An exploration of key factors influencing (promoting or hindering) current & future use of technologies in Learning & Teaching, with relevance to metropolitan universities

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An exploration of key factors influencing (promoting or hindering) current and future use of technologies in learning and teaching, with relevance to metropolitan universities.

A thesis submitted for the MA in Learning and Teaching in Higher Education (MALTHE). London Metropolitan University, 2013.

Penelope J Lister

Important:

This thesis is a print copy exported from a submitted website. Not all additional materials might therefore be included in this copy, such as tables, embedded graphs or diagrams. As such it is a record of the topic and general scope of the work rather than a full copy. A best effort has been made to create as complete a copy as possible.

The online version, faithfully archived *as it was submitted*, is available here: http://webteach.penworks.net/maresearch/

This website was submitted at the time of assessment, along with PDF copies in addition to the website itself.

No text has been changed or any additional material added or removed in this new copy (2021).

Abstract

Learning and teaching need to adapt more quickly, and perhaps more radically, to accommodate new and diverse sets of learners (Tate & Klein-Collins 2013, Cavanagh, 2013) making best use of any and all technology suited to the purpose of learning and teaching. By beginning to effectively utilise that which the digital information world now affords them, the needs of each individual student can be met with more flexibility (Boys & Ford, 2008), and perhaps the role of universities as custodians and disseminators of society's shared knowledge can be enhanced and even reinvented for a modern digital age (Lynch 2008, Katz & Gandel, 2008).

The Advent of new technologies has had enormous implications for higher education, with "…an extraordinary impact on teaching and learning, institutional management, administration … (and) …library services, research production and dissemination; and student life…" meanwhile "the actual effects of these technologies" have not always measured up to their sweeping expectations (Guri-Rosenblat 2009 in Altbach et al, 2009).

By researching predominant themes appearing in current literature and carrying out a pilot study of primary stakeholders from a variety of academic roles involved directly and indirectly in learning and teaching, this paper seeks to shed light on what those expectations and perceptions might be. Focusing particularly on 'technology enhanced learning' but also related technology practices, it will seek to establish what may most influence the adoption of technology into university life.

Attempting to categorise key themes into a 'Problems and Benefits Hierarchy', conclusions propose new ways of providing effective e-technology training support, noting the most positive and negative forces highlighted in the study, and how to move forward with that knowledge. Focus might then be brought to bear more effectively to begin the 'paradigm shift' transformation helping to create learning and teaching fit for purpose for the 21st century (Hämäläinen & Häkkinen, 2012).

Aims and Focus

The aim of the research was to ascertain influencing factors on uptake of technology in learning and teaching, and which (*driving and restraining forces*) might be at work on an individual employee in academia. These factors would then be compared with common influencing factors identified from the literature. A Problems and Benefits Hierarchy was proposed, using five rankings of 'variables': real, imagined, intermittent, persistent, legacy.

Primary stakeholder research would contribute to the Problems and Benefits hierarchy via three distinct stakeholder groups. The possibility that a variety of academic roles may exert influence was acknowledged, so respondent roles for Research Group 1 (RG1) were not limited to teaching staff, but also included support, research and administration staff who may also have influence, albeit indirectly. A small sample of staff (staff n=8) were sourced and took part. More input from a second Research Group (RG2) with other academics was also gathered using informal techniques (staff n=<20) via LinkedIn & Research Gate.

A small group of mainly undergraduate students (students n=8), from a variety of disciplines formed the third Research Group (RG3), and was used to measure key student expectations of technology utilisation in teaching and study scenarios. This was to provide some counter landscape to that which the staff would provide. Amount of input varied between each student, and students came and went in the participation, as the group was informal with no pressure to take part or not.

Focus for the literature review would be on journals and significant texts concerned with aspects of online technology use(s) in learning and teaching, but not limited only to practice in teaching scenarios.

Method

Literature Review Analysis

A decision was made to use a core selection of significant books and relevant academic papers for the literature review. Around 10 books and reports were used, plus a selection of up to 15 current papers and articles. Books, journal articles and research papers were selected in part on the basis of their currency, and nothing is used that is older than 2007 (except Hayes, 2000, on usability) by reason of the exponential growth in use of technology since then. In 2007 the world internet population was less than half what it is today, and is set to double every 5.32 years (Guo-Qing et al, 2008), and Smartphone penetration has topped 1 billion users since the advent of the iPhone in 2007, and is set to double by 2015 (Strategy Analytics, 2012).

All texts were also chosen on the basis of their focus on Web 2.0 or semantic technology, social media or other online applications. Other learning technologies such as interactive whiteboards, Second Life or uses of Learning Management Systems were not included as being deemed to be more generally thought of as Web 1.0 or 'older' technology, as "the content-centric course design approach and the standard LMS are no longer meeting the student's preferences and needs…" (Kusen & Hoic-Bozic, 2014, p 181) and are "closed-platform Web 1.0 type technologies conducive to teacher-driven pedagogical approaches and not […] the networked and collective learning possibilities of Web 2.0" (Brown, 2011).

To begin the work of recognising and measuring popular themes and factors commonly discussed in the literature, each was noted and allocated either a problem or a benefit label, summarised by the perception of the general context and tone of the theme in the literature.

Research Groups and Methods

A variety of methods were utilised to obtain primary data. These included use of multiple online questionnaires, an informal social media Facebook ('secret', i.e. closed) group for the student research, and discussions initiated by this research using an academic LinkedIn group or a small group in ResearchGate, both with participants who were self-selecting, i.e. taking part of their own volition, out of interest in the topic.

Stakeholder research was carried out concurrently with the writing of the review, with iterative development of questions, in part formulated with some reference to what was being established from the literature.

Research Group1: Staff*

8 members of academic staff, a sample of academics known to the researcher (though some not personally) taken from a variety of job roles, including lecturing, administration, senior management, libraries, research, student affairs, academic development and e-learning support. International universities are included: UK, USA, Australia & Canada (1 person) and China.

Research Group2: Staff*

a) Participants from the LinkedIn discussion group '*Higher Education Teaching and Learning*' who responded to questions posed for this research and took part of their own volition.

> See this link for the LinkedIn Discussion

b) Participants from the ResearchGate social network, and who responded to questions posed for this research and took part of their own volition.

> See this link for the Research Gate Discussion

Research Group 3: Students*

8 students, 7 undergraduate, 1 postgraduate, from a sample of students known to the researcher, from a possible group of around 50, with a wide variety of subject disciplines: social sciences, computer science, politics, life sciences. Multinational (many with English as second language), including Italian, Bulgarian, Polish, Bangladeshi, English.

Further details of all groups are available to evidence that real people took part. These are recorded in the Participants page in the Appendices. This page is password protected for privacy purposes. Please contact me for further information.

Questionnaires

For Research Group 1 (staff), a technique of using multiple short questionnaires with quick-fire questions based on a theme was used. This allowed for groups of answers to generate analytics and metrics separately, and also to focus the mind of the respondent clearly. It also is a successful way of not requiring a lot of time from the respondent, they know it won't take more than a few minutes each time they complete a set of questions. Questionnaires were based in part on iterative theme development from literature and previous questionnaire responses as well as themes discussed with the student group (RG3).

Six sets of questions were developed, all following themes to do with use of technology from the point of view of a single user. This was referred to as developing the 'Technology Profiles' of the individuals taking part. (Please refer to Technology Profiles Questions.)

Questionnaires were delivered to respondents in groups of 2, that is, Sets 1 and 2, Sets 3 and 4, Sets 5 and 6. This avoids respondent 'fatigue', a syndrome which can adversely affect more detailed or prolonged questioning of participants in many circumstances.

Social Media

Social media was chosen as a suitable medium to garner informal feedback from the student group, (RG3), and also to obtain first hand responses from staff unknown to the researcher, in an immediate and useful way (RG2). Overall it proved extremely successful, especially the **LinkedIn** group. Though the disadvantage of this was that participants were self selecting, and so do not represent any sample (even a random one), it proved that not only 'fans' of Technology Enhanced Learning took part, indeed, several respondents were sceptical about technology and any benefits they could see deriving from it.

A **Facebook** 'secret' (Facebook terminology for a private, unseen to the public group) group was used to discuss all sorts of aspects of the topic with students. Students came and went during the discussions, so every student did not consistently give comments on every question. Two or three students became the core respondents in this group, and interestingly, sometimes held very different points of view (though they were not actively discussing with each other, more responding individually to my questions and probing).

Approach to data analysis

The work has been undertaken as interpretivist research from a critical realist perspective, where systems and organisations represent the reality which is a constant, but that this reality has multiple perceptions (Krauss 2005). These perceptions are what is of most interest to this research. Thinking about the Real, the Actual and the Empirical (Baskhar, 1978), this research has interpreted the Real as being the policies, systems and organisational aspects of IT and e-learning, the events and behaviours (the Actual) as the provision of support, chosen pedagogies and learning and teaching practices, and the Empirical being the staff and student experiences (and perceptions of those), and the measurement and interpretation of those experiences from the raw data.

The Problems and Benefits Hierarchy used five ranking factors (real, imagined, intermittent, persistent, legacy) which were formulated by the researcher prior to any primary data or literature review findings. The researcher, on having some knowledge and experience of the field of TEL, has brought this experience to bear in formulating these five rankings, in an attempt to structure a 'weighting of importance'. The analysis used contextual and response categories derived from the literature review, and from the primary data gathered from RG1, RG2 and RG3 to interpret data into these rankings. Strata of context involved up to three stages of context categorisation.

