EVOLVING E-LEARNING: CONTRIBUTIONS AND EVALUATIONS OF THE LEARNING BLEND FOR HIGHER EDUCATION

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Abstract

This thesis addresses research on the introduction, use and effectiveness of Virtual Learning Environments (VLEs), learning resource supports and experiences of applying these as blended learning supports for modules and programmes in universities. The author's five selected papers, which span seven years, address these perspectives and outline experiences of how student feedback can inform design of the learning blend and the effects on student learning experiences in business higher education. The papers relate to linked strands of enquiry within the set of publications, namely: Web-based Learning Supports for Higher Education; Web-based administrative supports and Infrastructure Issues for Higher Education; Developing e-resources for Higher Education Virtual Learning Environments (VLEs); Use of e-learning resources and VLEs to support action learning for postgraduate students in Higher Education; Developing models to evaluate Student Satisfaction.

The contribution to knowledge consists of a foundation for understanding new skills and competences for digital supports as they contribute to blended learning environments and in their support of different learning approaches and for a range of historical approaches that evolve to currently used methods in strategy; design; infrastructure; student feedback/assessment issues. Also evaluations undertaken in support of the papers demonstrate how academics and students behave, relate and learn in digital media, including resource provision and perspectives on how instructors' can promote blended, problem-based and action learning.

The papers present the development of a series of evaluation models that have proven to be robust in terms of adapting to changes in the support of VLEs, the differing blends and the approaches to learning. The models are flexible enough to incorporate the variable elements of a full range of philosophical stances to evaluations, where necessity requires.

Acknowledgements

I would like to extend thanks to my supervisors and mentors David Bryde and Mark Brundrett. Their advice was invaluable on structure and content for this submission.

Thanks are also extended to all of the students and academic staff who were either the subjects of research in the works or who contributed to the works presented here.

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1. Introduction and Overview of the Submission

The papers selected for this submission developed out of a series of initiatives that started in Liverpool John Moores University in 1992. At this time the development of electronic and text-based learning supports, by Liverpool Business School, for a Business Information degree, supported an open learning approach and paralleled work by Boot and Hodgson (1990). The learning supports became part of a flexible resource that could be continually updated and developed (in electronic form) to support Business Students in Higher Education.

Between 1994 and 1996 this strand of development was further boosted through the author leading a national project to produce a text based Business Degree (also developed in electronic form) which built on the Liverpool Business School existing resource.

Beyond 1996 the university sector started to use a range of computer mediated supports for students (CD-ROM and internal file servers) and at LJMU staffs had also been involved in the Higher Education Funding Council initiatives of the mid-1990s to produce electronic resources, these were the Teaching and Learning Technology Projects (TLTPs).

The development of electronic resources for students in Higher Education and online supports for students came together towards the end of the 1990s. In this period universities started to use templates that facilitated modules and develop courses that could be placed on internet sites.

For LJMU these developments led to a range of template-based modules, devised by Laws (1998).

This submission is concerned with providing a research perspective on the introduction, use and effectiveness of Virtual Learning Environments (VLEs), learning resource supports and experiences of applying these as blended learning supports for modules and programmes in universities. The author's

five selected publications address these perspectives and outline experiences of how student feedback can inform design of the learning blend and the effects on student learning experiences in business higher education, as they have developed since the early 1990s. The five papers forming the published work are refereed journal articles hereto referred to as papers 1-5, explained in detail in sections 2.1-2.5 respectively and presented in appendix III.1 – III.5. The five papers relate to linked strands of enquiry within the set of publications, namely:

1. Web-based Learning Supports for Higher Education (paper 1)
2. Web-based administrative supports and Infrastructure Issues for Higher Education (paper 2)
3. Developing e-resources for Higher Education Virtual Learning Environments (paper 3)
4. Use of e-learning resources and VLE's to support action learning for postgraduate students in Higher Education (paper 4)
5. Developing models to evaluate Student Satisfaction (paper 5)

These lines of inquiry are summarised in Tables 2.1 and 2.2. The key questions addressed by the papers were concerned with communicating outlines of developments in digital information technologies for learning in a Business School as well as strategic and infrastructure support issues within one of the UK's largest universities, as a means of exemplifying issues within the wider university sector. The body of work addresses evolution and advances in technology commensurate with student needs over a period that has seen the transition from web-platforms for student learning designed by academic staffs evolve to commercially designed web platforms that become embedded in the learning blend for students. The five papers collectively outline what was, and is, current research and thinking, in Higher Education, as well as evaluation, to enable holistic overviews of strategy, process design and feedback for researchers and practitioners who work with digital information technologies. The papers also use clear and current examples, case applications and illustrations throughout, in an effort to tie the material to

real world practice and thus provide interest and better understanding for the researcher and practitioner.

The collected papers outline the development of ICT-related knowledge over a fourteen-year period, introducing trans-disciplinary research to demonstrate how 'digital' learning processes and supports can be used to help academics and students meet the challenges of post-modern society characterised by norms, multi-tasking, resource developments, use of e-books and sustainability of the learning resource.

The papers 1 - 5 consist of a collection of works published over a seven-year period (2001-2008). The papers are presented in chronological order and map to an evolving conceptual order. As paper 3 (section 2.3) also reviews a period of fourteen-years (1992-2006), the totality or whole is a demonstration of the author's unique contribution to knowledge in the field of e-learning and blended learning support development in higher education. The contribution to knowledge here presents researchers with a range of historical approaches that evolve to currently used methods in strategy, design; infrastructure; student feedback/assessment issues; learning resource issues and learning approaches in the practice relating to e-Learning Technologies, supported with theoretical underpinnings.

It is important to consider that the student modules evaluated as part of these papers undergo a range of learning approaches in business education, that range from didactic approaches to problem-based as well as action learning.

1.1 Structure of the Published work presentation

The structure that follows this introduction presents five further chapters (2-6) that are presented in an order to highlight the salient issues that describe and present arguments for a set of works of this type.

Chapter 2 presents a summary, in terms of the collected Papers Contribution to Knowledge and Critique. Within each section there is an outline of the

contribution, findings and a critical perspective on the papers. The Lines of Inquiry and summary Contributions to Knowledge are presented in tabular form at the end of the chapter.

Chapter 3 presents a research methodology based upon Rationale and Application. The chapter introduces a philosophical overview and moves to The Rationale section which outlines the author's belief system in carrying through the design and evaluations for the published works. It argues for the learning approach linked to the methodological stance of the researcher, how it evolved to meet the needs of evaluation through alternative inquiry paradigms. The Application section presents the author's conceptual framework developing from the need to integrate technology into the learning and teaching process. The argument develops by describing the mapping of the framework to three ontologies.

Chapter 4 presents Extant Literature for the published works complementing those citations in chapter 2 it provides complementary literature with sections attached to the individual published works, a section on future trends with a short Extant Literature summary section also provided.

Chapter 5 presents a reflection from the author. In this chapter he draws together a reflection concerning his methodological stance and belief system which directed his research for the published works presented.

Chapter 6 presents a conclusion for the published works focusing on the drivers for the published works. His section on the Conclusion Summary comments on methodological, reflective and quality supports for the published works.

2. Published Works Contribution to Knowledge and Critique

In this section each submitted work (papers 1 – 5) is summarised by outlining its contribution to knowledge. The papers are represented as part of lines of inquiry, schematically in Table 2.1 and contributions to knowledge in Table 2.2. They are also in provided in published form (appendix III).

2.1 Web-based Learning Supports for Higher Education (paper 1)

McClelland, R.J. (2001b), Digital Learning and Teaching: evaluation of developments for students in Higher Education, *European Journal Engineering Education* 26 No. 2 pp 107-115 Article: ISSN 0304-3797, Electronic: ISSN 1469-5898 (Refereed and Single Authored - RS)

The research for this 2001 publication was undertaken in 1998. It examined student profiles and gauged student perceptions concerning use of a website template providing resources for learning from quantitative data, as well as also eliciting some qualitative information. The aim of the research was threefold: to establish a standard questionnaire for such evaluations; to use the questionnaire as a means of refining the design and content of subsequent sites and to examine various aspects of the student learning process, as a result of the blend presented.

The study occurred early in the lifetime of universities supporting students through the medium of web-sites. Up to this time, in the UK, the university sector had seen advances in the use of CD-ROM supported-learning, wide use of software supports and the Higher Education Funding Council for England (HEFCE) supported Teaching & Learning Technology Projects (TLTP) that required universities to host shared electronic learning resources on internal university file servers.

2.1.1 Development of Themes in publication (paper 1)

The paper's use of a synergistic combination of an innovative digital learning and teaching support, containing developed resources, combined with targeted student evaluation surrounding the learning environment, learning blend and consideration of student learning styles provided a robust research method or model that considered and focused on the student learning experience. The structure of the web-sites and the learning supports that populated them, created the foundation for an evaluation model that sought to identify optimum digital learning blends.

2.1.2 Findings (paper 1)

Findings from the paper contributed to knowledge in a variety of ways.

- First, by providing a feedback mechanism during the learning process, concerning the learning blend. In the two-student cohort cases this was traditional teaching with web-site supports and learning materials added on, to supplement the blend.
- Second, by providing a monitor of perceptions of a new learning experience for students in higher education and, due to the inclusion of assessed learning styles for the cohort, research provided insights into the effects and comparisons of learning styles in this blend.
- Third, by providing a systematic process for responding to the design and content needs of web-sites for students, dynamically, as the sites are being developed.

The findings concerned students' perceptions of the learning received, holistically (through both web-sites and traditional teaching) where traditional teaching did not alter, as well as perceptions of the frequency, accessibility and enjoyment of the sites when offset against attributes such as gender, age groups, mean degree mark and learning styles.

