A model for evidencing the benefits of technology-enhanced learning in higher education in the UK

Megan Quentin-Baxter
Higher Education Academy Subject Centre for Medicine, Dentistry and Veterinary Medicine,
Newcastle University, United Kingdom

Jacquie Kelly
JISC infoNet
Northumbria University, United Kingdom

Stephen Probert
Higher Education Academy Subject Centre for Business, Management, Accountancy and Finance
Oxford Brookes University, United Kingdom

Cary MacMahon
JISC TechDis (formerly Higher Education Academy Subject Centre for History, Classics and Archaeology)
Higher Education Academy, United Kingdom

Gill Ferrell
JISC infoNet
Northumbria University, United Kingdom

A model for describing and collecting evidence with which to evaluate technology-enhanced learning was developed as part of the Tangible Benefits of e-Learning project which took place in the UK in 2007. This small study sampled innovative technological approaches to support learning in business, health and the humanities in the tertiary sector, and documented the results as case studies. The model, underpinned by theories of the potential of technology to bring about organisational change, is discussed in the context of the results observed. The model illustrates how technology-enhanced pedagogic innovation relies primarily on qualitative evidence, while evidence of the benefits of process-automation can be quantified. The model may help institutions to choose the most appropriate type of evaluation strategy when technology-enhanced learning innovations are being tested.

Keywords: Technology-enhanced learning, innovation, e-Learning, tangible benefits, evidence of organisational transformation.

Introduction and background

The Funding and Research Councils, Joint Information Systems Committee (JISC) and further/higher education institutions have invested heavily in technology-enhanced learning and teaching in the United Kingdom (Brown, et al., 2008). While the arguments were justified in theory and in policy (e.g. HEFCE 2005), these stakeholders required assurance that this expenditure of public monies was appropriate and defensible.

In March 2007 the JISC Learning and Teaching Committee commissioned JISC infoNet to coordinate a small study investigating the 'Tangible Benefits of e-Learning' with a view to clearly identifying evidence that technology-enhanced learning was delivering tangible benefits for learners, teachers and institutions, across a range of subjects in UK higher education. 'Technology-enhanced learning' (used interchangeably here with 'e-Learning') was broadly taken to mean "*understanding, creating, and exploiting digital technologies for learning*" (ESRC 2006). Goodyear and Ellis (2008) noted that: "*choices have to be made about what to measure, what counts and how to count it*" which presents a challenge to universities seeking to justify costs (Drucker, 2007).

The Association for Learning and Teaching (ALT) managed the project on behalf of JISC infoNet, and the Higher Education Academy identified and worked with subject-based examples of e-Learning from the sector. The intended outputs were case studies describing the approaches taken; identification of the evidence used to demonstrate the value of the approach; shared practice among the participants; and a report for the funding agencies.

The resulting project report (JISC infoNet, 2008) outlined the use of a modified CAMEL qualitative methodology (JISC infoNet, 2006) *enabling/encouraging an honest discussion and evaluation of practice and identified tangible benefits between a wide variety of subject disciplines* to capture 37 case studies gathered from 16 institutions in a three-month period from May-July 2007. As part of the analysis the researchers developed a model of tangible benefits (Figure 1), against which the case studies were mapped. This paper discusses this model in more depth, outlining how institutions might use it to better understand what evidence to collect to inform their e-Learning policy development.

Method

JISC infoNet invited Academy Subject Centres supporting provision in business and allied subjects, all areas of health, and the humanities and social sciences to use their people-networks to identify volunteers to participate. The study design involved two face-to-face meetings of participants, a shared wiki and mailing list. A case study template captured details of the benefits, and the results were analysed using a simple checklist against examples of evidence identified during the workshops. Participants worked in pairs or small groups discussing the case studies to identify potential sources of evidence for each. Case studies were plotted on the model. The project team collaborated on the project report (JISC infoNet 2008) which contains a longer discussion of the method and the results.

Results

Thirty-seven case studies were gathered from participants across the UK who were delighted to showcase their e-Learning developments in this way. A variety of pedagogic theories (behavioural; cognitive; social cognitive; constructivist) were evident, with socio-constructivist present in many of the case studies. Wide-ranging drivers for adopting e-Learning were critical in mobilising uptake of technology and included:

- promoting recruitment and retention of larger numbers of more heterogeneous students (strengthening social justice and accessibility)
- promote autonomous learning
- flexibility for students, staff and other stakeholders – students are physically and socially distributed, and increasingly wish to pace learning according to personal circumstances
- actively engaging students and meeting wide pedagogic requirements (Laurillard, 2002)
- making teaching relevant to "generation y" students – modern teaching methods
- environment 'enriched' by interactive multimedia and virtual reality – new approaches which were previously impossible (e.g. virtual tours/field trips, etc.)
- evidencing the development of skills and professional attitudes – recording achievement and reflection
- preparation for employment / practice – students can practise in 'safe' simulated surroundings
- academic support for learners in work-based learning and increased involvement of employers
- strategic alignment with government policy and linkages outside the institution
- institutional reputation for innovation – this may be productive (provides teachers with training and support), or counter-productive (suitability for particular courses / cohorts, or 'box ticking')
- preservation of institutional assets and continuity through staff changes
- improved transparency of quality management or administration (transformative)
- involvement of staff, students and possibly the public in the development of the approach
- high risk of innovating (compared with not innovating).