The research, both through the literature review and RG primary data, was in some part to establish whether this hypothetical set of rankings was indeed an accurate or useful way of weighting the importance of themes. So, the five PBH rankings were not devised directly from literature findings, but rather were used to develop the overall structure of importance or significance from an interpretivist standpoint. By then placing each theme from the literature, based on initial overall context impression, as either a 'problem' or a 'benefit', a first categorisation was made. Developing a second scale of '*contextual categories*' for a fuller literature

theme context measurement it was possible to place them into the Problems and Benefits Hierarchy (PBH) in terms of the real, imagined, intermittent, persistent, legacy ranking factors (see Table 3, Findings). The use of simple '*response categorisation*' derived from RG 2 and RG3 responses, was then further categorised into the existing '*contextual categories*' and used to add to the literature theme contextual category rankings. Both these sets of categories (contextual and response) were developed from interpreting primary data and literature findings.

Grounded theory and critical realism were investigated through the work of Oliver (2012), whose 'Critical Realist Grounded Theory: A New Approach for Social Work Research' offers valuable commentary on the combining of the paradigm and the methodology, which seems relevant to this project. "Constructivists have used grounded theory to make explicit the assumptions and unspoken knowledge of participants, elicit their meaning-making rather than make claims about an objective reality and develop contextualised theory for practical application", and "(a) critical realist grounded theory would draw inspiration from the hermeneutical (text interpretation) bent and fluidity of the constructivist approach" with "(c)ritical realist grounded theory would address both the event itself and the meanings made of it" (p378).

Response data from Research Group 1 was used to challenge or confirm the core placing of 'problem' or 'benefit' for each of the top six themes. Additional value and understanding was also derived from knowing individual technology profile characteristics of respondents in Research Group 1. A 'Rogers Diffusion of Innovations (RDI) Indicator' was assigned to each respondent, and this would ideally have been matched to theme PBH contextual rankings to build further evidence for their placement interpretation in the PBH. In this study there is not enough data to achieve this effectively, however, respondent RDI is used to create a glimpse of the technical characteristics of stakeholders in university professions as all key finding responses have been coded.

The evidence was analysed in this order, to build some system of triangulation, though this is not strictly proving results, merely building possible interpretation of results. See the diagram for *data analysis architecture* below for an overview.

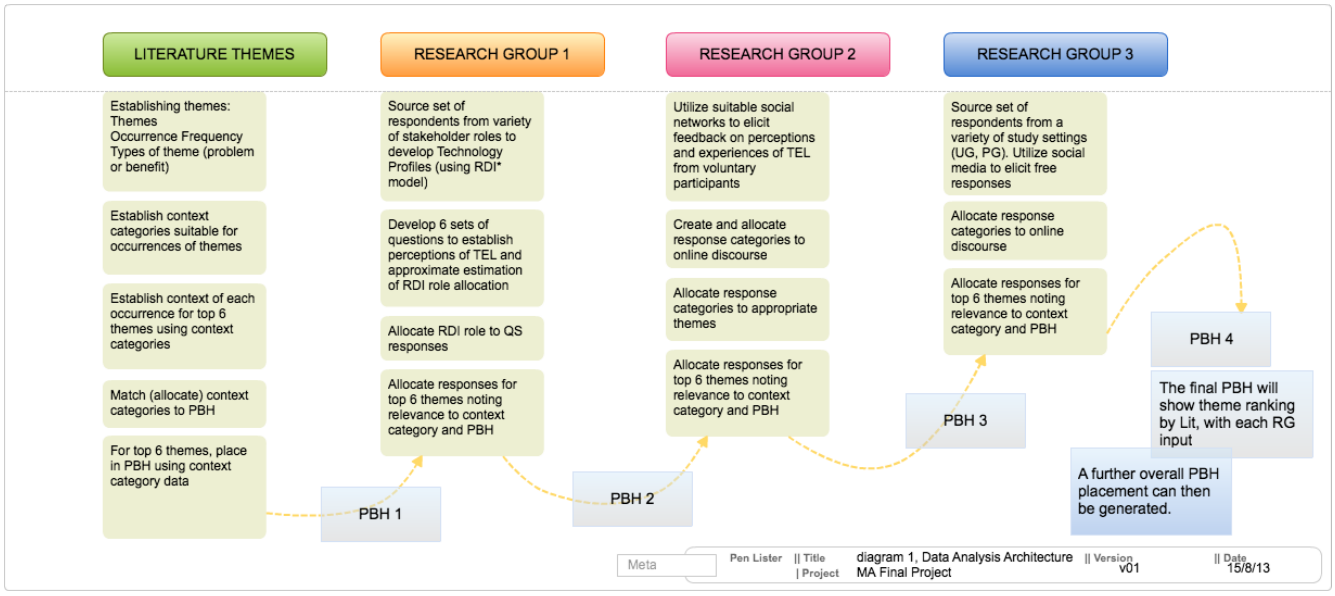

Fig 1: showing Data Analysis Architecture

To minimise interpretive scaling, categorisation was largely done by looking for simple keywords in text to match criteria. For initial problem or benefit placing, an indication of general tone of text or commentary. In contextual categories, a reference to the past, an assumption, a reference to research, an expert experience, a conjecture about data which was not evidenced, as well as the strength or weakness of each context. For response categories this was a similar technique, but matched to that data, and simpler.

Whilst it is acknowledged that the ‘interpreting’ of contextual categorisation which was applied to themes to create the initial PBH from the literature and beyond was not as robust as would be ideal in a larger study, it was an attempt to make a start on such a system.

Rationale for research focus

The advent of new and innovative technologies in the past decade has had enormous implications for higher education (Altbach et al, 2009), with significant increases in distance and blended learning provision (Cavanagh, 2013). Web-enabled networked technologies and systems (have) an impact on post-compulsory education's core objective of teaching and learning (Boys & Ford, 2008), giving the student 'more flexibility to focus on areas they have difficulty with […] and to take learning when and where it is most convenient'. The university is still investigating how to provide what the new student customer wants (Boys & Ford 2008), and at the same time not to compromise what the university has always stood for in the past (Lynch, 2008). Many staff may continue to feel alienated by the pressure to adapt to new ways of teaching (Zellweger Moser, 2007), and consequently do not engage with the drive to become technologically literate. Some e-learning practice may not always result in enhanced learning experiences, as 'the actual effects of new technologies in recent decades have not always measured up to the 'sweeping expectations' that have characterised their arrival on the scene' (Guri-Rosenblit, 2009, in Altbach et al, 2009). This all contributes to a murky and unclear picture of how universities are managing to progress into the digital age.

Drawing on technology adoption models, interpretivist critical realism (looking at grounded theory critical realism through Oliver, 2012) as a paradigm, and using 'Integrative Logic' (Mason, 2006), this research seeks to contribute to this dialogue, and has attempted to find some way of prioritising a hierarchy of influencing factors, which may in turn help to formulate policy and professional development for learning and teaching practice. A literature review and a pilot study involving key stakeholders (students and staff) were carried out, the pilot study to provide raw data to contrast with literature review findings. In order to construct meaningful data, an analysis approach consisting of the compilation, correlation and categorisation of themes and sub-themes, recognised for frequency, significance and level of problem or benefit was used. These were then allocated a score in five contextual rankings forming a proposed new hierarchical system, the Problems and Benefits Hierarchy, these rankings were proposed to be Real, Imagined, Intermittent, Persistent and Legacy.

(NB this section has been added after the assessment process at the request of assessors, in order to make more clear to online readers the research rationale of the project. The section is a copy of that included in the submitted 'Critical Commentary', which is available in full from the Downloads page.)

Areas of Investigation

The project will attempt to establish promoting and hindering factors on the uptake of technology enhanced learning in higher education, and note any relevance to metropolitan universities in particular.

A proposed Problems and Benefits Hierarchy will be used to analyse the most common themes appearing from a literature review concerning technology amongst academics, and technology enhanced learning which predominantly uses online technologies, noting themes and whether they are problems, benefits, or both. Along with this core placing a system of context factors will be used: real, imagined, intermittent, persistent and legacy, to attempt to place themes into the hierarchy effectively.

Stakeholder research (for primary data) will be developed from themes in the literature, to contrast with the initial literature findings, and to see any differences between staff and students in relation to how they perceive problems and benefits of TEL, and what might be more important to them in connection with those. The project will be limited to a top level analysis of most common themes.

The diagram below is a visual interpretation of topic areas and how they might relate to each other within

research groups 1 and 2 (staff), with an overview evaluation with research group 3, the students.

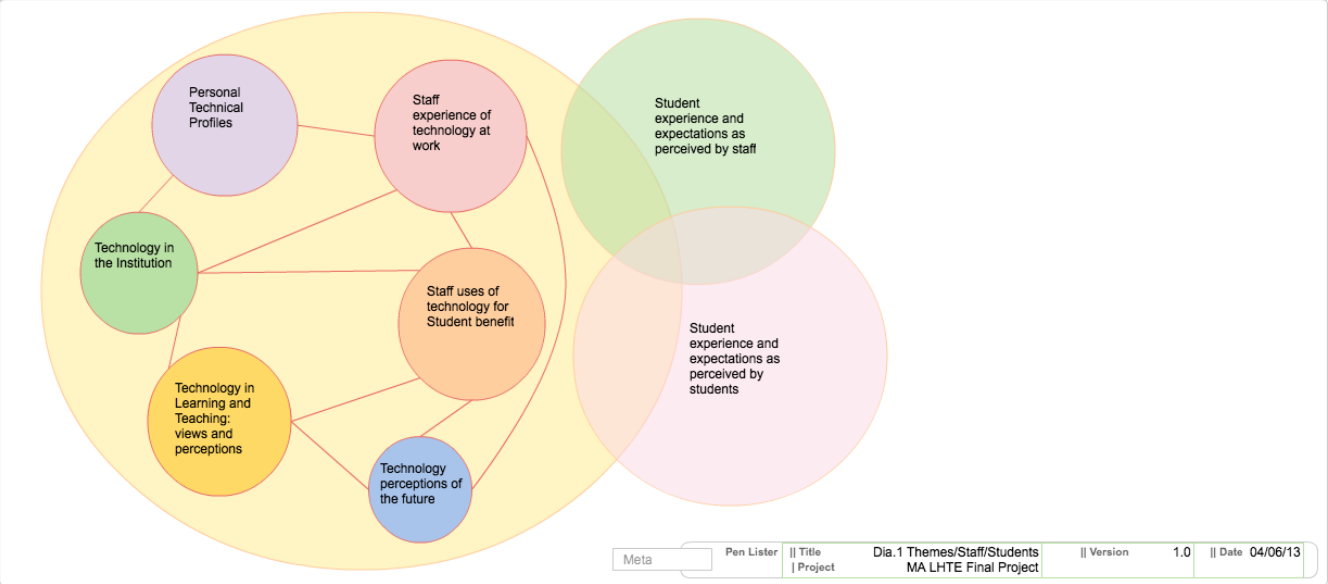

Fig 1. showing Theme Relationship Areas

Further Details

For further details of respondent groups and more on how the project worked, please also refer to The Aims, Focus and Methods page.