2.1.3 Critique (paper 1)

The evaluation of student experiences using a web-based template developed in-house, occurred at a point were commercially developed Virtual Learning Environments (VLEs) were being introduced into Higher Education. The efficacy of the evaluation was limited and would have been greatly enhanced if a comparison was made with a commercial VLE. Although the evaluation was robust, and a model was developed relating learning strategy to learning styles, the measures provided were concerned with what had occurred and not why this had occurred. For this deeper understanding a qualitative evaluation is suggested here as an overlay that would enhance the model.

2.2 Web-based administrative supports and Infrastructure Issues for Higher Education (paper 2)

McClelland, R.J. (2001c), Web-based administrative supports for university students, *International Journal Educational Management*, Vol.15 No.6 pp 292–302 ISSN 0951-354X (Refereed and Single Author - RS)

This paper was invited by the International Journal of Educational Management in 2001 and was concerned with the sum-total of technology-based supports currently offered to students in a UK university that has a technological infrastructure[1]. An earlier publication by the author that supported this work, examined students' perceptions of administrative support systems offered through a campus wide information system and range of supporting web-sites. Critical evaluation of the research of this paper was developed from that earlier research by the author, McClelland (2000a).

There is a wider context to consider here, in terms of student learning environments in HE, and that is how web-based technological supports for students are enhanced and complemented within a university technological

[1] LJMU was an example of a university of this type

infrastructure as well as the effects of external developments in, for example, standard web-site formats such as those that followed from academic designed templates (namely Blackboard) and student administrative supports that are commercially designed (for example Oracle).

Evaluations of student use of Virtual Learning Environments (VLEs) at LJMU, was first undertaken with the introduction of academic staff designed module templates (for learning), within Liverpool Business School (LBS). As was the case for paper 1, the templates supported undergraduates (levels two and three) at Liverpool Business School in 1998. The focus of this paper furthered the body of knowledge into complementary provision, as in the following year with different cohorts of undergraduate students using course administrative templates (supporting course administrative needs) designed by academics, those cohorts were exposed to a new infrastructure support. The number of administrative templates used for modules and courses was only a small percentage of provision within the School.

This paper proposed that combination of the student and academic supports can result in a comprehensive management system for both academic staff and students through the integration of student records, module registration, links to web-based modules and programme student support site, all from the facility of one-stop sites. In effect the Campus Wide Information System (CWIS), for staff and students at the university, was outlined by the author as: moving paradigmatically towards that of a fourth generation system, through the application of the fourth generation techniques (4GT) of database query, report generation, data manipulation, screen interaction and definition, code generation, high level graphics capabilities and spreadsheet capability.

Application of the synergistic model developed in paper 1 (a standard questionnaire incorporating assessed learning styles) was adapted and now applied in a complementary environment (administrative supports and infrastructure).

2.2.1 Development of Themes in publication (paper 2)

The themes developed use of a synergistic combination of an innovative digital administrative supports, containing developed resources, combined with targeted student' evaluation surrounding the administrative and infrastructure environment blend and consideration of student learning styles provided a robust research method that considered and focused on the student support infrastructure. This provided an extension of the evaluation model to one of evaluating the supports for optimum digital learning blends.

2.2.2 Findings (paper 2)

Findings from the paper contributed to knowledge in a variety of ways.

- First, by providing a feedback mechanism during the learning process, concerning the administrative and infrastructure blend. In the two student' cohort cases this was traditional teaching function with web-site supports for course administration added on, to supplement the blend.
- Second, by providing a monitor of perceptions of a new learning experience for students in higher education and, due to the inclusion of assessed learning styles for the cohort, gaining insights into the effects and comparisons of styles in this administrative and infrastructure support blend.
- Third, by providing a systematic process for responding to the design and content needs of students in using these web-supports for administration and infrastructure, as the technologies developed.

2.2.3 Critique (paper 2)

Although the research here demonstrated effective integration of staff/student administrative and learning web-based supports that could be evaluated by application of a previously established model, in order to ascertain

perceptions of student experience, the approach was ambitious in attempting to draw together a unifying evaluation of:

- A Campus Wide System
- A Student Self Service System
- A web-based administrative and learning system

This was partially achieved but focused more on the measurement of student perceptions, whilst relying on descriptive and semi-qualitative observations of other systemic elements. On refection this was a limitation and the study would have derived more benefit from a series of focus groups consisting of staff stakeholders, to enable a deeper understanding of those complementary systemic elements.

2.3 Developing e-resources for Higher Education Virtual Learning Environments (VLEs) – four case studies (paper 3)

McClelland, R.J. Hawkins, N (2006) Perspectives on the use and development of a broad range of E-Books in Higher Education and their use in supporting Virtual Learning Environments *Electronic Library* Vol. 24 No.1 pp 68-82 ISSN 0264-0473 (Refereed and Principal Author - RP)

This work was initially presented as an invited international conference paper (International Conference on the Future of the Book) in Beijing (2004) and was then submitted for refereeing to the International Journal of the Book. After acceptance, the Electronic Library Journal editor invited the author to submit a modified version of the work to this Institute for Scientific Information (ISI) ranked journal.

This paper summarised and focused on developments of four models of educational resource production, that included two types of outsourced models (one with in-house benefits to a university); a hybrid model, resulting

from a university consortium approach to production and an in-house model that contribute to learning blends.

2.3.1 Development of Themes in publication (paper 3)

This paper was both wide in scope and coverage of initiatives that developed flexible learning resources for universities.

The requests for this work from conference organisers and journals are testament to the substantive nature and coverage presented.

For each of the four models proposed the resultant blend was outlined for different supporting infrastructures. A particular focus was made on the nature of the blend for the hybrid and in-house models (both developed between 2002-2004) that incorporated e-books and wraparound texts (the latter could also be e-books).

The paper reviewed student evaluations, over a six-year period, attached to the development models (those using evaluation models that sought to identify optimum digital learning blends and supports for those blends).

The paper also extended the analyses beyond that typically produced for the author's web-site evaluations. By using homogeneity/multiple correspondence analysis in order that the student profiles could be segmented, therefore enabling profiles of student groupings as responses to the learning blends (for either student learning or infrastructure considerations).

Extending the model through analysis also enabled insights into patterns of use of the blend supports with differing student attributes (such as age group, course and mode of study for postgraduate and undergraduate modules).

This breadth of coverage within one paper was identified as groundbreaking by Hansson[2], the editor of an international research book on Digital Information Technologies, who commissioned the author to submit a chapter exemplifying this work.

2.3.2 Findings (paper 3)

Findings from the paper contributed to knowledge as follows:

- The paper focused on the development of four models of resource production for blends over a 14 year period, that included two types of outsourced models (one with in-house benefits to a university); a hybrid model, resulting from a university consortium approach to production and an in-house model that contribute to learning blends.

- The paper covered a wide range of issues including: the processes of production; costings; positive and negative aspects of the process for universities and their programmes; infrastructure issues; student learning issues and ownership/copyright issues.

2.3.3 Critique (paper 3)

Although the paper presented four models of resource provision for Higher Education, spanning a fourteen year period, one limitation was that it did not provide a forward look on how this provision might develop or what would be the most effective model.

It was demonstrated that each of the four models proposed could undergo a generic evaluation approach and two further measures were presented for consideration. One of these was a quantitative map that segmented demographic data on the student groups and the second was a set of costs attached to units of production. The paper conclusion may have derived

[2] See McClelland (2008)

benefit from the incorporation of one or both of these measures, in order to support a preferred model.

2.4 Use of e-learning resources and VLE's to support action learning for postgraduate students in Higher Education (paper 4)

McClelland, R.J. (2006) Action-Learning for Postgraduate Business Enterprise Education: A Flexible E-Learning Approach *The International Journal Of Learning* Volume 13 No. 4 pp 55-64 Article: ISSN 1447-9492. Electronic: ISSN 1447-9540. (Refereed and Single Author - RS)

This paper was based on the outputs of a Northwest Development Agency (NWDA) funded research project. The idea for evaluating action learning on a Masters in Enterprise at LBS came originally from the UK Northwest university consortium e-Learning project. Liverpool John Moores University was a member of this consortium. The aim of the Masters programme was to support and provide e-mediated postgraduate study through flexible action learning sets and delivery patterns, knowledge transfer supported by electronic module resources in order to specifically serve employees of Small to Medium Enterprises (SMEs) in the Northwest of England.

2.4.1 Development of Themes in publication (paper 4)

The paper draws on the use of a synergistic combination of an innovative digital learning and teaching support, containing developed resources, combined with targeted student evaluation surrounding the learning environment, a problem-based approach a learning blend and design in consideration of student learning styles. This was also the case in papers 1 and 2. The approach built on an already established robust research method that considered and focused on the student learning experience; the structure of the web-sites; and the learning supports that populated them. This provided an extension to the established evaluation model that sought to identify optimum digital learning blends applied to a commercial VLE, Blackboard. The overall model was now extended to incorporate a qualitative evaluation

(substituting a survey with interviews and experiential summaries) and an action learning approach, whilst taking an interpretivist stance based upon consideration of the learning experience.

2.4.2 Findings (paper 4)

Findings from the paper contributed to knowledge as follows:

- They facilitated an extension to the established evaluation model that sought to identify optimum digital learning blends applied to a commercial VLE, Blackboard.
- The model was now extended to a qualitative evaluation of an e-Learning Masters programme that was underpinned by Action Learning (substituting a survey with interviews and experiential summaries), taking an interpretivist stance based upon consideration of the learning experience.
- It was one of the first UK studies using e-mediated provision for Action Learning.

The programme seemingly met a gap that the students' felt existed in their businesses. In addressing how the course had resulted in changes to the individuals and their businesses, the group provided feedback on the three modules that had made up the M.Ent. to the eight month point in the course, in order to reflect on the impact that individual aspects of each module had on their working lives. Also Students identified that they engaged with the learning materials. Irrespective of the flexibility concerning their use, the structure and operation of sets did stimulate students to engage with the learning materials provided (electronically and on a Blackboard web site). This was evidenced in the cohort's continued questioning surrounding the content of the learning supports within sessions. Numerous requests for workshops were made for the modules, and in those sessions there was explicit engagement and application of the content of the learning supports.

