being delivered mainly to technicians. They would much have preferred an in depth course to increase their specific skills, rather than this broad look at the latest technologies, which they did not see at that time to be relevant to their working life. At the same time managers from the target group were happily signing up to another part time MSc in Software Engineering and Formal Methods which was seen as providing relevant skills.

So in summary the very managers who's understanding the company wished to broaden were the force that scuppered the degree, just because they did not understand the significance of the way the world was changing. When the university asked the company to address their commitment to providing numbers for this course

the senior managers responsible had moved on – and the new ones were unable to confirm this commitment. In 1998 The University was forced to close the course down while "teaching out" the existing students - a very expensive process which took until 2002 to complete.

The e3an project

The Electrical and Electronic Engineering Assessment Network (e3an) was established in 2000 as a three year initiative under Phase 3 of the Fund for the Development of Teaching and Learning (project no. 53/99) [8]. The project was led by the University of Southampton in partnership with three other UK south coast higher education institutions; Bournemouth University, The University of Portsmouth and Southampton Institute. The First Author was the Principal Investigator, with technical assistance from the second author. The project collated sets of peer-reviewed questions in electrical and electronic engineering which had been authored by academics from UK Higher Education. The questions were stored in a database and available for export in a variety of formats chosen to enable widespread use across a sector. Around half of the questions were Objective questions and could be imported into test engines such as QuestionMark [6, 15].

The objectives of the project were twofold. The first objective was to produce a database of high quality questions which teachers could use to create stage tests or worksheets for their students. The questions all had worked solutions or hints, so that the students could obtain feedback. The second objective was to form a community of practice in Electrical and Electronic Engineering assessment. Around 100 academics contributed to this database, and they all received some training on modern assessment methods, and contributed their own experiences and skills to the network.

This short description demonstrates that the primary objectives of the project were entirely in the area of pedagogic innovation. The project plan had assumed that the technology of collecting and storing the questions and some associated metadata would be straightforward. In the event this was not the case. Numerous technical issues arose. The xml QTI specification for representing questions was new and poorly specified, and hardly used. The use of xml representations for equations were in their infancy and again there was little support for mathML in any of the software. The range of software for delivering questions was large (and non standard). Many of the academics we were working with did not have regular access to the Internet, and were not likely to set tests on-line – even if they used MCQs they preferred to have them printed. Furthermore, educational metadata was not sufficiently fine grained in its descriptive facility to distinguish between numerous similar questions at the level users required.

The development of a community of practice was successful, and the educational development approaches developed by the project have been established [ref here]. However the project, which had been designed and financed as a pedagogic intervention rapidly became a technical firefighting exercise although the staff who had been employed to manage the project were not strongly technical. In the end all the technical problems were solved, and a database of a few thousand questions was

released on a CD – and could also downloaded from the web site. The project has been enormously successful technically for Southampton; some of the solutions we chose were adopted by a number of later projects and by examination boards and e3an is much used as an exemplar item bank. The authors' lab is now a centre of expertise in e-assessment with many follow up technical projects.

However, as the creation of the database neared competition the project staff acquired new jobs, based on their newfound expertise, leaving the project before the results were rolled out to students. The resulting dissemination phase was much lower key than had been planned, and the work has not been used as much as was envisaged.

As an aside, technical advances since 2000 have been significant. Tools exist for capturing new questions, and the database can be accessed on line as a web service. It can then be connected to other question rendering tools to allow students to work directly with the questions on-line.

The DialogPLUS project

The DialogPLUS project was a collaboration between Pennsylvania State University, the University of Leeds, UCSB, and the University of Southampton. It began in February 2003 to investigate 'Digital Libraries in Support of Innovative Approaches to Teaching and Learning in Geography'. The project was funded for three years by the Joint Information Systems Committee (JISC) in the UK and the National Science Foundation (NSF) in the USA under the Digital Libraries in the Classroom Programme. The second author was the Principal Investigator.

According to JISC [10]: "This programme aims to examine how integrating recent technical developments with digital content will improve the learning experience of students and provide new models for the classroom including the impact of integration on student achievement, retention, recruitment and on institutional structures and practices." Specific objectives were to:

- Bring emerging technologies and available digital content into core teaching and learning
- Develop and use innovative approaches in integrating technologies for the benefit of undergraduate teaching
- Demonstrate how the pedagogical process needs to be adapted or developed to support the learning process when using technology
- Examine the human and organisational issues associated with implementing new modes of teaching."