Information for those taking part in the research:

Issues

Researcher bias

I will seek to ask questions in a fair and objective way, and though I am a web technologies professional, do not have any strongly held views on the uptake of technology in teaching scenarios. I do not have any expectations of the results and findings of this research.

Stakeholder bias

It is always possible that each stakeholder answers questions with some individual bias, and as no obvious 'control' group is taking part, I am seeking to even out bias by selecting a group of respondents from a variety of academic working roles.

Consent and Privacy

Primary Research

Please note that names, emails, current place of work and job titles will be recorded, in order to evidence that responses are true and accurate, and to make relevant reference to your own situation or geographical location.

All responses are separated from names and emails, to ensure full confidentiality. I will state this at the end of each set of questions, for you to click an 'accept' button, before you submit your responses. Naturally, ***you can withdraw at any time during the research, and are under no obligation to complete all the question sets***.

If it becomes relevant to associate a particular response with the source individual, I will contact you for permission.

The research is purely for academic purposes, to shed more light on the increasing significance that technology has on our work and personal lives in the context of higher education, and how that might impact further adoption of technology in teaching scenarios and university life in general.

Research Ethics and Consent Links

- http://data-archive.ac.uk/create-manage/consent-ethics/consent
- http://www.bera.ac.uk/system/files/3/BERA-Ethical-Guidelines-2011.pdf
- http://www.bloomsburyacademic.com/view/What-Are-Qualitative-Research-Ethics/chapter-ba-9781849666558-chapter-004.xml?print
- http://www.londonmet.ac.uk/research/the-research-and-postgraduate-office/staff/research-ethics.cfm

Lit Review Summary

The literature review looked at a selection of papers and journal extracts, with the Internet in Higher Education being of significance in offering the most suitable research. Extracts from substantial texts sourced from JISC, Unesco or others were also reviewed. Criteria for selection was the year published, with nothing older than 2007 (by reason of the exponential growth in use of technology since then, see Aims, Focus and Methods for more), as well as an orientation towards research around use of internet and web 2.0 applications, or social media, as these were perceived as most relevant to gaining an overall picture of the future digital landscape for any university. Other learning technology studies, for example use of interactive whiteboards, second life or uses of learning management systems were not included as these were perceived as largely web 1.0 or increasingly less popular technologies (this is evident in the number of papers available, as well as some content of papers reviewed).

Themes most commonly found in the literature were often of relevance to metropolitan universities by virtue of the nature of the student body present in a metropolitan university, i.e. being diverse, with numerous other commitments and requirements. There were 16 most common themes, these were then divided into Strategy types and Learning and Teaching types, with Assumptions summarised to conclude. The top 6 themes were then analysed (compared and contrasted) further using primary data established from the other sections of this research.

The Sixteen themes:

- INSTITUTION SUPPORT
- SOCIETAL CHANGES
- ICT SUPPORT (Provision)
- ELEARNING SUPPORT (Provision)
- SKILLS AND TRAINING (All aspects, Students & Staff)
- COST (All aspects)
- DEPENDENCIES (Infrastructure & Systems)
- COMPLIANCE
- DIGITAL DIVIDE (Inc Device Divides)
- PEDAGOGY / LEARNING DESIGN
- STUDENT CENTRED LEARNING
- LEARNING QUALITY
- CONVENIENCE / WORK LIFE BALANCE
- SHARED RESOURCES (All aspects)
- ACCREDITATION
- ASSUMPTIONS (idealism)

Top themes:

- INSTITUTION SUPPORT
- SOCIETAL CHANGES
- PEDAGOGY / LEARNING DESIGN
- STUDENT CENTRED LEARNING
- LEARNING QUALITY
- CONVENIENCE / WORK LIFE BALANCE

Literature Review

While there has been an apparent and continuing explosion in technological advances in all areas of life (Manyika et al, 2013), it may be that this is not fully or even significantly reflected in university culture and practices (Brown, 2012). A wealth of research exists, emanating from the UK and beyond, in Europe, Australia and the USA, with significant amounts of time and other resources being invested into this field, and published both in educational as well as computer science journals. The research, while having an overarching field in common, is fragmented, and often outstripped by the pace of advances in technology itself – "extracting meaningful research findings…has been hampered by the speed of innovation, which often renders study results obsolete as new technologies replace old ones" (Altbach et al, 2009, p136). The approach to the literature review is to ascertain the landscape and territory in relation to use and uptake of technology in university learning and teaching, both formal and informal, by attempting to establish themes which commonly appear. Of particular interest is the focus in relation to metropolitan universities. Themes will be noted, collated and analysed for popularity and significance as influencers. **This forms part of the research as a whole.**

The literature review takes the form of discussion of the themes that most commonly appear. There were 16 main themes noted, these have been loosely grouped into two sections – ***'Strategic'*** *and* ***'Learning and Teaching'****, with Assumptions summarised to close. Overlap between themes often occurs, but overall this grouping attempts to connect some of the territory, which otherwise is often overwhelming and unwieldy, and difficult to establish any logic or clarity. Please also refer to the* ***Literature Analysis****, which includes tables and diagrams appropriate to illustrate points made in this text, with relevant links. Below is a quicklinks list to aid navigation between sections.*

QuickLinks

Page 1

Strategic

1. SOCIETAL CHANGES *(Policy, Requirements)*
2. INSTITUTION SUPPORT
3. ICT SUPPORT & TRAINING
4. ELEARNING SUPPORT & TRAINING
5. MOTIVATION AND SKILLS *(The Individuals Perspective and Implications)*

Page 2

6. ACCREDITATION
7. COMPLIANCE *(Accessibility, IPR, Institutional Quality Assurance etc)*
8. DEPENDENCIES *(infrastructure and Systems)*
9. DIGITAL DIVIDES
10. COST*(Implementation)*

Page 3

Learning & Teaching

11. PEDAGOGY / LEARNING DESIGN

12. STUDENT CENTRED LEARNING
13. TEACHING & LEARNING QUALITY
14. SHARED RESOURCES *(Institution/policy Implications/T&L)*
15. CONVENIENCE (FLEXIBILITY) / WORK LIFE BALANCE

Assumptions summary

16. ASSUMPTIONS

Strategic

1. Societal Changes

(National or Regional Policy and Requirements, demographic behaviour changes)

The rapidly changing society, both in terms of the nature of the new knowledge economy with all that entails (Tate & Klein-Collins, 2012, and Levine, 2000 in Boys & Ford, 2008), as well as the new levels of institutional accountability for each student they are charged to educate (Oblinger, 2013), demand changes in practice and policy (Boys & Ford, 2008). Many of these changes involve uses of technology that if not always directly involving learning and teaching, do always impact learning and teaching (Guri-Rosenblit, in Altbach et al, 2009). What could be termed 'indirect driving and restraining forces' may ultimately have the greatest bearing on the uptake and uses of technology within learning and teaching settings. Institutional forces such as those of cost saving or cutting measures like staff reduction and resources 'consolidation', institutional 'negative equity', increased sector competition and fluctuating legal or national policy requirements all impact approaches to teaching practice and the importance of learning outcomes, perhaps most especially in the context of the metropolitan university. Technological 'disruption' and advancement, as aspects of the continual process of the digitisation of society, also contribute to the changing expectations of the university in relation to its place in that society. The territory is therefore complex, creating a 'Tower of Babel syndrome' (Guri-Rosenblit, 2009).

Diane Oblinger, in her Game Changers chapter 'IT as a Game Changer', discusses significant changes in society in relation to technology advancement affordances that in themselves may become (or already are) strong drivers towards utilisation of technology at all levels of the learning and teaching process. For example convenience of access, the 'catalytic role in collaboration', shared infrastructure and Open Learning. The 'tools that students use in their daily lives' are absent from the classroom (Kukulska-Hulme, 2012). Kukulska-Hulme discusses at length the changes in public perceptions and expectations in relation to 'accessing and acquiring knowledge' as a result of technology advances, and the consequent changes required in staff and higher education institutions in order to respond by providing more in the way of all modes of elearning, as well as continuous development of institutional ICT 'capacity', and individual staff ICT skills. The notion that 'external conditions' are significantly impacting on learning and teaching, perhaps with user generated content and online social environments especially relevant.

Brown (2012) puts it like this: "much of the literature in the field sees the effective integration of Web 2.0 in HE as prompting or requiring a paradigmatic shift *(Franklin & Van Harmelen 2007)*. This shift has been

characterized using the ‘perfect storm’ metaphor *(Brown & Adler 2008)*, the integrally linked phenomena of emerging technology, societal change (stemming from and feeding into the emergence of Web 2.0), the coming-of-age of the digital generation, and the pedagogical changes that will help people build the knowledge and skills to effectively ‘ride the wave’ of those changes.”