2.4.3 Critique (paper 4)

Whilst an established evaluation model extended to a qualitative study and applied to a student cohort on a Masters programme for this paper, a limitation was that the evaluation did not extend to an assessment of the knowledge transfer to the workplace.

A useful extension of the evaluation model would have been to gauge impacts of the action learning process on the work function of the students.

To some extent there was a constraint placed on the analysis undertaken by funders. Only one measure was applied to the impact of the student Action Learning experience in the workplace, that of Gross Value Added (GVA) a measure used by government.

2.5 Developing models to evaluate Student Satisfaction (paper 5)

Douglas, J., McClelland, R.J. and Davies, J. (2008). The development of a conceptual model of student satisfaction with their experiences in higher education. *Quality Assurance in Higher Education* Vol. 16 No. 1 pp. 19-35 ISSN 0968-4883 (Refereed and Joint Author RJ)

This paper developed from a 2006 Total Quality Management conference paper presented in Hong Kong, (Douglas *et al.,* 2006). It introduces a conceptual model of student satisfaction with their Higher Education experience through identification of the variable determinants of students' perceived quality using Critical Incident Technique (CIT) as the method. The technique serves to offer an alternative to that of a student feedback questionnaire.

2.5.1 Development of Themes in publication (paper 5)

Themes in the paper involved the identification of determinants for business HE students and involved Functionality/Usefulness; Responsiveness; Access; Communication and Socialising. However a number of additional specific HE determinants were identified as follows: Teamwork; Socialising;

Usefulness/Functionality; Motivation; Management and Virtual Resources (embedded within the Faculty). The latter was determined as a neutral (no response on the theme).

The development of a preliminary model was identified in this paper. The model will be developed and enhanced through further studies with student groups at two other UK universities.

The approach in the paper presented a complementary methodology to the quantitative approach (strict measurement), allowing for rich data to be collected for identification of determinants, providing an invaluable source of underlying information.

2.5.2 Findings (paper 5)

Findings from the paper contributed to knowledge as follows:

- The paper employed use of the Critical Incident Technique (CIT) as an evaluation method of student experiences in HE.

- The CIT serves to offer an alternative to that of the student feedback questionnaire.

- This procedure put forward a different methodological approach to earlier researchers, when evaluating students, both in terms of higher education customer satisfaction and student satisfaction in HE

The findings of this paper, concerning year 2 and 3 undergraduates in business for one institution, were validated through researcher triangulation. Findings for Teaching, Learning and Assessment identified the critically critical determinants to be Responsiveness and Communication (these can lead to positive and negative loyalty behaviours if left unchecked). Here also Motivation and Functionality were observed as Satisfiers. Within the Ancillary Services the critically critical determinants were determined to be Access and

Responsiveness. Attitude, Communication, Management and Tangibles were determined as Dissatisfiers, whilst the Satisfiers were determined to be Friendliness, Socialising and Functionality/Usefulness.

2.5.3 Critique (paper 5)

This approach used in the research had limitations, in terms of the restriction placed on students to respond to predetermined questions when the technique pertains to be qualitative. CIT has been reported as early as 1954 (Flanagan, 1954). This study however used a design of questions based on the work of Edvardsson and Nilsson-Wittell (2004) who had examined the Teaching, Learning and Assessment (TLA) or support services environment that have criticality surrounding incidents of satisfaction and dissatisfaction in order to determine the drivers of change in the loyalty behaviour of consumers. Those drivers that do lead to such a change are termed critically critical (according to CIT principles).

Another limitation of the study was that it occurred with a relatively small group in one Faculty of one university. In order to develop and establish the method and provide a robust model, the work will need to extend to other cohorts and universities.

Table 2.1 Lines of Inquiry for the five Publications

Section 2.1 (paper 1)	Section 2.2 (paper 2)	Section 2.3 (paper 3)	Section 2.4 (paper 4)	Section 2.5 (paper 5)
McClelland, R.J. (2001b), Digital Learning and Teaching: evaluation of developments for students in Higher Education, *European Journal Engineering Education* Vol. 26 No. 2 pp 107-115 Article: ISSN 0304-3797, Electronic: ISSN 1469-5898	McClelland, R.J. (2001c), Web-based administrative supports for university students, *International Journal Educational Management*, Vol.15 No.6 pp 292–302 ISSN 0951-354X	McClelland, R.J. Hawkins, N (2006) Perspectives on the use and development of a broad range of E-Books in Higher Education and their use in supporting Virtual Learning Environments *Electronic Library* Vol. 24 No.1 pp 68-82 ISSN 0264-0473	McClelland, R.J. (2006) Action-Learning for Postgraduate Business Enterprise Education: A Flexible E-Learning Approach *The International Journal Of Learning* Vol. 13 No. 4 pp 55-64 Article: ISSN 1447-9492. Electronic: ISSN 1447-9540	Douglas, J., McClelland, R.J. and Davies, J. (2008) The development of a conceptual model of student satisfaction with their experiences in higher education. *Quality Assurance in Higher Education* Vol. 16 No. 1 pp 19-35 ISSN 0968-4883
Epistemological Philosophy: Positivist	**Epistemological Philosophy:** Positivist	**Epistemological Philosophy:** Postpositivist	**Epistemological Philosophy:** Interpretivist	**Epistemological Philosophy:** Postpositivist
Methodological Approach: Quantitative survey, statistics to different cohorts and levels of undergraduate students in business.	**Methodological Approach:** Systems evaluation and Quantitative survey, statistics to different cohorts and levels of undergraduate students and staff on business courses.	**Methodological Approach:** Quantitative surveys, measures, statistics and interviews to a range of undergraduate and postgraduate students, as well as staff in business.	**Methodological Approach:** Statistics, measures, qualitative Interviews and recorder observations for postgraduate students on a Masters in Enterprise.	**Methodological Approach:** Quantitative measures and Critical Incident Technique utilisation to establish determinants of satisfaction/dissatisfaction/criticality for undergraduate students
Type of Study: One year web-site development and development of learning blend informed by student questionnaire feedback	**Type of Study:** Two year web-site development, Infrastructure considerations and development of learning blend informed by student questionnaire feedback	**Type of Study:** Fourteen-year longitudinal study spanning text, IT resource and web-site development informing learning blends. Student/staff qualitative interviews, statistical and finance observations, student questionnaire to a range of undergraduate and postgraduate levels/cohorts yielding a feedback informed study.	**Type of Study:** One and half year study of embedded web supported Masters for Enterprise development (through Action Learning) and attenuation of learning blend informed by study of student learning patterns and interviewing for feedback to inform learning blend.	**Type of Study:** One year study developing an alternative model for evaluation of student satisfaction in Higher Education that uses Critical Incident Technique. This approach was informed by undergraduate student feedback via a questionnaire.
Student Learning Approach: Problem Based	**Student Learning Approach:** Problem Based	**Student Learning Approaches:** Didactic and Problem Based	**Student Learning Approach:** Action Learning	**Student Learning Approaches:** Didactic, Problem Based.
Appendix III.1	**Appendix III.2**	**Appendix III.3**	**Appendix III.4**	**Appendix III.5**

Table 2.1 Summary Contributions to Knowledge for the five Publications

Section 2.1 (paper 1)	Section 2.2 (paper 2)	Section 2.3 (paper 3)	Section 2.4 (paper 4)	Section 2.5 (paper 5)
Paper 1 occurred early in the lifetime of universities supporting students through the medium of web-sites, findings established a feedback mechanism concerning the learning blend, a monitor of student perceptions of a new learning environment (offset against leaning styles) and a dynamic systematic process for responding to design of the blend and web-sites whilst under development	Paper 2 contributions included how web-based technological supports for students are enhanced and complemented within a university technological infrastructure as well as the effects of external developments in, for example, standard web-site formats such as those that followed from academic designed templates (namely Blackboard) and student administrative supports that are commercially designed (for example Oracle).	Paper 3 summarised and focused on developments of four models of resource production for blends over a 14 year period, that included two types of outsourced models (one with in-house benefits to a university); a hybrid model, resulting from a university consortium approach to production and an in-house model that contribute to learning blends. The work covered a wide range of issues including: the processes of production; costings; positive and negative aspects of the process for universities and their programmes; infrastructure issues; student learning issues and ownership/copyright issues.	Paper 4 facilitated an extension to the established evaluation model that sought to identify optimum digital learning blends applied to a commercial VLE, Blackboard. The model was now extended to a qualitative evaluation of an e-Learning Masters programme that was underpinned by Action Learning (substituting a survey with interviews and experiential summaries), taking an interpretivist stance based upon consideration of the learning experience. It was one of the first UK studies using e-mediated provision for Action Learning.	Paper 5 employed use of the Critical Incident Technique (CIT) as an evaluation method of student experiences in HE. This technique serves to offer an alternative to that of the student feedback questionnaire. This procedure therefore put forward a different methodological approach to earlier researchers, both in terms of higher education customer satisfaction and student satisfaction in HE.
Appendix III.1	**Appendix III.2**	**Appendix III.3**	**Appendix III.4**	**Appendix III.5**

3. Research Methodology – Rationale and Application

The conceptual development in the publications presented was drawn from an initial study on Digital Teaching, Learning and Programme Supports, McClelland (2000b). The model was developed for web-based instruction; student evaluation and incorporation of learning styles for students in higher education, providing a synergistic approach to forward development that could be applied in different contexts and to assess new developments. The focus was on the student learning process.

It has been widely accepted that the methodological contrast between qualitative and quantitative approaches in research originates from the basic difference between social and natural science.