The model arose from creative discourse between the discipline groups about what the project was trying to achieve. While quantitative metrics were available to evidence one case study, they were inappropriate to use in another.

The y-axis in Figure 1 below shows how the 'e-approaches' progress from simply *automating existing repetitive practices* (automate) through those that add increased value by the *timely application of information* (informate) to *transforming organisational custom and practice* (transform). The term 'informate' (Zuboff, 1988) described the impact where information had a transformative effect on

individual behaviour, and subsequently the management, strategy and structure of organisations. Schein (1989) distinguished between 'informate up' whereby data is passed *up* the hierarchy for analysis (e.g. students sitting an exam) and 'informate down' whereby performance information is passed *downwards* to empower those nearest to the issues (e.g. information-rich environment with flexible assignment submission dates). Transformed institutions will have responded to the needs of a modern e-society, up-skilled staff and innovated 'behind the scenes' in order to change departmental and institutional processes.

The x-axis illustrates the degree to which the problem is clear and defined i.e. the evidence that was used to measure benefits (essentially from measurable (quantitative) metrics to anecdotal (qualitative) reports); scalability of the approach; and the driver/s for implementing a technology-based approach. This reflects (in reverse order) the six key indicators ("*1. client satisfaction, 2. knowledge and skill acquisition, 3. application and implementation of training on the job, 4. business unit impact, 5. return on investment and 6. intangible benefits*") observed by Phillips and Stone (2002) in the context of measuring the impact of training. Placing these headings on the same axis implies a direct or inverse relationship from which inference is possible. 'Rational and well-defined' technology interventions are able to be costed in terms of resources and impact on numbers; while 'complex and innovative' interventions rely more heavily on student engagement and qualitative evidence from staff and students.

The types of tangible benefits cited by the case studies included:

- effect on resources (e.g. effect on cost of delivery, time, automating existing processes)
- effect on exam results
- influence on retention (e.g. students or staff)
- staff satisfaction with e-learning
- modifications to learning spaces (e.g. libraries, wireless networks, informal learning spaces)
- effect on a social justice agenda (e.g. widening participation, tailoring delivery)
- influence on recruitment (students or staff; e.g. through greater accessibility; opening new markets)
- effect on management of learning assets (e.g. institutional intellectual property, repositories)
- influence on policy (e.g. institutional, faculty/school, departmental, or extra-institutional body)
- influence on learning and teaching methods
- effect on staff personal development (e.g. skills, employability, confidence)
- influence on educational research
- effect on learning (e.g. context, style, insight and reflective practice)
- effect on student personal development (e.g. skills, employability, confidence)
- student satisfaction with e-learning (e.g. effect on motivation, attendance and enjoyment, as shown in national and institutional surveys, module evaluation, focus groups, or other)
- innovation in teaching, learning and assessment (e.g. stimulus to creative approaches).

The case studies were subjectively placed on the model in Figure 1 according to their transformative effect and benefits profile. Where an approach automated an existing process the case study was placed low down on the model. Where data and information were provided to staff about students it was slightly higher (informate up), and when provided to students for them to organise and process, the case study was in the top portion of the model (informate down and transform). The position of a case study in the x-dimension depended on the driver for the approach, the kind of evidence available to measure its benefit (quantitative or qualitative), the scale of impact, etc.

Discussion

Evidence of a return on investment (ROI) and value for money (VFM) can be more clearly demonstrated towards the left of Figure 1, with the creative research and development (R+D) zone towards the right. In the R+D zone evidence for the efficacy of an innovation relied on a teacher's professional instincts and student satisfaction, and may appear to cost more to provide than can be justified in financial terms. Goodyear and Ellis (2008) argue that "*taking a seriously student-centred approach means acknowledging the complexity of the work that gets done under the banner of (e)learning. What may look like a technological intervention actually depends on a web of skilful activity, human relationships, and subtle adjustments to a changing material environment*", therefore the cost model is incorporating not just technological but educational R&D taking place which might not have otherwise occurred. There was some anecdotal evidence in this study that staff converting materials to a technological delivery also changed the underlying pedagogy.