2. Institution Support

The infrastructure, approach and strategic ‘mission’ of an institution is of great relevance to its ability to embrace a digitally scalable and achievable policy and practice in its work. Only by doing this will teaching and learning practice ‘on the ground’ have a strong enough support to be adopted more universally by staff across all disciplines and faculties (Newton & Taylor, 2013). Thinking about Rogers Innovation Diffusion theory, we know that the ‘late majority’ and the ‘laggards’ will not take on new practice until all their needs for *trust* and *proof* are met, and institutional level requirements and support are perhaps the only thing that will achieve this.

Clifford Lynch in ‘A Matter of Mission: Information Technology and the Future of Higher Education’ (‘The Tower and The Cloud’, Katz, ed, 2008), writes on the duties of scholarship, namely the custodianship and dissemination of knowledge (scholarship) set in the wider remit to disseminate that knowledge on a global scale, in order to attempt to meet the ever growing (and currently unmet) demands for access to higher education. The mission of an institution, while perhaps being global, is first being ‘local’, yet may still mean that to effectively ‘disseminate’ that knowledge, they need to offer a much more flexible and diverse course structure to their local populations (Cavanagh in ‘The Postmodality Era: How “Online Learning” Is Becoming “Learning”, Game Changers, 2013).

2.1 Strategic Policy

A variety of papers and texts make commentary on the importance of ‘top down’ and ‘bottom up’ influencing factors in relation to uptake of technology in learning and teaching. The UCISA Technology Enhanced Learning Survey (TELS) from 2012 rank ‘Central University Senior management support’ and ‘School/Departmental Senior Management support’ at 2 and 3 in the top 5 important influencing factors (after ‘Availability of TEL Support staff’ at number 1) in ‘encouraging the development of TEL and processes that promote it’. It is not clear, however, what form this support should take, but TELS do go on to ask questions about strategy and policy documents (internal and external), and their perceived effectiveness in promoting technology enhanced learning. However, the drawback of surveys such as the TELS is that no indication is made as to what ‘effectiveness’ actually means, so the usefulness of statistics such as this in practical terms remains questionable.

Understanding “the intractable problem of getting faculty to take seriously their own professional development with regard to new technologies for teaching and learning” (Kukulska-Hulme, 2012) might be in some way explained by “…(the) resistance is (also) associated with academics driving institutional policies who may ‘adopt pedagogies that actually structure, constrain and contain the somewhat anarchic and more radical potential of *(Web 2.0)* technologies’ (Ravenscroft 2009, p.2). *(Institutions)* tend to opt for closed-platform Web 1.0 type technologies conducive to teacher-driven pedagogical approaches and not to pedagogies based on student contributions, and the networked and collective learning possibilities of Web 2.0″ (Susan Brown,

2012). Brown also found evidence of top down and bottom up influencing factors both being required: “(t)here needs to be a bottom-up and top-down convergence of ideas among academics on the ground and those forging Teaching, Learning and Assessment strategies particularly in relation to aims”, recognising “the fact that no academic context is hermetically sealed”.

2.2 Faculty Adoption

Themes surrounding factors at play which influence faculty adoption appear frequently in many academic studies. This theme, whilst significantly concerned with learning and teaching also fundamentally operates at a more strategic level. Without institutional and senior faculty management level policy and strategic support, faculty wide change will likely not happen.

Franziska Zellweger Moser, in ‘Faculty Adoption of Educational Technology’ (2007), reports the need for faculty ‘buy in’ as essential in order that curriculum design and learning and teaching practices change. She demonstrates a ‘Faculty Educational Technology Adoption Cycle’, and states: “faculty support has been identified as a critical factor in the success of educational technology programs, *(but)* many people involved in such efforts underestimate the complexities of integrating technology into teaching.” Intrinsic and extrinsic forces however, bring to bear a variety of pressures in any tutor, to achieve changes in teaching practice. Zellweger Moser talks about Early Adopters (Rogers 1995, 2003) and the importance of professional support being offered early in the cycle of technology adoption. If (faculty) professional support is offered too late in the cycle, this can result in mediocre quality of efforts, and can in turn create negative experiences which are passed on to other staff (Early Majority), resulting in lower rates of adoption further down (Late Majority, Laggards). Creating a cycle of positive and high quality experience is therefore very important to successful adoption.

Newton & Taylor (2013), talk about the importance of a “shared vision and energy that touches all parts of the organisation”, and the need for staff to be given the time to ‘upskill’ and to integrate their work with technology and curriculum (re)design support, “…institutional recognition, if this is the way the university wants to move, that all staff at some point will be freed up so that they can devote time and energy into developing the new skills…” There is also a need to create parity across an institution so that expectations are clear and aligned for all staff, therefore a requirement for change management in transition to digital learning and teaching.

That “higher education institutions are currently challenged to look for innovative ways to develop their faculty, particularly in light of new economic realities that put pressure on resources” remains a problem across the sector, and “…it has been instructive over the years to reflect on how we can engage faculty in critical assessment and adoption of new technology if they perceive that it will bring them no personal benefit or that they have no time” (Kukulska-Hulme, 2012). Though “the needs of students may be perceived as relatively remote from the needs of faculty”, perhaps the increasing need for more convenient and flexible learning provision (Oblinger, 2013, ch3) will help to drive change forward.

3. ICT Support and Training Provision

Technical support and Elearning Support provision, in both training and perhaps ‘helpdesk’ formats are very significant influencers, and their presence or absence form key driving or restraining forces in uptake of

technology in learning and teaching. How much of this is down to perception rather than reality remains unknown, as much of the information surrounding this is anecdotal or dependent on an individual's interpretation of support and training. For example, several questions were posed by TELS (2012) which list relevant 'support' type responses as choices in Likert scales. But it is not clear who is responding, what their knowledge and expertise is, or how they might interpret notions of support and training (i.e. to what level, in what, when, how etc).

Kukulska-Hulme (2012) cites the importance of faculty support by stating that in order to achieve teaching delivery change, one must instigate adequate professional development fully supported by faculty using collaborative teams, work based learning, show and tell and 'reverse mentoring' (the student is the teacher). However, she acknowledges the problems of instigating complex and costly professional development programmes, especially for "a public institution with limited funds […] to find cost-effective yet engaging solutions to the intractable problem of getting faculty to take seriously their own professional development with regard to new technologies for teaching and learning".

Zellweger Moser tries to address this issue, stressing the importance of support "particularly in competence development and educational technology course design" (.i.e pedagogical support, see later), and "the development of adequate expectations about faculty requirements and how much effort and competence are necessary to successfully incorporate educational technology […] This includes .. the development of a sufficient educational technology infrastructure and a satisfactory framework for educational technology support". This indicates that Faculty adoption goes hand in hand with support and training. Taylor & Newton (2013) challenge the traditional approach of 'support hand holding', saying "…current practices which position one-to-one assistance and face-to-face training as principal strategies are no longer sustainable or effective in building university wide capability in the use of technologies for teaching", and instead suggest "…access to professional learning opportunities (is) provided flexibly, in different modes, making use of current technologies and recognising constraints of time and place…".

4. Elearning Support and Training Provision

Kukulska-Hulme makes a strong case for the importance of pedagogical and course design support and training to work closely with technology support, making a clear distinction between the two. Quoting Friel et al (2009), who "give evidence for the effectiveness of a "collaborative training team" approach whereby technology training is placed into a pedagogical context by means of pedagogical dialogue to complement technology skill attainment; their approach also involved IT representatives providing one-on-one faculty support between training sessions to allow for development of personal technology skills among faculty, and a hotline for immediate problem solving". This is the ideal then, but both costly and time consuming. Zellweger Moser comments that "time commitment is the prerequisite for an involvement in competence development and an engagement in course (re-)design activities". Zellweger Moser gives helpful evidence too, on the difference between IT support and (pedagogical) course design support, as well as funding issues when discussing funding sources for smaller and larger course (re) design projects. So, we see provision for support (IT and pedagogical) is closely aligned to faculty adoption and central mission strategy.

5. Motivation, Skills and Training

(The individual perspective, staff and student)

Staff motivation is widely *perceived* as one of the most significant driving or restraining forces for technology uptake in learning and teaching. Motivation can be a completely subjective force, dependent on sometimes false perceptions and assumptions as well as on more formal factors such as faculty support and professional feedback. Zellweger Moser (2007) uses Roger's system of Innovation Adoption to outline this, and in one paragraph sums it up, "…if early adopters experience too many setbacks, their negative reporting may lead to skepticism among the early majority, who will be tentative in their adoption of technology. These conditions discourage quality course design, and negative experiences are likely… As a result of this process, early adopters and the early majority will abandon use of technology, and the late majority and laggards will not even start adopting it". The idea that some noticeable *individual* advantage must be attained through the utilisation of a technology is also common – see Mclean et al (2008) in Kukulska-Hulme (2012), Taylor and Newton (2012), who 'express a typical perspective on this issue: "… academic staff will perceive little need to participate and will spend their time where they derive most personal benefit"'. For example, if extra work or time or effort is involved, then the 'what's in it for me' level is considerably diminished, to potentially make the use of the technology redundant, but conversely, if time and effort are saved (e.g. automated marking, plagiarism detection, ease of use etc), then use of technology will be embraced. Only innovators and some early adopters (Rogers, 1995, 2003) will put in time and effort to experiment with new technology regardless of cost or advantage to themselves.

Susan Browns paper, 'Seeing Web 2.0 in context: A study of academic perceptions' (2012), is notable here for the reported low rate of response to participate in that study. Of the 97 academics who responded to her questionnaire (out of an approximate total of 4250 across the University), 74 responses were analysed, the rest having given insufficient data for analysis. This, in itself, might be an indicator of motivation in relation to issues surrounding technology. Notwithstanding the low response rate, the study goes on to reveal some interesting feedback on perceptions and uses of Web 2.0, especially from the qualitative data gathered.