Qualitative methodology is associated with the epistemological stance of interpretivism (critical theory), an approach to inquiry that maintains:

"unlike animals or physical objects, human beings are able to attach meaning to the events and phenomena that surround them, and from these interpretations and perceptions select courses of meaningful action which they are able to reflect upon and monitor."

(Gill & Johnson, 1991, p. 126).

Inductivism, which is also related to the interpretive stance, can generate theory from the interpretation of a particular stimulus. Glaser and Strauss (1967) cited in (Gill and Johnson, 1991, p. 33), recognising the validity of this process, emphasise that

"theory that inductively develops out of systematic empirical research is more likely to fit the data and thus is more likely to be useful, plausible and accessible."

Methodologically, quantitative research is said to be more objective than qualitative, which is criticised for being biased by the values of the researcher. It is however affirmed (*ibid.*, p. 8), that scientific activity:

"can in no way be regarded as generating knowledge with an 'objective', value-free status. No piece of research is value free, as simply by selecting the topic the researcher is investing in it and therefore imposing his or her own values on it."

Also (Hofstede, 1991, p. 146) reminds us:

"*Scholars are as human and as culturally biased as other mortals* "

3.1 Research Methodology – Rationale

The author's fundamental belief system in approaching design of e-Learning supports for students in Higher education is Vygotskian. Vygotsky is considered a social constructivist who made the following points that are relevant to designing e-learning interactions.

Learning, and particularly the development of higher mental processes, requires a cooperative interaction between a student and a more learned other, where the latter may be a human tutor or an intelligent computer system. (Vygotsky, 1962) makes the following three points that are relevant to designing e-Learning interactions:

1. Learning is engineered by shifting the learner's zone of proximal development, which can be achieved via a collaborative dialectic maintained between the learner and a tutor or system.
2. Meaning - in the head - derives from the social context and the interaction, so the learner develops a conceptual understanding `through' dialogue. Or, putting it another way, `thought follows action'.
3. Language is considered the primary mediator of thought and a tool for thinking, so the external dialectic processes engaged between

interlocutors becomes internalised to provide improved reasoning and reflective capabilities.

In considering the requirement for a tutoring dialogue in the context of Vygotsky's work, this leads to a critique of dialogic tutoring systems in terms of the degree to which they supported effective educational dialogues. Questions posed in the approach include how did these systems model features of effective tutoring dialogue? And to what degree was the computer an effective tutor or more learned other? (Ravenscroft, 2001, pp. 142-143)

In terms of the author's approach to research, assessment of student learning styles is a key feature of all of the papers selected to constitute the published works here. Learning style considerations are also included in the syllabi of the majority of modules studied (used as a research measure in these works). The author's own personal learning style assessment consistently exhibits the style of active experimenter (demonstrating positivist traits, linking the learning style to research style). Since the early 1990's he has assessed his style, periodically, to monitor his own development. He encourages this practise with students, who study Research Methods at postgraduate level and Market Research Methods at undergraduate level (modules of study that feature in all papers presented here). In 1994 the author undertook research into the notion of academic tribes, examining learning styles (McClelland, 1994a, b) accepting the inference that these were linked to teaching styles and research styles of academics (supported by a university Teaching Fellowship in 1995). Several studies have demonstrated that academics learning styles are tentatively linked to teaching styles. Other linked works have demonstrated that active experimenters, in particular, are associated with the deductive approach in research. As both a teacher and researcher the author's identified learning style (defined by traits) would place the researcher, epistemologically, as a positivist, that is, preferring to prove hypotheses in research (a hypothetico-deductive approach). This was predictably the case, for the author, for many years as a scientist, prior to 1989. Since this time, in contrast to his assessed style, the author has developed to consciously incorporate philosophies and concepts of reflective research, reflexivity and qualitative

approaches as part of his research toolkit. The submission here addresses these questions through epistemological and methodological experiences that resulted in the author following a journey of mixed method application (quantitative and qualitative) where the researchers' ultimate philosophical position moved from an epistemological stance which was exclusively positivist, to a current stance which is postpositivist. The positivist stance is defined by Guba and Lincoln (1994) through proposing the epistemological question

"*What is the relationship between the knower or would-be knower and what can be known?*" (p. 108).

They (*ibid.*) describe the positivist epistemological position (table 3.1) as variably consisting of:

"*Dualist/ objectivist; findings true.*" (p. 109)

and go on to describe the nature of knowledge (table 3.2) as:

"*verified hypotheses established as facts or laws.*" (p. 112).

For the researcher this stance led to approaches to evaluating student feedback that informed design of blended learning supports, initially using the methodological approach of quantitative methods, on situations where learning was offered to students through essentially web-based and Virtual Learning Environments (VLEs). Over time the epistemolological position developed and shifted to that of postpositivist, now incorporating methodologies that are qualitative and therefore including the epistemological position of interpretivism, where the research problem necessitated, incorporating critical theory approaches, action learning, interviewing and critical incident technique.

The critical theory epistemological position is described (table 3.1) as variably consisting of:

"*Transactional/subjectivist; value-mediated findings.*" (p. 109)

and they go on to describe the nature of knowledge (table 3.2) as:

"*structural/historical insights.*" (p. 112)

The result of this epistemological shift has enabled the author to demonstrate how the selected body of work contributes to developing a framework for understanding new skills and competences for resource provision and digital supports as they contribute to blended learning environments and support different learning approaches. The papers demonstrate how academics and students behave, relate and learn in digital media (whether being introduced, in transition or embedded) and how instructors can promote blended, problem-based and action learning.

Table 3.1 Basic Beliefs (Metaphysics) of Alternative Inquiry Paradigms Source: Guba and Lincoln (1994)

Item	Positivism	Postpositivism	Critical Theory *et al.*	Constructivism
Ontology It is the study of the nature of being, existence, or reality in general and of its basic categories and their relations, with particular emphasis on determining what entities exist or can be said to exist, and how these can be grouped and related within *an* ontology	Real "reality" but apprehendable	Critical realism – "real" reality but only imperfectly and probabilistically apprehendable	Historical realism – virtual reality shaped by social, political, cultural, economic, ethnic, and gender values; crystallised over time	Relativism – local and specific constructed realities
Epistemology theories of knowledge typically involve some assumptions about existence and what exists	Dualist/ objectivist; findings true	Modified dualist/ objectivist; critical tradition/community; findings probably true	Transactional/ subjectivist; value-mediated findings	Transactional/ subjectivist; created findings
Methodology	Experimental/ manipulative; Verification of hypotheses; chiefly quantitative methods	Modified experimental/ manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods	Dialogic/ dialectical	Hermeneutical/ dialectical

Table 3.2 Paradigm Positions on Selected Practical Issues
Source: Guba and Lincoln (1994)

Issue	Positivism	Postpositivism	Critical theory *et al.*	Constructivism
Inquiry Aim	Explanation, prediction and control		Critique and transformation; restitution and emancipation	Understanding; reconstruction
Nature of Knowledge	Verified hypotheses established as facts or laws	Nonfalsified hypotheses that are probable facts or laws	Structural/historical insights	Individual reconstructions coalescing around consensus

The author's aim was to develop a more holistic approach to his research throughout the 1990's. In particular, when researching the attitudes and perceptions of students to learning events and supports, he considered that quantitative measures, obtained from rating scales, such as attitudes and perceptions, were enriched, and subsequent findings greatly enhanced through personal interviews, open-ended free response answers and focus groups with both staff and students. His wider acceptance of the interpretivist or critical theory stance, now leads him to be more open and reflective to combining the epistemologies of positivism and interpretivism (a postpositivist stance). Guba and Lincoln, 1994 describe a postpositivist methodological position (table 3.1) as variably consisting of:

"*Modified experimental/manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods.*" (p. 109).

They go on to describe the inquiry aim (table 3.2) as:

"explanation: prediction and control" (p. 112)

They describe the postpositivist methodological stance (table 3.1) as variably consisting of:

"*Modified experimental/manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods*" (p. 109)

They, finally, go on to describe the Inquiry aim as the same as that of positivism (table 3.2) and the Nature of knowledge as:

> "*nonfalsified hypotheses that are probable facts or laws*". (p. 112)

3.2 Research Methodology – Application

A careful consideration of the author's indicative research questions and sub-questions in the publications offered would indicate the prevalence of those for which a methodological qualitative approach is most appropriate. However, another reason for planning to engage both the qualitative and quantitative approaches in his research is that he wants to exploit the advantages and the strengths that each of them could confer to his studies and compensate for the possible disadvantages and shortcomings that the single use of each of them could have. There is therefore methodological triangulation in much of the work undertaken. However there are explicit references to data internal validity and reliability, where quantitative methods have predominated (papers 1 and 2) and subject triangulation, where qualitative methods have predominated (paper 4). The combination of qualitative and quantitative research is a rounded strategy through which the author believes that he can gain an insightful picture of the issues addressed by his research and increase its scope and depth. It allows him to understand both the more objective evidence, facts and causes epistemologically through positivism and methodologically through quantitative research as outlined earlier (*ibid.*), concerning, for example, the persistence of inequality in particular fields or the outcomes of the implementation of resource-based learning approaches in Higher Education, and the phenomenological meanings (pluralism and subjectivity, qualitative research) that people and especially students attach to themselves, their lives, their position in their learning development. It provides the researcher with in-depth and holistic knowledge both of processes (for example through which learning is implemented), a concern of qualitative research, and outcomes, for example the effects of the learning process (a concern employing evaluative methods of quantitative research). Integration

of the quantitative and qualitative methodologies also helps the researcher to tackle the dual concern of his studies that has to do with large-scale social and policy issues such as the direction of Higher Education technology development (through the epistemological stance of positivism) and methodological quantitative research or small-scale behavioural, cultural and perceptual aspects (through his critical realism and qualitative research). This integration, he feels, permits the collection of rich and local grounded data, discoveries and explanations (particularly through the use of the qualitative approach), that can form the basis for the confirmation of blended learning design; theory generating, whilst verifications and confirmations of hypotheses through the use of the quantitative approach. Although as Miles and Huberman say:

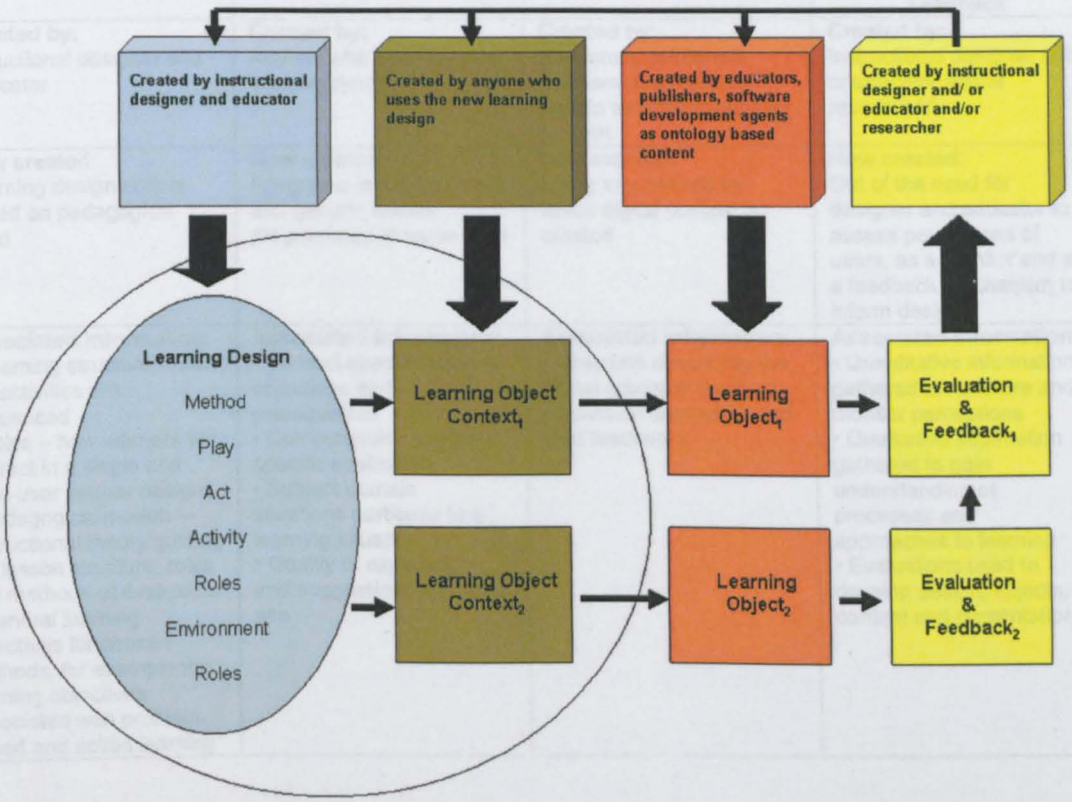
"*both types of data can be productive for descriptive, reconnoitering, exploratory, inductive, opening up purposes. And both can be productive for exploratory, confirmatory, hypothesis-testing purposes*".

Miles & Huberman (1994) quoted in (Punch, 1998, p. 240)

The merging of the two approaches serves (*sic*) as a way of increasing the validity and addressing the generality problems of the qualitative approach in the logic of triangulation (*ibid.*, p. 247).

In addressing the need to integrate technology into the learning and teaching process a conceptual model to guide developments was followed by the author, refined, developed and proposed here (after Knight *et al.*, 2006). The model centres around learning objects that evolve out of learning design. The associations for this model are: the learning design, learning object content, learning object, evaluation and feedback (Figure 3.1). The loops highlighting evaluation and feedback are integral to the process and have formed the basis for the published works presented here.

Figure 3.1 Learning Object Contexts: a conceptual model (after Knight *et al.*, 2006)



The information and associations can be further elaborated (table 3.3) as a generative pattern (based on the notion that the design can be taken from it's implementation and later be used to provide instant universal access).

Three ontologies can be identified to which the conceptual model can be mapped (*ibid.*):

I. An ontology of learning object content
II. An ontology of learning design
III. An ontology that serves to connect other ontologies

These ontologies are outlined in terms of creation, association and associated information (table 3.3).

Table 3.3 Information associated with the learning design, learning object content, learning object, evaluation and feedback (after Knight *et al.*, 2006)

Learning Design	Learning Object Context	Learning Object	Evaluation and Feedback
Created by: Insructional designer and Educator	**Created by:** Anyone who uses the new learning design	**Created by:** Educators, publishers, software development agents as ontology based content	**Created by:** Instructional designer and/ or educator and/or researcher
How created: Learning design editors based on pedagogical need	**How created:** Integrated into future tools and generic across programmes at same level	**How created:** Using any method by which digital content is created	**How created:** Out of the need for designer and educator to assess perceptions of users, as a monitor and as a feedback mechanism to inform design
Associated Information: • Learning structure - how the activities are sequenced • Roles – how learners will interact in a single and multi-user learner designs • Pedagogical models – instructional theory guiding the lesson structure, roles and methods of evaluation • General learning objectives for chosen methods, for example the learning objectives associated with problem-based and action learning	**Associated Information:** • Content specific learning objectives and prerequisites • Competencies and their specific evaluation • Subject domain situations particular to a learning situation • Quality of experience and suggestions for better use	**Associated Information:** • Metadata describing the digital resource (such as discussion comments and chat feedback)	**Associated Information:** • Quantitative information gathered to measure and monitor perceptions • Qualitative information gathered to gain understanding of processes and approaches to learning • Evaluations used to develop design, objects, content and presentation

The framework has allowed the author to specify reusable chunks of learning content whilst defining a way of describing designs for different units of learning (modules, sessions etc.), whereby the learning objects (digital or non-digital) can be referenced, use, re-used or referenced during the student learning process.

4. Extant Literature for published works

4.1 Literature surrounding published works 1 and 2

Co-terminus with the period surrounding published works 1 and 2, Volery & Lord (2000) wrote:

'*The rapid expansion of the Internet as a potential course delivery platform, combined with the increasing interest in lifelong learning and budget restrictions, has created a significant incentive for universities to develop online programs. As the technology is now available and relatively user-friendly, those universities which do not embrace it will be left behind in the race for globalisation and technological development.*' (p. 216)

Such online developments were accompanied by evaluations of the staff and student experiences using this Internet medium (McNaught, 1999; Boles *et al.*, 1999; Baillie and Percoco, 2000; Voley & Lord, 2000; Butler, 2000; Boticario & Gaudisio, 2000; Barbera, 2000).

Also in this period Boticario & Gaudisio (2000) wrote:

'*It is obvious that positive use of the Internet media currently available will radically change teaching/learning relationships. The lecturer will have to become an information facilitator, a critical analyst of knowledge, a study guide, a reviser and assessor of a student's academic education. Students will have to start to be aware of their essentially active role in the learning process as members of a virtual community of people with shared educational interests.*' (p. 120)

Their work (*ibid.*) described the principles and specifications of a Web site implemented as a Web-based adaptive educational system. The comparative advantage of this approach, they concluded, lay in distinguishing adaptation tasks not only for study-assistance tasks but also for any other Web-site activity, including access to any available resource (pages, repositories,

searches, mailing lists). They outlined that their system behaved like an interactive system intended to focus the teaching on students' performance, and resolve problems detected in Internet use for distance learning.

This early study (*ibid.*) provided the groundwork for the approaches adopted by lecturers interested in this approach within HEIs, to adapt to the existing educational systems for undergraduate and postgraduate students, particularly within Business Education.

Whilst this adaptation focused on the process of education, the requirements of the learning and teaching agendas within LJMU needed investigations surrounding student learning processes, staff experiences and the embedding of quality evaluation processes. Each of these requirements for knowledge gave rise to the development of research groups and projects that were funded (external contracts and grants), sponsored from within LJMU (through awards, Fellowships) and subsequently supported many of the papers presented here.

Volery & Lord (2000) had identified the key factors for learning and teaching processes, in online delivery, to be Effectiveness; Technology; Instructor Characteristics and Student Characteristics. They devised a questionnaire that measured a number of items for each characteristic. They identified six factors as Ease of access and Navigation; Interface; Interaction; Attitudes towards students; Instructor technical competence and Classroom interaction. They concluded that there were three critical success factors in online delivery: technology (ease of access and navigation, interface design and level of interaction); the instructor (attitudes towards students, instructor technical competence and classroom interaction); and the previous use of the technology from a student's perspective.

Combining knowledge from both the work of Boticario & Gaudisio (2000) and Volery & Lord (2000) served to initially provide quantitative research strategies for evaluation of web-supported learning approaches at LJMU and greatly supported the papers for this body of published work.

The approaches that developed at LJMU in the late 1990s surrounding web-based learning initiatives, were also supportive of the opinions of Inayatullah (1999)[3], who suggested, the lecturer can then play the more important role of asking questions, engaging the student at many different levels - not only deconstructing his or her worldview but also reconstructing it and relating daily problems to the grand questions facing humanity.

In this period similar developments were occurring both nationally and internationally such as the 'Oncourse' Project at Indiana University, in 1997, establishing a framework of a "template-based course management system" that would be the basis of many of the later learning management systems (LMSs) including WebCT and BlackBoard. Simultaneously, Bodington Virtual Learning Environment (VLE) developed at the University of Leeds, incorporated multiple roles for users to access resources and the flexibility to organize resources based student and faculty needs. The release of the EDUCOM/NLII Instructional Management Systems Specifications Document Version 0.5 (April 29, 1998) brought about the standardization of many of these developments and encouraged the widespread use of an LMS to store and distribute academic resources and provide new tools for communication and collaboration. These developments continued as higher education expanded access to new participants (lifelong learners), sought cost efficiencies across traditionally separate units and incorporated new modalities of assessment (Craig, 2007).