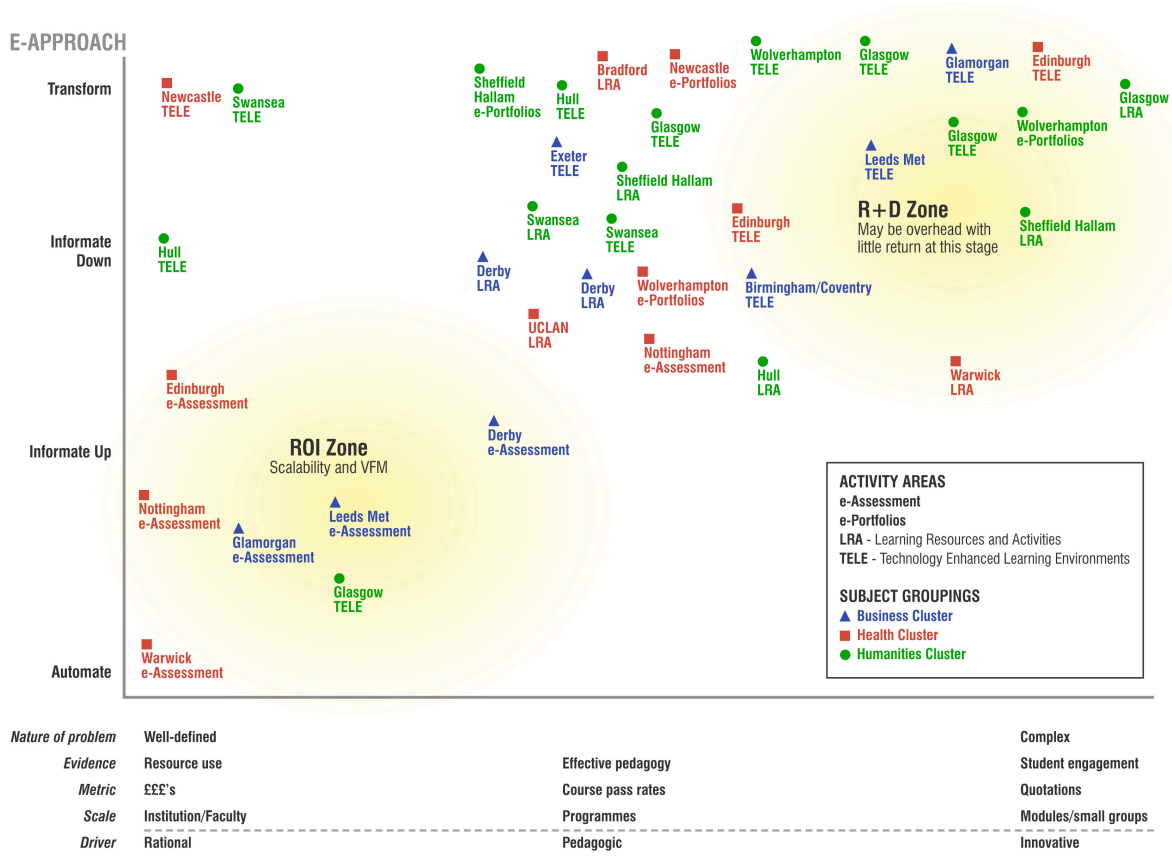

Figure 1: Mapping case studies to the e-Learning benefits model against transformational approaches, drivers for change and metrics. Adapted from the Tangible Benefits of e-Learning project report (JISC infoNet 2008), (used with permission).

Contributors estimated that the break-even time for innovative R+D activities was at least three years. There were no examples of an automated process appearing in the R+D zone, implying that the drivers for automation were rational rather than innovative. It is possible that few 'automate' examples were recruited to the study because they were perceived as e-Administration of learning, rather than e-Learning. Pedagogically-driven case studies of programmes or cohorts where the intended benefit was to improve learners' understanding of a particular subject fell towards the centre of the graph where the tangible benefits were measured in terms of course or module pass rates, as well as qualitative measures of achievement. E-Assessment was the only process demonstrating some consistency across subjects (noting that not all subjects lent themselves to e-Assessment; Accountancy was one) but even that was broadly focussed.

Anecdotal evidence suggested that some innovations had 'drifted' a short distance along the width or height of the model over time, generally from bottom to top and laterally towards the centre. This is partly explained by the availability of different kinds of evidence being realised over time, and it seems that some administrative support systems became more pedagogic as they were developed further.