Student digital skills are sometimes overestimated, so while staff need consistent professional development to up-skill and reconstruct practice, students too may need support and even training. "In terms of technology use, … there were students who reported that they were 'alienated', and 'overwhelmed', and that they 'struggled' and 'felt lost' by the technology. It was clear that students' abilities … in a technology enabled environment were sometimes overestimated, as some students reported difficulty navigating the approaches and technologies presented", (Taylor & Newton (2013). Conversely, Kukulska-Hulme (2012) suggests 'reverse mentoring', i.e. students mentoring staff in skills and uses of technology, as part of faculty professional development initiatives.

Findings Summary

Focus in the findings is confined to the top six themes, and their significance to future uptake, support and training of TEL. These may also be most relevant to cash strapped metropolitan universities with large diverse student bodies. The findings have been divided into the following sections:

- The Literature Data, with themes established from the review, including how they were established, with any statistics relevant and links to tables or graphs in the Literature Data Analysis pages.
- The Research Group Data *confining analysis to the top six themes*:
  - Results and findings from the Research Group 1
  - Results and findings from the Research Group 2
  - Results and findings from the Research Group 3
- Final results for the top six themes in the Problems and Benefits Hierarchy

Please use the links above to navigate to each section for further detail and information. Alternatively, download the Findings PDF from the Downloads page, for reading offline.

Top 6 Themes

Of the sixteen themes most often occurring in the literature, the top six most frequently appearing themes were:

- *Institutional Support*
- *Societal Changes*
- *Pedagogy and Learning Design*
- *Student Centred Learning*
- *Learning Quality*
- *Convenience/Work Life Balance*

Research Group Findings brief summary

The Rogers Diffusion of Innovations Indicator for RG1 respondents were:

- *1 Innovator*
- *2 Early adopters*
- *4 Early majority*
- *1 Late majority*

Key factors highlighted by RG1 question set responses were *willingness and desire to work from home, desire for use of own devices and software, positive attitudes to technology advantages for learning quality and experiences, need for allocated time to redesign courses.*

The most common themes talked about in RG2 were *effectiveness measurement and top-down/bottom up driving factors.*

The most common themes talked about by RG3 were *lack of skills in teaching staff, and perceived lack of significance of technology in learning experience advantage.*

Final Problems and Benefits Hierarchy for top 6 themes

The final PBH was iteration 4, using aspects taken from all data sources. More research would need to be done to establish more than an overview glimpse, indicated below:

- *Institutional Support*
  Problem: real, persistent
- *Societal Changes*
  Problem: real, persistent
- *Pedagogy and Learning Design*
  Problem and Benefit: real (strong), imagined (significant), persistent
- *Student Centred Learning*
  Problem and Benefit (with ambivalence): real, imagined (significant), persistent
- *Learning Quality*
  Benefit (with ambivalence): real (strong), imagined (significant), persistent
- *Convenience/Work Life Balance*
  Problem: real, persistent

Findings

Literature Data

Establishing Themes

The themes discovered from the literature were often clear and easy to establish, and many texts reiterated similar topics and concepts. Whilst some distinct ‘ambivalence’ existed in perspective or interpretation by some of the researchers in the texts, this was in itself a point of interest for this research, as shed light on theme context and placement into the PBH (Problems and Benefits Hierarchy).

Establishing themes to build a picture of thinking and practice around uptake of technology in learning and teaching has proved a fairly functional and informative way to approach creating a basis by which a variety of additional data sources can be placed via a series of further structured combinations for comparison analysis. This then allows an attempt to draw some tentative conclusions around problems and benefits of the increase in technology uptake for learning and teaching.

Using the literature review to establish the key themes by which all other categories and topics were then adapted and aligned gave a clear system by which to accommodate all data, avoiding too much duplication or overlap, though some is always present, particularly in some themes. This is in the nature of the territory, and is therefore acknowledged as a challenge to interpretation and analysis in this pilot study.

Themes were therefore established, and a frequency table was drawn up by allocating a simple code to each text, noting mentions of any theme accordingly. This established the frequency of each theme occurrence across all literature in the review. An occurrence was regarded as some aspect of the text or paper being aligned or directly involved with the theme or themes.

In total, sixteen themes were established:

1. INSTITUTION SUPPORT
2. SOCIETAL CHANGES
3. ICT SUPPORT (Provision)
4. ELEARNING SUPPORT (Provision)
5. SKILLS AND TRAINING (All aspects, Students & Staff)
6. COST (All aspects)
7. DEPENDENCIES (Infrastructure & Systems)
8. COMPLIANCE
9. DIGITAL DIVIDE (Inc Device Divides)
10. PEDAGOGY / LEARNING DESIGN
11. STUDENT CENTRED LEARNING
12. LEARNING QUALITY
13. CONVENIENCE / WORK LIFE BALANCE
14. SHARED RESOURCES (All aspects)
15. ACCREDITATION
16. ASSUMPTIONS (idealism)

- > Click this link for Theme table with literature code allocation and frequency totals
- > Click this link for Theme Frequency totals piechart

Of the sixteen themes most often occurring in the literature, the top six most frequently appearing were Institutional Support, Societal Changes, Pedagogy/Learning Design, Student Centred Learning, Learning Quality and Convenience/WorkLife Balance.

Theme in Literature	*Number of occurrences*	*Percentage of occurrences*
INSTITUTIONAL SUPPORT	9 occurrences	8%
SOCIETAL CHANGES	12 occurrences	10.6%
PEDAGOGY / LEARNING DESIGN	13 occurrences	11.5%
STUDENT CENTRED LEARNING	12 occurrences	10.6%
LEARNING QUALITY	13 occurrences	11.5%
CONVENIENCE / WORK LIFE BALANCE	9 occurrences	8%

Table 1 showing frequency of top six literature themes

Themes were divided into problems, benefits, according to information from the literature review (predominantly being seen as either causing problems or benefits). Most themes were either one or the other, but a minority of themes were both problems *and* benefits. The placing of the theme as either a problem or a benefit was significant as would be further interpreted by data derived from the stakeholder research groups.

Theme in Literature	*Problem or Benefit (literature setting)*
INSTITUTIONAL SUPPORT	Problems
SOCIETAL CHANGES	Problems
PEDAGOGY / LEARNING DESIGN	Benefits
STUDENT CENTRED LEARNING	Problems and Benefits
LEARNING QUALITY	Problems and Benefits
CONVENIENCE / WORK LIFE BALANCE	Benefits

Table 2 showing problem or benefit setting of literature theme

These themes then indicated that a further level of analysis was required, that of *context*. By establishing not only the type and frequency but also the context of a theme's occurrence in the literature, one might be able to establish its place in the Problems and Benefits Hierarchy more accurately. The fact that the PBH required some level of interpretation as to 'real', 'imagined', 'intermittent', 'persistent' and 'legacy' led to a further set of contextual categories being developed in order to give informative setting to the PBH placing. These categories sought to shed further light on how a theme occurrence had appeared in terms of what had led to it's appearance. The contextual categories fell into four broad areas, with categories in each area. Aligning them with the PBH factors created a system of measurement of context. Categories could therefore estimate

levels of ‘realness’ or ‘persistence’, for example, by looking at theme context in this way.

An interpretivist approach was used to create the context categories, as once data is seen – in this case the content of the research papers – it becomes clearer how estimations of context of themes might be measured. It appeared from the literature that using the category terms listed here would most accurately capture the type of context being dealt with. Whilst not a robust set of terms, it may be that this is in itself a finding of the research, in that an explicit set of reliable terms can be applied for the interpretation of context of research data such as being analysed here.

These context categories were then assigned to theme occurrences for each source (though not individual ‘macro’ occurrences), using a simple scale of terms, in order to indicate their consequent PBH factor. See below for terms used and consequent PBH factor, and for table containing all occurrences with their contextual category allocations.

Contextual Scope	***Types of context in scope (examples)***	***Description***	***PBH Factor***
CONJECTURE, SPECULATION, ASSUMPTION	PA – Personal Assumption	*statement from a personal or individual standpoint with no evidence or expertise present*	[PBH:Imagined]
	DC – Data Conjecture	*statement being attributed to data which is not adequately evidenced*	
	HS – Hearsay	*statement attributed to ‘everyone’ or similar, which is only assumption*	
CONTEXT ASSOCIATION, STRENGTH AND FREQUENCY	IAL – Contextual interpretation/association low strength & frequency	*occurrence measurement of theme in research – low*	[PBH:Intermittent]
	IAH – Contextual interpretation/association high strength & frequency	*occurrence measurement of theme in research – high*	[PBH:Persistent]
EVIDENCE AND EXPERTISE	EK – Expert Knowledge	*statement made from deduction or logic using expert knowledge, but not directly connected to research evidence*	[PBH:Real]
	RE – Research Evidence	*statement made as a result of research evidence [PBH:Real]*	
SYSTEMS, CHANGE, THE PAST	P&C – Refers to the past or need for change	*statement about the past, or requirement for change in systems or central strategies, policies or provision*	[PBH:Legacy]

Table 3 showing key to terms for literature theme contextual categories and PBH allocation

- > Click this link for Contextual Category Allocation Table – *this shows how the sources were allocated contextual codes to place them into this system of ranking.*
- > Click this link for Contextual Categories to PBH for top 6 themes

Research Group Data

Through using a number of different groups of participants it was hoped that some kind of constructive comparisons might be made about perceptions and relative association or context between each subject group within the context of technology use in learning and teaching. Whilst sampling methods for this research project were minimal in their robustness (being non random or self selecting), there is still some attempt made to avoid bias by including a variety of types of participants, i.e. various job roles, or degree disciplines, so as to make some attempt at avoiding skewed results. It must be said however, that sample size as well as sampling techniques would need significant strengthening for any further research to be carried out to build on this pilot project.