Early research at LJMU by the author surrounded both the process and evaluation of the student learning approaches. Initially the process and learning evaluations were attached to perceptions of the templates used, the student perceptions of architecture and the learning styles exhibited by the learners based on work undertaken by Kolb (1984). A survey instrument was developed (McClelland, 2000 b) to evaluate the student experiences and over time this evolved, during which time the template-based module presentations

[3] As quoted in Volery & Lord (2000)

at LJMU were replaced by the commercial VLE, Blackboard (see McClelland, 2000 a, b; 2001 a, 2001 b, c; 2002 a, b, c; papers 1 and 2). The programmes evaluated that used the web-based modules were undergraduate and postgraduate courses in Business at LJMU and constitute a core theme of the first two papers presented here. It is interesting to note that throughout the period of the publication of papers selected, it was observed that the design and supports on web-sites developed at LJMU did not discriminate learning styles (see McClelland, paper 1; 2002 a; 2008). The initial research for the selected papers was concerned with blended, problem-based approaches in order to develop blended learning environments for students, a focus not tackled to any extent within the literature at this point in such a holistic way. The works were therefore addressing gaps and contributing to knowledge at this point.

Paper 1 investigated the use of resource-based flexible learning materials[4], mediated through web-sites, where academic staff in Liverpool John Moores University had designed the web-site template. The work dealt with the undergraduate experience and was an invited paper. The approach to evaluation of two student cohort experiences, of identically structured web-sites, utilised a questionnaire and incorporated an assessment of student learning styles into the subsequent analyses. The learning experience of students followed a problem-based approach.

Problem-based approaches to learning (PBL) have a long history of advocating experience-based education. Psychological research and theory suggests that by having students learn through the experience of solving problems, they can learn both content and thinking strategies.

The process requires that the teacher acts to facilitate the learning process rather than to provide knowledge. The goals of PBL include helping students develop flexible knowledge; effective problem-solving skills; self-directed learning skills; effective collaboration skills, and intrinsic motivation.

[4] Materials developed by the author between mid 1990s up to 1998

There is considerable research on the first three goals of PBL but little on the last two. (Hmelo-Silver, 2004, p. 235)

Defined by Boud (1985, pp. 13-18) problem-based approaches to learning (PBL) are concerned with experience-based education. His definition was:

"*The principal idea behind problem-based learning is that the starting point for learning should be a problem, a query or puzzle that the learner wishes to solve*" (pp. 13-14).

This approach was common in those modules, evaluated at LJMU, where an ideal blend was sought (that is for web-based supports combined with a variety of learning and teaching supports).

The problem-based approach has found wide application in Engineering, Medicine and Law undergraduate and graduate programmes, it has found growing application in business education, being widely used for subjects such as Database Development, Marketing Research Methods and Research Methods (mirrored across the business/enterprise education HE sector).

Six core characteristics have been identified as common to problem-based environments for learning (Boud & Feletti, 1997, p. 2)

I. Using stimulus material to prompt student discussion and problem solving.
II. Presenting problems reflective of professional practice.
III. Guiding students' critical thinking by providing only limited resources to help them develop resolutions to the problem in question.
IV. Having students work cooperatively in small groups, in and out of class.

V. Enabling students to identify their learning needs and the appropriate set of solution resources.
VI. Encouraging students to self-evaluate and self-validate their learning processes by reapplying the new technical knowledge and problem solving approaches to other problems in the field.

4.2 Literature surrounding published work 3

This work is notable in outlining a fourteen-year period (1992 – 2006) of evolving resource based learning material developments for higher education through projects either secured by Liverpool John Moores University or where the university were consortium partners. The total funding received for all of these projects was £1.17 million. This paper presents four cases outlining development of learning resources for students in higher education for the period that resulted from these projects. The author held a key development role in all projects, and is referred to throughout the paper as the academic developer. The paper covers the range of developments that include text-based open learning materials to the population of VLEs with electronic resources such as e-books. The work considers problems, tensions, contrasts and complementarities surrounding the blends used, particularly e-books, in further developing learning environments to support learning.

Paper 3 also incorporated perspectives on action learning, espousing those research observations proposed by Koo and extended by the author McClelland (2008)

Action Learning approaches had developed within Liverpool Business School from the mid 1990s for postgraduates. The LMS Blackboard was introduced on these modules in 2003 and further developed the content and relevance of papers for this body of published work through incorporation of this learning approach. (Koo, 1999, p. 92) had reported:

"In addition to the electronic libraries, there are many news groups on the Internet where action learners can freely discuss their ideas and seek assistance from each other. Learning can be achieved rather conveniently without the need of brick and mortar and face-to-face tuition. Learning through the Internet offers an entirely new horizon with virtually unlimited boundary. Never before in mankind's history has learning been made so convenient, flexible, dynamic, exciting and challenging."

Liverpool Business School (LBS) within LJMU had for many years, prior to the introduction of commercial VLEs into universities, been involved in producing electronic resources (case 1) and open learning materials (case 2) for international and national learning projects for business, which staffs within the School had retained in electronic form. The staffs had also been involved in the Higher Education Funding Council initiatives of the mid-1990s to produce electronic resources. These were known as the Teaching and Learning Technology Projects (TLTPs). The experiences; research and developments at LJMU enabled staffs participation on a UK Northwest university e-learning project in 2002-2004. This consisted of a consortium management group arranging authorship of modules for an e-Learning Masters in Enterprise (M.Ent.) programme to be delivered through the medium of Blackboard. The consortium commissioned approximately twenty-five academic authors from five regional universities to write e-Learning materials. The aim of the programme was to support and provide e-mediated postgraduate study through flexible action learning and knowledge transfer to specifically serve employees of small to medium enterprises (SMEs) in the Northwest of England. The Northwest Development Agency (NWDA) funded the project. This paper provided case studies for each of the initiatives and a fourth case for a further in-house e-Learning resource development initiative.

The paper was important in highlighting how the VLE Blackboard was now an embedded support within the author's university. It has been reported (McClelland, 2008) that the VLE Blackboard became embedded in the Learning and Teaching process of LJMU. From the period 2003 onwards

feedback from students concerning Blackboard diversified and been streamlined to address:

- Contributions to each of the university modules, as part of the student module feedback process students are asked to rate their satisfaction on the degree to which Blackboard supports their learning.
- Particular learning research questions concerning student approaches to various learning approaches or blended learning VLE resource supports. This resulted in targeted research beyond this period that examined action-learning approaches for postgraduates
- The efficacy of communication or assessment tools supported by Blackboard. (pp. 338-339)

4.3 Literature surrounding published work 4

LBS undertook a collaboration with a distance learning provider in 2004 and utilised the expertise of a range of staffs to develop bespoke e-Learning resources for a collaborative distance Masters in Business Studies (the subject of this work).

In 2004 the NWDA funded a further regional project group called NetworkingNorthwest to facilitate five action learning (AL) projects for delivery to Northwest enterprises. Five universities were successful in bidding for the project monies to deliver the action learning (Liverpool John Moores; Salford; Manchester Metropolitan and Bolton Universities as well as University of Central Lancashire were the successful bid teams) and an action learning research group from Leeds University was appointed to evaluate the resultant five pilot projects.

Although Action Learning had been evaluated on business postgraduate courses for many years, this was one of the first studies using e-mediated provision, through Blackboard, and Action Learning Sets. The blend for this one-year course, consisting of three modules of study was therefore similar to

previous studies from this author, in terms of a blend, however the learning approach differed here. The author and his research team also studied this AL approach in addition to the research group at Leeds. At an early stage, and to conform to the widely held view on evaluating Action Learning (Revans, 1983; Howell, 1994; Mumford, 1995), the methodological evaluation undertaken by the LJMU team was primarily interpretive in approach.

Action learning approaches were originally proposed by Revans. There are various useful books i.e. Revans (1983), but, like all powerful methods, the principle and the process are very simple and serve to direct the energy and expertise of the participants. The action learning approach is a process of disciplined small group discussion.

The groups typically are no smaller than four members and no larger than seven members.

Group members share a context; typically:

- They may come from the same type of organisation
- The material is always live and highly relevant to all concerned
- Action learning is learning from experience
- The group agrees to meet over a period of time
- The length of a session depends on the group size (the ideal size is usually denoted as seven).

Action Learning finds wide application in business postgraduate programmes, especially the Human Resource subject areas.

As part of this published work an additional observation was made by the author, that the action learning programme did not really suffer unmet expectations or needs from students. Corley and Thorne (2006, p. 43) have reported unmet needs with a postgraduate County Council development programme on management and change (offered within the same department

of the author's university), where action learning is used. In that research study the particular unmet needs centred on disillusionment with managers as a problem with implementing change. Students on the study in published work 4 did not mirror that feedback, this was probably due to those female students being predominantly owner/managers who were in fact the drivers of change in their own companies.

Feedback received for this action learning pilot praised the e-learning supports approach, and many voices felt that "it provided an excellent resource for students." The supports existed outside of the sessions (hosted on a Blackboard web site) and provided for self-paced learning, guidance and theory. Cox (2003, p. 354) has stated: "*E-Learning represents a process to align people, knowledge and strategy to build agile organizations that adapt to create value for internal and external stakeholders in a global industry.*" This may be viewed as a panacea as (Graham, 2004, p.314) argues:

"*Now what this suggests is that they (the students) do not simply require useful information, but a composite educational experience, and it may be that this is not something that digital technology can supply because it crucially involves learning with others.*"

4.4 Literature surrounding published work 5

The identification of instruments and dimensions used as a basis for this published work is believed to be one of the most critical steps in the evaluation of service quality in order to develop a standardised measurement based on consumers' perception. SERVQUAL, the instrument developed by Parasuraman *et al.,* (1985; 1988), through an exploratory study in the service industry, is seen as the most popular instrument of service quality measurement in recent decades (Asubonteng, *et al.,* 1996). The instrument used here is a quantitative survey.