The interdisciplinary nature of the study prompted new insights for the participants and the project team. While the technology was essentially similar, and the case studies were broadly spread, there remained strong disciplinary preferences within the group, probably related to shared 'drivers' for informating. The business and allied subjects reported a need to informate in order to recruit, meet the expectations of and retain very large numbers of modern, technology-aware ('generation-y') students. Students needed individual attention and to feel empowered and engaged, and expected e.g. assessment to be marked and fed back immediately. The health case studies cited pressure to maintain and promote quality management, enhance autonomous learning, prepare students for work/practice and for registration with the professional bodies (meeting 'fitness to practise' and 'professionalism' requirements). The humanities and social science disciplines found technological solutions to pervasive pedagogical problems (often textually-oriented with face-to-face seminars and lectures an integral and valued part of teaching methodologies). For these disciplines e-Learning had produced both significant enthusiasm, and significant resistances. A positive introduction to and support for staff innovating with e-Learning was

considered essential to engendering creativity and uptake by staff in the humanities. Despite these differences, the disciplines appeared more evenly spaced across the model than the researchers had initially anticipated.

The authors acknowledge the limitations, but believe that this model may help institutions to manage expectations of evaluation outcomes, and maximise resources when collecting evidence for assessing the tangible benefits of technology-enhanced learning in their institution.

Limitations

A key limitation to this study was a particularly demanding six-month timeframe from March 2007 (spanning the main exam period and into the summer), and the variety of participants involved who brought diversity but also logistical challenges in arranging face to face meetings, and compiling the very diverse outcomes into a single report. The case studies may not be a representative sample of either their subjects or their institutions, and the examples collected may have been subject to 'confounding' (Clark, 1994) by Hawthorn and other effects.

Acknowledgements

With thanks to the participating institutions: University of Birmingham (with Coventry University), University of Bradford, University of Central Lancashire, University of Derby, The University of Edinburgh, University of Exeter, University of Glamorgan, University of Glasgow, The University of Hull, Leeds Metropolitan University, Newcastle University, The University of Nottingham, Sheffield Hallam University, Swansea University, The University of Warwick and University of Wolverhampton; colleagues in JISC infoNet; the Association for Learning and Teaching (ALT); staff in the Higher Education Academy and its Subject Centres; and JISC CETIS. With thanks also to the JISC Learning and Teaching Committee for funding this project.

References

Brown, T., Hewitt, R., Jenkins, M. & R. Jenkins (2008). *2008 survey of technology enhanced learning for higher education in the UK.* Universities and Colleges Information Systems Association (UCISA). http://www.ucisa.ac.uk/publications/tel_survey.aspx [viewed 18 July 2008].

Clark, R.E. (1994). Media will never influence learning. *Educational Technology Research and Development*, 42, 21-29.

Drucker, P.F. (2007). *Essential Drucker (classic Drucker collection).* Butterworth-Heinemann Ltd; 2nd Ed edition, ISBN: 0-750-68506-9.

Economic and Social Research Council (ESRC) (2006). Technology enhanced learning, the teaching and learning research programme. ESRC, London. http://www.tlrp.org/tel/index.html [viewed 18 July 2008].

Goodyear, P. &. Ellis, R. A (2008). University students' approaches to learning: Rethinking the place of technology. *Distance Education*, 29(2), 141-152.

Higher Education Funding Council (HEFCE) (2005). HEFCE strategy for eLearning. http://www.hefce.ac.uk/pubs/hefce/2005/05_12/ [viewed 18 July 2008].

JISC infoNet (2006). *The CAMEL Project: Collaborative approaches to the management of e-Learning*. Northumbria University. http://www.jiscinfonet.ac.uk/camel [viewed 18 July 2008].

JISC infoNet (2008). *Exploring tangible benefits of e-Learning: Does investment yield interest?* Northumbria University. http://www.jiscinfonet.ac.uk/case-studies/tangible/ [viewed 18 July 2008].

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies.* 2nd Edition, RoutledgeFalmer, New York.

Phillips, J. J. & R.D. Stone (2002). *How to measure training results: A practical guide to tracking the six key indicators*. McGraw Hill.

Schein, E.H. (1989). The role of the CEO in the management of change: The case of information technology. In T.A. Kochan & M. Useem (Eds), *Transforming organizations* (pp. 80-95). Oxford University Press. http://books.google.com/ [viewed 18 July 2008].

Zuboff, S. (1988). *In the age of the smart machine: The future of work and power*. New York: Basic Books.

Contact author: Dr Megan Quentin-Baxter, Director, Higher Education Academy Subject Centre for Medicine, Dentistry and Veterinary Medicine, Newcastle University, United Kingdom. Email *megan@medev.ac.uk*

Please cite as: Quentin-Baxter, M., Kelly, J., Probert, S., MacMahon, C. & Ferrell, G.. (2008). A model for evidencing the benefits of technology-enhanced learning in higher education in the UK. In *Hello! Where are you in the landscape of educational technology? Proceedings ascilite Melbourne 2008*. http://www.ascilite.org.au/conferences/melbourne08/procs/quentin-baxter.pdf