Research Group 1 (RG1)

Technology Profiling

The fluency and familiarity of technology tools informs many aspects of decision making and utilisation possibilities in relation to technology uptake, therefore to attempt to establish why and what stakeholders may think and do in relation to their technology habits was at the heart of the research for Research Group 1. To then be able to align this with the Rogers Diffusion of Innovations adopter categories was desirable, as Rogers model has been used in a number of other studies in this field (Sahan, 2006). To add some measurement of technology skills and experience into this model seemed logical, and could lead to further understanding in this field in relation to uptake of technology enhanced learning and teaching.

Rogers categories can be summed up below with a frequently used abridged set of terms for the types of people found in each category. More in depth descriptions are contained within Rogers own work (1995, 2003), or those which this research used, in Sahan's 'Detailed Review of Rogers Diffusion of Innovations Theory and Educational Technologies Studies based on Rogers Theory' (2006).

1. Innovator: Venturesome
2. Early Adopters: Respectable
3. Early Majority: Deliberate
4. Late Majority: Skeptical
5. Laggards: Traditional

A scale of proficiencies and efficacies was developed from data gathered in the question sets, and then used to allocate a 'Rogers Diffusion of Innovations indicator'. Using their anonymised code name of R1, R2 etc, the profile of each participant was then placed into the Rogers scale of technology adopters, but with additional technical proficiency and efficacy awarenesses.

Our participants appear to be:

- 1 innovator (R1)
- 2 early adopters (R3 and R5)
- 4 early majority (R4, R6, R7, R8)
- 1 late majority (R2)

This was intended as an approximate indicator to add a technical aspect to the Rogers Adopter categories

model.

Table 4: showing the RDI indicator allocations

Please refer to page 4 of the RG1 data analysis appendix for more details.

Questionnaire Set Results for top six themes

Questions were divided into short sets of around 8 questions each, and each set devoted to a specific topic. This helped to focus the thoughts of the participant, limit the participation time required and made it easier for respondents to continue with the research knowing it was not too time consuming. Six question sets were used in total. These are the main findings, with key points indicated. *Please refer to the full questions sets, and the data analysis.*

The data has been analysed for the top six themes only (themes with most occurrences in the literature), taking into account the time and depth limitations of this research project. However, this demonstrates the principle of how this type of data can be used in relation to literature themes and other related research group data.

Main key findings of each theme were collated with the theme's perception as to it being a problem or a benefit. Overall they confirmed the placing of the theme, but there are some conflicts, and some challenging comparisons noticeable. **Refer to page 3 of Research Group 1 Data for a full set of findings for the top 6 themes.**

Theme in Literature	***Problem or Benefit*** ***(Literature setting)***	***Question Set Key Findings*** ***(Problem or Benefit)***
INSTITUTIONAL SUPPORT	Problems	Strongly perceived as posing problems
SOCIETAL CHANGES	Problems	Fairly perceived as posing problems
PEDAGOGY / LEARNING DESIGN	Benefits	Fairly perceived as offering benefits
STUDENT CENTRED LEARNING	Problems and Benefits	Fairly Ambivalent
LEARNING QUALITY	Problems and Benefits	Strongly ambivalent
CONVENIENCE / WORK LIFE BALANCE	Benefits	Fairly Ambivalent

Table 4 showing problem or benefit setting of literature theme, with comparison of overall placing from question set data

Research Group 2 (RG2)

The informal conversations (instigated by this project) which occurred through use of social media networks with an Academic group on LinkedIn and ResearchGate were both enlightening and worthwhile, demonstrating amply the abundance of thinking and opinion surrounding the topic. Though ResearchGate offered far less input, being a smaller and more specific network (therefore a smaller pool or participants to draw from), the HE LinkedIn group was a hive of activity for around 2 – 3 weeks, with nearly 40 comments made by experienced HE practitioners, both lecturers and support staff.

Results were categorised into most common themes mentioned and then assigned to the PBH hierarchy according to relevance. A table was created for the category to theme relationship, and then for theme to PBH allocation. Highlighted quotes of interest were used to generate suitable categories, then categorise and finally place into the research project themes.

The two most predominant response categories were '**Top down/bottom up**' and '**Effectiveness (teaching & learning)**'. Top down/bottom up was then matched with the 'Institutional Support' literature theme, and Effectiveness was matched with 'Learning Quality'. Within 'Top down/bottom up', the most common type of comment was quite negative, either with the respondent's current experience, presumptions about reception or provision, or seeing problems with those areas for others, not necessarily themselves. For 'Effectiveness', there appeared to be significant polarisation in perception or confidence in technology having a positive effect (more or improved learning), as well as about methods by which such things are measured. Two camps seem to exist, those who embrace, sometimes with little proven evidence beyond their own experience, and those who would doubt any effectiveness at all.

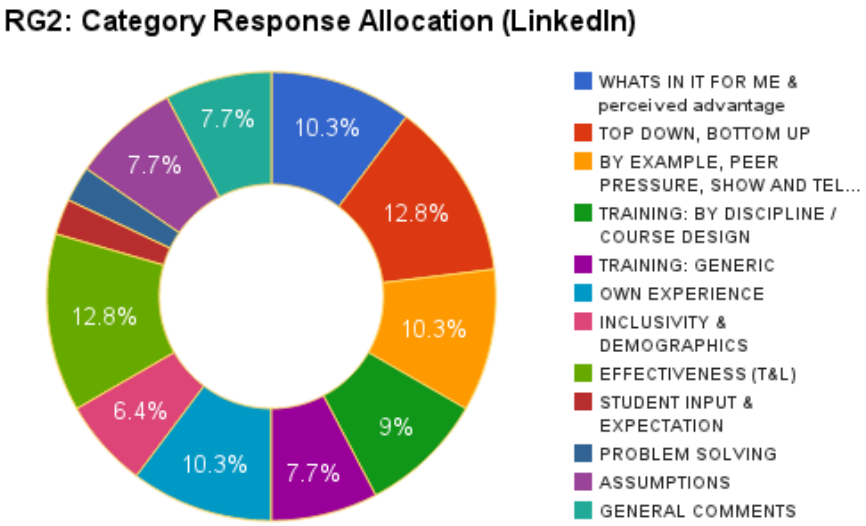

Fig 1: Showing percentage of responses per category, RG2 (LinkedIn)

The chart in Fig 1 shows the close resemblance to percentage of occurrences for themes in the literature. The

one area that differs is ‘staff motivation’, which may here be more evident in terms of self generated topics. In much research, the research is often dependent on questions instigated by the researcher. This demonstrates very well the additional value of using self generated feedback through social network channels.

Also see LinkedIn Category Response Allocation Table.

Research Group 3 (RG3)

Findings for Research group 3, the students, though limited in amount, were perhaps quite valuable as contrasting data to that gathered from staff. The amount of data tended to limit how much it might be analysed within the system, however, as anecdotal input, insight is increased.

Students are concerned about what they learn, and the potential of that learning to lead to greater knowledge. They are perhaps not so concerned with *how* they learn, though some consideration is given by them as to methods of assessment and communication, which was in itself quite enlightening. The other perhaps significant problem from a student perspective is the lack of technical skills of the lecturers, which came through quite strongly, even with the limited amount of data.

As the study process perhaps creates ‘a giver and receiver’ mentality, there was hesitancy in putting forward new ideas, and a sense of “you just get used to the way things are” (student quote), but there was also knowledge of the increased competitiveness of the university experience, as seen in another of the quotes.

Some quote highlights, which provide insight into TEL influencing factors from the student perspective were as follows:

- *I’d like to see teaching move towards interactive technology, such as electronic whiteboards and the like. Granted the use of technology requires a great deal of investment, not just in equipment but in training and support, but at the end of the day it’s a necessity in order to compete with other providers.*
- *There’s always the stereotypical generation gap when it comes to the use of technology and I know not everyone is keen on advancements, but at the end of the day people need to realise that we’re not using chalkboards and abacuses anymore.*
- *There are facilities in Blackboard that are not utilised (course areas, for example) which could benefit feedback and interaction with students as a whole. As it stands we are not really encouraged to communicate by any means.*
- *We tried blogging for a piece of coursework and it didn’t work well as the other students just weren’t interested in participating.*
- *Quite frequently we have to shout out advice on how to open a link or something.*
- *More often than not they seem to know less as they struggle when they can’t set lecture slides up.*
- *It doesn’t matter if they are competent with technology or whatever as long they are able to keep their field alive inspiring their students to either follow the same path…*
- *There should be more opportunity for students to be technologically creative with their assignments across all faculties – I’m not sure why there is such a focus on essays which develop little in the way of communication and ICT skills (both of which are valuable in the workplace).*

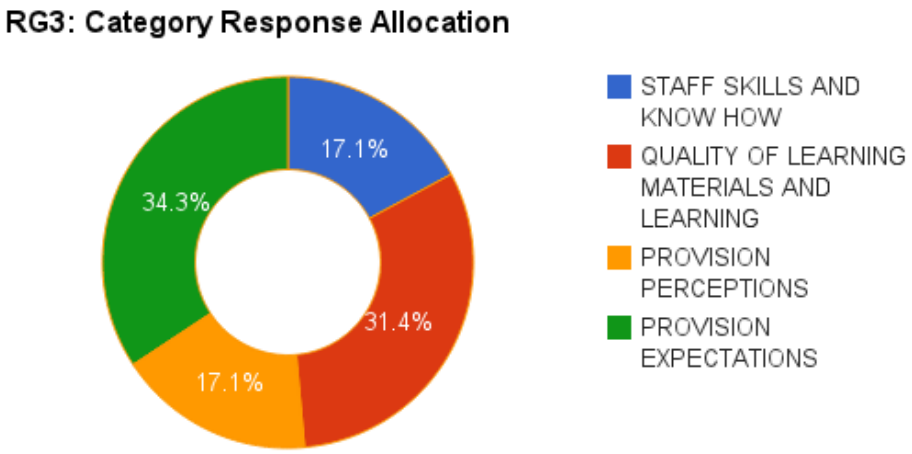

Fig 2: Showing percentage of responses per category, RG3

Problems and Benefits Hierarchy v1

Problems and Benefits Hierarchy v1

The first Problems and Benefits Hierarchy was mapped after the literature theme analysis had been completed, including the contextual categorisation. This showed that all of the top themes were ‘real’, with expert knowledge or research evidence being the predominant contexts of those occurrences. Pedagogy/Learning Design had the highest ‘real’ count, with 25 instances, and Convenience/Work Life Balance had the lowest, with 11 instances. The full details are available below.