Paper 5 combined an original ten determinants (reduced to five dimensions) of service quality from quantitative studies proposed by Parasuraman *et al.,*

(1985; 1988) with a further eighteen determinants redefined by Johnston (1995), as the basis to explore whether experiences within the HE (TLA) and the support services (Ancillary) environments could be identified as Satisfiers, Dissatisfiers, Criticals, Neutrals or other determinants specific to HE. The approach used was essentially qualitative with some quantitative observations also considered. Results in the form of responses (from more than 160 individual students) and anecdotes (numbering more than 500 in total) were evaluated using the qualitative analysis software NVivo, to identify emerging themes. This procedure presents a different methodological approach to service quality determination, Parasuraman (1988), where ten determinants proposed were developed into five dimensions. In this paper the refinement was to combine the original ten determinants (*ibid.*) with Johnston's (1995) eighteen redefined determinants to explore student experiences in the HE environment.

4.5 Future Trends

Jennings (2005, p.166) has said something that is certainly the author's observation at Liverpool JMU "*It is apparent that the majority of Blackboard users in University College Dublin (UCD) is only just beginning to tap into the potential on offer, and they are using the system as an effective means of delivering and managing an array of multimedia content.....those that are already familiar have begun to look elsewhere to enhance the environment by including outside sources of interactivity in the guise of digital video or Flash files.*"

(Roberts *et al.*, 2005, p. 10) outlined the challenges and opportunities for informal learning in ubiquitous computing environments can be thought of involving three interrelated aspects, namely: educational environment; personal environment; technical/computing environment Formal to informal learning is a continuum: at the formal extreme all control over the learning process lies with the tutor and at the informal extreme the control over the learning process lies with learner.

Richardson and Watts (2005, p. 118) highlight that with widening internet access, life long learning and increasing numbers of mature, distance and disabled learners, electronic education has to grow. Use of Web-based learning and in particular the feedback obtainable from formative assessment, such as quizzes in WebCT, will help develop the confidence of the returning learner. WebCT is a good vehicle for the delivery of a course at a remote study centre, for example, to support a franchised network of colleges. With the increase of student numbers wishing to study at their local college, this provides better access to higher education.

Interestingly Huang and Luce (2004, pp. 533-534) concluded in their work that:

I. Due to the key advantages of MBA program supported by VLE such as convenience and more interesting, there should be a good market potential for MBA program in VLE to grow in the future.
II. Incorporating suitable teaching modes in VLE is the key for the success of online MBA programs. A combined teaching mode of VLE and TLE can be a good choice.
III. Those online MBA programs or other programs that have had difficulties in keeping a high level of teaching quality and students' satisfaction may need to consider revising there teaching mode by combining both VLE and TLE teaching modes.

This blend, recommended through research at Ohio University, is mirrored in many of the postgraduate programmes at Liverpool JMU with similar student feedback. This can form the basis of a strong recommendation concerning a future trend for business postgraduate education supported by digital information technologies.

The author feels (through the findings from the published works) that development of quality resources is key to the future use of VLEs, this is endorsed by Wise (2005, p. 113) who outlines:

"Academics are more likely to be recognized and rewarded for writing research articles and books than for creating imaginative e-learning materials.....This would also signal to university leaders that publishers are important partners in driving change and supporting the widening participation and other strategic agendas of importance to policy makers."

A proposed future look at VLE use has been made by Totkov (2003, p.7) who outlined that:

"The evolution in learning and training at distance can be characterised as a move from distance learning (d-learning) to e-learning to mobile learning (m-learning).....The European project, from e-learning to m-learning, sets in place the first building block for the next generation of learning (the move from d-learning and e-learning to m-learning). The Leonardo da Vinci project sets out to design a Wireless VLE as harbinger of the future of learning."

This may be the immediate future direction for blend of e-learning to develop, however the author feels a more succinct future look may be found from the statement made by De Vries *et al.*, (2006, p.10) who say:

"The involvement of regular teachers and professional instructional designers is needed to further educational innovation through the development and sharing of Learning Designs. Ultimately, individual teachers are the carriers of educational innovation in their institutes. Opportunities for this are created by instructional designers who in explorative projects guide new directions of educational innovation."

The author maintains that a comprehensive infrastructure, backed up by a robust Learning and Teaching Information strategy is essential for the support of VLE mediated university courses. McDougall *et al.*, (2003) has endorsed this by outlining that as institutions throughout the world clamber to offer courses via the Internet, many are blissfully ignorant of the support infrastructure that is required to deliver a high quality service to their new

market. Within a globally competitive environment, the University of Southern Queensland's (USQs) strategically planned, systematically integrated, and institutionally comprehensive student support infrastructure provides a model for sustainable and quality distance education (p. 37-38). The author also suggests that this is the case for Liverpool JMU, for distance as well as on campus courses.

As a result of Blackboard now being embedded in the Learning and Teaching process of LJMU, the period 2003 onwards has seen feedback from students concerning Blackboard diversify and be streamlined to address:

1. Contributions to each of the university modules, as part of the student module feedback process students are asked to rate their satisfaction on the degree to which Blackboard supports their learning.
2. Particular learning research questions concerning student approaches to various learning approaches or blended learning VLE resource supports. This has resulted in targeted research.
3. The efficacy of communication or assessment tools supported by Blackboard.

In terms of the development of blended e-learning resources, costs of production, amongst others, have been a major barrier to resource developments in higher education. As the author outlined in paper 3, generally the barriers fall into categories such as: costs; project management (expertise); author expertise amongst academics; pedagogic issues related to the subject matter; learning and teaching strategy emphases on resource provision for different HEI's; and the offer of complete programmes with full web-based supports from publishers (but at a cost).

Recently, in the complementary area of electronic book developments, there have been three notable evaluations of electronic textbooks on the Web through the Electronic Books ON-screen Interface (EBONI), which focused on assessing how appearance and design can affect users' sense of engagement and directness with the material (Wilson *et al.*, 2003, p. 462) The

EBONI Project's methodology for evaluating electronic textbooks is outlined and each experiment is described, together with an analysis of results. In recommending for future design, based on the main findings of the evaluations, users appear to want some features of paper books to be preserved in the electronic medium, while also preferring electronic text to be written in a scannable style.

(Falk, 2003, p. 258) has observed that university libraries are discovering that new digital resources are sometimes accompanied by new problems. For digital materials that originate on-campus, these libraries are able to retain primary responsibility, and to control content and access. But the bulk of electronic journals typically come to the libraries through licenses, and the ability to ensure long term access to the journal files often remains in doubt. Observations have also been made that increased reliance on digital collections is leading to a decline in the importance of collections of printed materials (*ibid.* p. 261).

The author feels that these observations are mirrored at Liverpool and the importance of the currency of the learning blend is paramount in the way students receive the VLE supports. There is an increased reliance on digital collections and linkages from VLEs are an essential component, as are the incorporation of e-books and structured, well-prepared e-learning resources.

In published work 4 the author demonstrated that on the VLE supported action learning programme at Liverpool JMU, the management of the learners and individuals was undertaken through adherence to the framework prescribed by funders, however the theory to overlay the concept of: action; review; planning; action was provided through comprehensive e-learning materials. It was not mandatory to follow these blended support materials, they were not compulsory learning supports and students were studying three CPDs where assessment was optional.

The author outlined (in this published work) that the Liverpool action learning team proposed that flexibility of delivery and assessment offered was

paramount in attracting busy SME manager/owners.

For this study it is also important that we should not lose sight of the single-gender nature of the cohort. This environment facilitated a whole range of benefits in terms of learning and discussions, not for reporting here. The programme team made strides towards a claim made by Anderson (2004) who stated:

"Positive action training can help raise women's awareness and understanding of organizational attitudes but strongly implies that this initiative will have limited impact unless it is part of a wider portfolio of measures designed to induce change at organizational level."

Learning with others (group work) is critical to the action learning process, however the team and philosophy of the M.Ent. Programme offers the blended approach to learning whereby provision of e-learning supports does not exclude group work, rather, it complements the group work and because use of the supports is not compulsory it allows for the sets to be used according to Revan's Classical Principles of action learning.

Paper 5 focuses moreso on evaluation as the Blackboard VLE is now embedded at LJMU. The models are flexible enough to incorporate the variable elements of a postpositivist stance to evaluation as well as positivist and interpretivist evaluations, where necessity requires.

It is quite pertinent to end this conclusion with the comments of Craig (2007), who concludes in his work by writing that, perhaps the one surety we have in this transitional phase is that the Learning Content Management System (LCMS) of the future will offer a very different set of features and tools. He says in his conclusion:

"The recent merger of BlackBoard and WebCT, the ongoing development of open source products such as SAKAI and other open-source products, which offer the promise of easily shared learning tools, and new techniques such as

Asynchronous JavaScript and XML (AJAX), will drive the change process. Eventually, a generation of students will demand a more responsive set of learning tools. Just as they are quickly moving beyond the traditional institutional environment to create their own virtual social realms, they may one day create and utilize their own learning tools and communities. Of course, institutions will always hold the upper hand in these developments as they maintain the formal credentials students require for future careers. But this exercise of power is an illusion in a rapidly changing society and we want to engage our students through experiences that are both empowering and transformative. Doing this will require that we rethink our LCMS model, and grasp the reality that the underlying paradigms are indeed changing faster than we think." (p. 160)

4.6 Extant Literature Summary

The papers selected to constitute the published work presented here have encapsulated those important elements in an environment of underlying changing paradigms, which are designing learning blends that are fit-for-purpose, learning approaches that suit the subject matter and student assessment and feedback processes that are methodologically appropriate for measurement (where the epistemology can be positivist) and able to decipher the essence of learning behaviour in students, avoiding any subjectivity bias (where the epistemology can be interpretivist). Also where evaluations necessitated, both measurement and underlying meanings interpretation, the epistemology can be postpositivist.