Martin and Treves (2007) described aspects of the DialogPLUS project from the standpoint of the geographers [11], addressing the first three bullet points above in some detail. The authors of this paper were involved in managerial, technical, educational and evaluative support roles at the University of Southampton and for the project as a whole. We became increasingly aware of the effect the project had on our own institution, particularly with respect to its influence on e-learning strategy and policy making as described in [5]

A primary objective of the DialogPLUS project was to investigate the practicalities of the joint design and sharing of learning activities, based upon existing digital resources. JISC and the NSF have already funded the production and licensing of many digital resources for use in education and research, and this programme was particularly concerned with deploying such resources in blended learning, exploring the associated technical, educational and organisational issues, and evaluating the impact on students and staff.

The final report for the DialogPLUS project [14] examines both the successes and failures of the project. To summarize the main successes briefly: the extended project team produced and implemented a large volume of online learning material, re-using digital resources from multiple sources, as was envisaged, and the vast majority of this continues to be used after the funding has ceased. Evaluation indicated that high quality online learning activities, as part of a blended approach, did enrich programmes of study. Team members now have a sound understanding of good practice in design for learning, elearning and blended learning and are able to make informed contributions to ongoing institutional, national and international work on digital repositories, sharing and reuse of resources, pedagogical planning, design and implementation tools. At Leeds, Southampton and Penn State Geography departments the project is seen to have been a success and the international aspect of the collaboration has made the resources more widely applicable.

However some of the objectives of the programme were not met, and there were also some interesting "negative outcomes".

First, the funders were very keen to see the results embedded. Since the resources continue to be used we can certainly claim that they are embedded. On the other hand one could argue that it was not just the use of the resources that should have been embedded, but the continued production of further resources and the increased use of blended learning within the Schools. In fact, at Southampton at least, the lesson that was learned was that in order to carry out such innovation one needed to keep earning more grant money. The School of Geography has continued to be successful in this respect, and the approach of funding educational development through grant funding has become enshrined in university e-learning strategy

Secondly, in the DialogPLUS project there was intended to be an emphasis on sharing the resources developed. The Geography departments collaborated on producing resources to support teaching objectives they shared in common, and we might have expected that this would have encouraged them to share use of them. In fact we saw very little of this except in the case of the most generic materials. (A learning object on Academic Integrity was reused by all departments, but only after they had completely changed the content in each case – it was only the learning design they shared). When it came to course materials, once one teacher had developed a course that used excellent blended learning resources we found that the Geography departments either decided to share the whole course, including the teacher, or to send the students to "attend" the course virtually at another university. It seems that is easier, and more beneficial, to share students than to share materials. Rather than emphasize the development and sharing of common learning objects to be deployed in redundant modules at multiple institutions, the project found itself facilitating the partners in extending access to their most unique module offerings to students from other institutions through Shibboleth-enabled federations.

Whilst the technical aspects of sharing resources were not problematic, there were legal barriers, including IPR and copyright, to sharing resources either directly or via repositories, particularly with parties outside the UK, as many of the UK licenses limit the resource use to UK higher education. An example of this was Digimap which licenses the use of the Ordnance Survey maps of the UK to UK HE only, so resources that made use of such maps could not be shared with the US partners.

Finally, attempts to prove that any initiative such as this has actually improved learning are necessarily going to be limited as it will never be possible to do double blind trials. As part of the DialogPLUS project both we and various external agencies conducted extensive evaluations with the learners and the teaching staff, the majority of which produced positive and encouraging results. A particular issue that we did encounter was the extent to which younger undergraduates were prepared to work on their own (as opposed to being taught) [7]. In general we produced further evidence to support the view that Blended Learning approaches are more suited to more mature students, who have developed a clear understanding of what they want to learn, rather than less mature learners who may still treat knowledge as something they are taught rather then something they seek to acquire.

Conclusion

The four case studies that we have described above were all successful projects – at least according to their associated publications and to some of the skakeholder community, and yet this paper has shown that there were still aspects of each project in which the original objectives were not fully realized, or where some unexpected and possibly unwanted results have been achieved.

Of course it is necessary to ask what makes a successful project? A final project report which shows that the objectives were met and the budget kept to? Or a class of happy students? Or an evaluation which demonstrates that a novel method improves the student experience? Or a change in institutional culture? And the correct answer may be any of these. One person's failure is another's success. And visa versa. The important lesson is that we should disseminate bad practice and unwanted outcomes as well as good practice and thus learn from our mistakes?

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