Table 1: PBH v1

The first iteration of the Problems and Benefits Hierarchy was then iterated a further three times (see the Data Analysis Architecture diagram) to attempt additional validity and clarification for accuracy and evidence of theme rankings.

Problems and Benefits Hierarchy v2

The second iteration of the PBH was done after data had been established from RG1 in order to further validate the placing of the ‘problem’ or ‘beneift’ aspect of the theme, not its context. This reaffirmed the perception of whether a theme was a problem or a benefit, overall. Data gathered from questions asked to RG1 challenged initial impressions of theme placement, in that all themes were regraded as problems, though two were ambivalent. Pedagogy and Learning Design was also seen as a benefit in terms of reactions to positive potential of use of technology, and student centred learning, interpreted here in the broadest sense of putting the student at the centre of all aspects of university life, received inconclusive results as to potential or perceived expectations or benefits, which was somewhat unexpected.

Table 2: PBH v2

Problems and Benefits Hierarchy v3

To compile a meaningful third iteration which included qualitative data from RG2, some licence was taken to adapt analysis, though this was not in itself overly damaging to the value of this stage of data contribution. Response category data was allocated a set of context category values as would best allow, considering the data was more limited. However, more context was developed in this way, to add to the overall validity of the PBH rankings. In fact it is noticeable that contexts appeared similar to that of the literature, though this might be in part due to only one individual interpreting the data.

Table 3: PBH v3

Problems and Benefits Hierarchy v4

The final PBH was then developed to include data from RG3. Though this group also only provided limited data, some of which could not be included as was categorised into a theme which was not part of the top 6 themes, the data that was produced was allocated context category values, and added to the PBH. This did not make significant impact on the PBH, but with further research in this area, could be analysed first separately, and then placed into the PBH with more value.

Table 4: PBH v4

Overall Problems and Benefits Hierarchy

The final overview of the top 6 themes in terms of PBH contextual ranking shows that only one theme survives as a benefit, and that is classed as a problem too (Pedagogy and Learning Design). Both Learning Quality and Student Centred Learning become problems with ambivalence, meaning they are more weighted as problems but still have some presence as benefits, of less significance. Convenience /Work-Life Balance now shows as a problem.

Table 5: Problems and Benefits Hierarchy Ranking Overview

Discussion Summary

Discussion here has a variety of focus priorities: the results themselves and their possible implications, reasoning behind technical profiling and literature review selection criteria, and how to improve on methods used for several aspects of the research such as analysis criteria for category allocation and consequent PBH placement. It might be that attempting to combine a variety of research sources and then develop a theme hierarchy, while also attaching some interpreted value to those themes (problem/benefit) might be too wide a remit for one project, and indeed this is a conclusion and recommendation for future analysis of this type.

Discussion also centres around the relevance for metropolitan universities, the noticeable high ratio of themes present that bear close relevance to such universities and any possible implications this might have for future provision, academic role skills expectations, and pedagogical practice involving uses of technology for large, diverse urban student populations.

The Research Approach

- Discussion of how best to analyse multiple sets of data which together build a rich picture of information
- Use of mixed methods (‘Integrative Logic’, Mason, 2006) in the context of an interpretivist critical realism paradigm (referring also to Oliver 2012)
- The project in part became a study of what worked and how to iterate these methods of analysis to best effect

Literature selection and analysis, key points

- Literature selection criteria
- An interpretivist approach from a critical realist perspsective to develop category analysis in connection with the literature review and for responses from RG2 and RG3
- Theme Occurrences
- More robust criteria for selection and analysis process in order to contribute more meaningfully to a theme hierarchy

Technology profiling, key points

- Use of the technical profile data in relation to the core interpretation of a theme as a problem or a benefit
- Rogers Diffusion of Innovations and technical profiling to create an ‘RDI’ indicator

Metropolitan universities, key points

- Diverse student bodies and learner differences in connection with technology enhanced learning
- Compliance: accessibility and the diverse student body
- Training provision with limited resources and a wide variety of academic staff

Discussion

The research approach and methods

It became clear as the project progressed that part of what was being researched were the methods utilised by which a wide variety of data types and sources such as those used here could be collated and measured in order to provide a more detailed and three dimensional image of the landscape surrounding technology adoption in learning and teaching. The literature research data, stakeholder individual digital and technical characteristics as well as stakeholder experiences, opinions and perceptions were all important sources in relation to technology adoption, but posed fairly complex challenges for analytical approaches. As the project progressed, these were adapted in order to best utilize all data in some way, so as to be measured as a whole.

Whilst the methods by which the data has been compiled and analysed are at this stage somewhat primitive, they are a beginning at trying to bring together this variety of disparate sources of information and data, and bring logic and systematic scaling to what these sources offer, to make possible measurement as a whole, using all sources.

Jennifer Mason (2006) in 'Six strategies for mixing methods and linking data in social science research', discusses a strategy to mixed methods which bears great resemblance to that taken in this project, that of 'Integrative Logic', where "studies are designed with several or multiple components […] with a clear sense that these deal with integrated parts of a whole" and that "different methods may be deployed because each is felt to be the best suited to its own specific part of the problem being researched, and because in combination they give a better sense of the whole". This is in a nutshell what is being attempted in this project. Risks and challenges surrounding the theoretical basis on which multiple data strands are analysed are noted in that paper which are very pertinent to this project, but as this was a pilot 'beginning', perhaps now knowing this, future research could explicitly specify theoretical analysis approaches more clearly, perhaps also more expertly with the knowledge gained from this project. As Mason states: "(integrative logic) is a great deal more challenging to put into practice… […] this approach really does call for an explicit and considered theory of data integration […] problems can arise because methods, approaches, and the theories underpinning these, do not always add up to a consensual take on the social world, or what its constituent parts might be, nor how they fit together". Jacobsen's relevant PhD work (1998) also used mixed methods, and states: "The strength of a mixed-method, or "multi-instrument approach" (Pelto and Pelto, 1978) to educational and psychological research, lies in its "triangulation" of multiple sources of data (Jaeger, 1988; Lincoln & Guba, 1985)." She goes on to extol a variety of virtues for using both qualitative and quantitative methods for gathering data. Whether this was then referred to as Integrative Logic is not known.

Literature Review Discussion

Analysis approach

The literature review in this project took the form of a 'current academic research paper analysis', with an interpretivist perspective (using empirical techniques) being brought to bear to attempt to develop a system by which research in this area could be analysed, in order to understand more about the key factors hindering or promoting technology utilisation in learning and teaching contexts. The system is (as yet) only in an early pilot stage of what might be developed with consequent further work, additional journal paper analysis as well as

data derived from more direct sources such as technology profiling of academic staff. The topic is a popular one, and will only become more relevant to higher education in the future, for example, even cursory examination of other social media academic conversations involving technology enhanced learning demonstrates that this topic continues to be a 'hot potato', with heated exchange on some boards and forums. In this sense the topic 'has legs' (Meyer & McNeal, 2011).

The three stages of literature analysis, (selection process, theme occurrences and context categorisation), were felt to largely be a success, as they were shown to provide a reasonably sound basis on which the stakeholder data could then be measured against, as the stakeholder data largely confirmed the initial findings of the literature.

Literature Data Selection

To make possible a more robust and repeatable methodology to how literature sources would be selected, a more explicit checklist of criteria could be developed and applied to all selections, which would likely include the following:

- Date published (in previous 5 years or less)
- Topic areas to fall within:
  - Web 2.0 Applications in education
  - Social Media in education
  - Online Courses
  - Internet and academic workplace
  - Internet and higher education infrastructure
  - Higher education and the digital society
  - Open Educational Resources (digital)
  - Shared Digital Memory Systems and Archives
  - Pedagogies for the 21st Century
  - IPR, licensing or associated legal aspects concerned with digital spaces
- Formal stipulation or categorisation as to global territories under review
- Number of types of paper and topics in any given study 'sprint'

Because there is a very large amount of research on a variety of topics of relevance, available from academic journals and other suitable professional publications, some way of controlling the amount of published research to be analysed at any one time would also need to be established. In the world of project management this might be referred to as 'sprints' of work, using an AGILE methodology. In the context of this type of study, sprints would work very well, as differing approaches to analysis could be applied and then compared, to constantly enhance the process of analysis iteratively.

Theme Occurrences

The themes were derived from the data itself, so used interpretative analysis to take terms most used or topics most mentioned and turn them into themes. These were effective at bringing numbers into the analysis (number of occurrences of a theme) and allowed the placement of each paper into a number of relevant themes it was concerned with or focussing on. Though there was overlap between themes, the system was quite successful at creating the initial literature theme analysis. Central to overlap was student centred learning, which might therefore be placed at the centre of future ways analysing importance.