This holistic approach positions the body of research as one of few that addresses, within the literature, a rounded approach of design and appropriate delivery of learning blend that is informed by student feedback.

5. Reflection

(Miller & King, 2003; Moore & Kearsley, 1996) have been quoted by Herner-Patnode *et al.,* 2008 in outlining that E-learning is different from traditional education in that it requires changes in pedagogical approach.

In identifying reflective e-learning pedagogy (*ibid.*) they have identified the following areas for consideration:

1. Division of roles in e-learning
2. Communicating with the students
3. Organisation and facilitator assistance
4. Awareness of student needs
5. Technical support
6. Pedagogical support and learners' ownership
7. Reflection as a means of evaluating a student's growth

The latter area has particular relevance to the author's chosen approach as he mirrors the profile of the teacher as a reflective practitioner, in that he:

- Examines his own motivations and the context in which issues and problems occur.
- Looks for distinct ways to pose the problem and attempts to get a different perspective on the students and issues involved
- Questions his own beliefs and orientations.
- Is responsible to the unique educational and emotional needs of individual students,
- Questions personal aims and actions.
- Constantly reviews institutional goals, methods and materials

The author in his research has acted as an instructor who understands student needs and accommodates those who need help will provide a course that is organised and prepared for technical difficulties, and whose students will gain a good perception of the overall content.

Greatly influenced by Kolb and evolving to an epistemological stance of postpositivism, the author's research supports constructivist and student-centred pedagogical approaches.

Nunes and McPherson (2003) have outlined that the theory of constructivism stems from the field of cognitive science, particularly from the works of Jean Piaget, Lev Vygotsky, Jerome Bruner, Howard Gardner and Nelson Goodman. Constructivism describes the development of knowledge through learning as a process of active construction of meanings in relation to the context and environment in which the learning takes place. They (*ibid.*) cite Brown *et al.*, 1989 who say that a learner's understanding of a subject is embedded in the experience of that individual. They also go on to quote Duffy & Jonassen (1992) who said:

"Constructivism proposes that knowledge or meaning is not fixed for an object, but rather is constructed by individuals through their experience of that object in a particular context"

It is therefore understood that basic constructivism relies on the use of prior knowledge in the construction of new meanings. Previously constructed structures of knowledge are retrieved and utilised as discrete packets for the development of new knowledge structures. This is the case for the author in the approaches he has used.

Spiro *et al.*, 1991 takes this basic theory of constructivism a step further. They argue that a new element of the constructive process must be added to those that are already recognised. That new element is the use of pre-existing knowledge in the active construction of new knowledge. The pre-existing knowledge is brought together from diverse areas of understanding and reassembled into knowledge structures that can be used to interpret and construct new meanings from the new situation presented. This process of knowledge construction by imposing meaning to learning experiences reflects the basis of the constructivist epistemology.

Applying this to the assessment process it is Macdonald (2004) who has said that the assessment of e-learning courses has a variety of roles to play in supporting course outcomes, and ensuring that students are equipped to benefit from the rich learning environment.

- The assessment of e-learning need not necessarily be online, although there are times when it is appropriate, for example when rapid feedback is required on progress and achievement testing.
- Constructivist approaches to study require students to learn by engaging in a variety of activities, which may involve collaborative work, problem solving or resource based learning. If such activities are central to course outcomes, then it is important that students undertake them conscientiously. Assessment strategy can afford students an opportunity for learning at critical points in the course.

In reflecting on the research processes applied, for the published works 1-5, the author concurs with Nunes & McPherson (2003) in that his designs and his development of e-learning environments adopts pedagogical models which in turn adopt moderate constructivist approaches, based on active and problem-based learning.

They (*ibid.*) go on to define two main characteristics for academic learning:

- Academic learning must be *situated* in the domain of the objective, the activities must match the complexity of that domain;
- Academic learning must contain both *direct experience* of the world and the *reflection* on that experience that will produce the intended way of representing it.

Therefore, academic learning is assumed to be much more than a mere process of passive reception and acquisition of knowledge. It is Laurillard, 1993 who said (ten years before this), that the way learners handle knowledge is what really concerns academics. This is the firm belief of the author.

6. Conclusion

The body of work presented here has contributed to a foundation for understanding new skills and competences for digital supports as they contribute to blended learning environments and in their support of different learning approaches. Also evaluations undertaken as part of the works demonstrate how academics and students behave, relate and learn in digital media, to resource provision and how instructors' can promote blended, problem-based and action learning. This submission has aimed to present a collection of works that inform researchers of a range of currently used methods in strategy, design; infrastructure; student feedback issues; learning resource issues and learning approaches in the practice relating to e-Learning Technologies, supported with theoretical underpinnings. This holistic presentation consists of a cohesive body of research that serves as a contribution to knowledge.

Through students' feedback the author has contributed to a quality monitoring mechanism at LJMU that has now crossed over to Learning and Teaching evaluation of initiatives. The net effect for the university was that from 2003 onwards it began moving towards the examination of learning experiences rather than the technology itself. (Nachmias, 2003, p. 225) cites Phipps & Merisotis (1999) who supported a similar approach and observed that:

"*Information and communication technologies are having, and will continue to have, a profound impact on higher education institutions around the globe.....This situation calls for a rigorous and comprehensive research efforts that will generate conclusive insights regarding how, and in what ways, technology can enhance the teaching/learning process, particularly at a distance.*"

Stiles (2003) maintained, at this time, that at Staffordshire University, Course monitoring and student feedback was being practiced effectively in both traditional and "e" delivery but the approaches used were "local". At the time it was highlighted that work was being carried out to develop a university wide

electronic feedback form for e-Learning courses. It was outlined that if this could be adopted, overall evaluation – an area identified as weak – would be greatly enhanced.

Dyson & Campello (2003) approached their VLE evaluations as a means of producing valuable information for the design of the subsequent studies. Their conclusions may be summarised as follows:

- The variables provide both qualitative and quantitative and objective and subjective data.
- Achievement of Goals needs to be assessed by practical tasks and a structured questionnaire.
- Technicalities such as connection reliability can severely hinder the experiment. (p. 8)

The activities of the three sets of authors highlighted above, in the period 2003, are mirrored in the work of this author in being concerned with:

- The impact of Information and Communication Technologies
- Developing feedback for e-Learning courses
- The variables provide both qualitative and quantitative and objective and subjective data.
- Producing valuable information for the design of subsequent studies

It is these drivers that have guided the published works presented here.

6.1 Conclusion Summary

The papers presented for the published work here have seen the development of a series of evaluation models that have proven to be robust in terms of adapting to changes in the VLE support, the differing blends and the approaches to learning.

The outcomes of the works have conformed to methodological triangulation and, in their use have endorsed the blends designed for student learning.

The author maintains that the approaches presented in these published works have widened and enriched his strategies of research into student learning in higher education and especially teaching, as he now incorporates his balanced methodological stance and conceptual framework and model in his research on undergraduate, masters and doctoral level modules (particularly those modules researched in the collected papers presented). His intention is that this strategy has, developed a combination of lines of inquiry that has met a gap in this area of educational research, contributing to knowledge and in a more effective way, better informed his teaching practice and research, and subsequently his academic interaction with peers, other academics at LJMU as well as the national and international debate on learning and teaching, through his almost seventy publications of which more than thirty of those are refereed research publications, concerned with technology supported learning.

A further contention of the author is that this openness and reflection applied to research findings and resulting teaching practice, can prove to be a more positive influence on student learning.

One final mark of quality and contribution to knowledge is that published works 4.1 - 4.4 were submitted in the UK's 2008 Research Assessment Exercise (RAE) under UoA 37 (Library and Information Management). The unit received a score as follows: 4* (5%), 3* (20%), 2* (30%) 1* (45%). Published work 4.5 was too late for the RAE 2008 deadline but went on to receive an acknowledgement of Highly Commended Award Winner at the Literati Network Awards for Excellence 2009.

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Appendix I Regulations 2006-7 for the PhD by Published Work (LJMU RD10A)

LJMU RD10A PhD (1992/V1)

LIVERPOOL JOHN MOORES UNIVERSITY

Preliminary Report and Recommendation of an Examiner on a candidate for the degree of Doctor of Philosophy (This report must be typed)

Each Examiner is required to make an independent preliminary report and provisional recommendation on the thesis and to forward it to the University before the oral or alternative examination is held.

Note: *Where a candidate has completed a formally assessed programme of course work, the result of the assessment must be communicated to the Examiner of the thesis* (see Regulation G8.2).

1. The Candidate

Name in full:

Name of School:

Name of collaborating establishment, if any:

Title of thesis:

Date of submission:

2. Name of *External/Internal Examiner:

3. Report of the Examiner on the thesis and any published work submitted

The Examiner is requested to give a reasoned assessment of the candidate's performance with particular reference to Regulation G12.1.

3.1 Does the thesis represent a significant contribution to knowledge of the subject by:

(i) the discovery of new facts
and/or
(ii) the exercise of independent critical powers?

3.2 Does the thesis provide evidence of originality?

3.3 Is the thesis satisfactory as regards literary presentation and succinctness?

3.4 Is the abstract of the thesis submitted acceptable?

3.5 In the case of a candidate who has completed a programme of formally assessed course work under regulation G8.2 is it manifest in the thesis that the candidate has benefited from the course of postgraduate study?

3.6 In the case of a candidate whose research programme is part of a collaborative group project, does the thesis indicate clearly the individual contribution and the extent of the collaboration?

*delete as appropriate

Report
Note: *A report of about 300 words should suffice.*

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