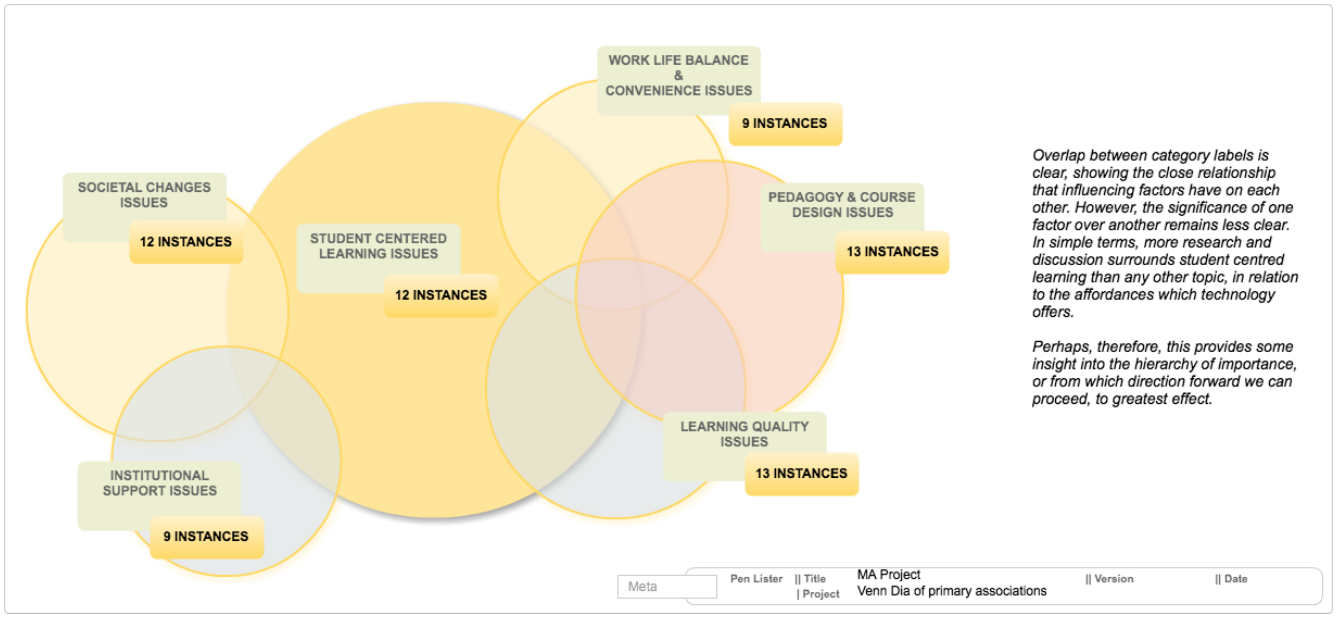

Fig 1: showing visual representation of student centred learning at the centre of top theme overlap

The top themes (all sixteen) were not necessarily saying anything that surprising, however the noticeable absence of much discussion in the literature about formal accreditation in order to encourage TEL was probably the most interesting finding.

> Link to Literature Themes (frequency table)

Contextual Category Analysis

The contextual categories used to give context to theme occurrences in the literature may in general terms reflect ways in which many individuals might interpret the literature research data, so whilst the categories are not in themselves very robustly developed (at this stage) they might be representative of how many in higher education might similarly react to what they think such data is telling them.

The contextual categories were again derived from the data itself, looking at the context of a theme occurrence, and assigning it a set of values concerning aspects of that context. Values consisted of the nature of the contexts factuality, reasoning and level of assumption. These values were then matched to the PBH scale. This allowed analysis of the occurrence as to its level within that scale of the real, imagined, intermittent, persistent or legacy factors. This was arguably the most difficult part of the analysis, and would need much more work in terms of theoretical underpinning as well as some clear explicit interpretation measurement system, if possible. This might be considered to be the most important aspect of this project, over time, as is attempting to evaluate how literature (research) might be ‘interpreted’, as well as how to measure its validity in a wider picture.

> Link to Contextual Categories and Theme Correlation

> Link to Contextual Categories to PBH for TOP Themes

Research Group Discussion

Technical Profiles

(Research Group 1)

Rogers Diffusion of Innovations Roles

Using the Rogers Diffusion of Innovation model to refer to characteristics of users in learning and teaching scenarios is not new. Sahan's 'Detailed Review of Rogers Diffusion of Innovations Theory and Educational Technologies Studies based on Rogers Theory' (2006), reviews a number of studies, with perhaps Jacobsen's work (1998) being of most relevance to this study. She used a variety of technical and computer competencies to inform her user characteristics, some of which seem surprisingly similar to those investigated in this project, though were not known about at its start. Jacobsen most relevant criteria listed below:

1. Patterns of Computer Technology Use
2. Computer Experience
3. Generalized Self-Efficacy
4. Participant Information

(Jacobsen, 1998)

Jacobsen has done much consequent work of a similar nature which doubtless would also be of relevance to this project, though has not been referred to here (due to time constraints).

While this study uses the *idea* of Rogers' Adopter Categories (innovator, early adopter, early majority, late majority, laggard), exactly which technical factors might help define those categories is not present in Rogers work, as he defines these categories only with social or personal characteristics and traits, but no technical specifications at all. This is perhaps no longer adequate in todays *post digital information revolution* setting, and this study has attempted to build on some of Jacobsen's work in this respect by adding technical profiling factors to the Rogers Adopter categories.

The development of a scale in order to allocate a technical aspect to the 'RDI' (Rogers Diffusion of Innovations) indicator for each respondent in RG1 was a simple way of integrating the Technology Profile data set into the Rogers Adopter categories. A variety of questions in the question sets involved factors listed in the scale used, so responses were used to place each respondent from Research Group 1 (RG1) into the scale.

> Link to Technical Profile RDI Indicator work

This was an approximate exercise and would need further specification if used on a larger sample, or for more in depth analysis, however, for the purposes of this study has proved adequate. By knowing more about the skills and perceptions of who is responding to specific theme issues, more can be understood or validated in relation to their responses. For example, if R1 is an Innovator, their responses can be interpreted in that context, but if R1 is a Late Majority, sometimes the very same responses might be interpreted very differently.

Question Set Responses

Interpreting and correlating RG1 responses to validate or challenge literature theme placements in the PBH was possible in terms of whether they were problems or benefits. Contextual analysis was not appropriate as

questions had been set by the researcher, therefore context was not relevant. Some key quotes were given a context, but not enough data was gathered in this way to analyse more widely, so perhaps this might be a further adaptation to consider for future work. Overall, the response data did shed light on what real users actually thought about those issues, and whether literature interpretation was accurate. This could prove significant to those involved in change management, as in order to innovate practice, policy makers (often) aim predominantly at innovators, early adopters and early majority as it is those stakeholders who are most engaged with change, in this case in technology enhanced learning and teaching. If we rely only on data which is compiled from unknown sets of users, e.g. the TEL report (2012), or numerous of the literature papers which do not tell us about those taking part beyond at most knowing their job role, we cannot know enough in order to cater adequately in providing training approaches, technical equipment and content production techniques or sharing.

Adding the RDI Indicator factor to the responses gave an understanding of who might be saying and thinking what in relation to the Problems and Benefits placed in the hierarchy, in terms of their general technical perceptions profile. A great example of this is found where R2 (Late Majority) was either absent in some of the positive and future facing aspects *(pedagogy and learning design section)* or they were prominent in some other sections, such as clearly negative views towards shared resources. Though this may sometimes only tell us 'what we already know', being able to measure such response differences based on an indicator of technical efficacy may potentially lead to more useful support provision or change management and delivery being offered in relation to specific needs or those of particular perceptions.

> Link to Question Set Analysis for Top 6 themes

Qualitative Data Analysis

(Research Group 2 & 3)

LinkedIn and ResearchGate

(Research Group 2)

Gathering qualitative and largely participant self-instigated data was an integral part of this research, in order to provide authentic experiences and perceptions of technology in learning and teaching. As the project was largely taking place in an online environment, it seemed therefore logical to utilise social networks to gather that data, and overall this proved very successful for a project of this size. However, LinkedIn proved a much more useful setting for professional discussion than ResearchGate as provided a greater emphasis on expert knowledge and the referring to other research, which was not evident in the ResearchGate comments, beyond referring to a participant's own current research projects, but reporting no findings.

The findings confirmed two of the main theme areas – institutional support (top-down/bottom-up) and effectiveness (learning quality), but a third strong theme emerged from RG2 that was not very prominent in the literature, that of 'what's in it for me'. This equated with staff (individual) motivation in the literature themes, but unlike there, was a frequent topic in the discussion. From a personal perspective then, individual advantage is a stronger driving force than might be acknowledged by literature alone.

As it was experiential data derived from 'real people', it might actually be a more accurate snapshot to hold up to literature interpretations, and reflect the initial placing with real peoples opinions, as it was self initiated

(unlike data from RG1), beyond the initial first question to kick off the discussion.

> Link to RG2 LinkedIn & ResearchGate Analysis

The Students

(Research Group 3)

It was noted that it was more difficult to engage the group than anticipated, even though they were motivated to help, as the topic seemed uninteresting to them beyond any small commentary about basic provision or lack of it in their Learning Management System. They also appeared generally quite unmotivated about new ideas for how technology could be used, though there was one suggestion about not always using essays and utilising more of what the internet and multimedia might offer, as it encouraged communication in a digital sphere, which was knowledgeable and worth further consideration. This lack of seeing the potential of technology is similar to the lack of ideas often seen in staff in relation to uses of technology for learning and teaching.

The one aspect that did come across clearly is the strong impression by students of the lack of technical skills amongst staff, which appeared to be perceived as much less than the students, in general. Expectations by students also seemed quite ambivalent, which echoes other studies (A course is a course is a course, Dziubian & Moskal, 2011). They are mostly concerned with having engaging lecturers who are passionate about their subjects and will act as great mentors to encourage others into the field.

> Link to RG3 The Students Analysis

Key aspects relevant to Metropolitan Universities

It is somewhat difficult to establish with fixed clarity what is meant by ‘metropolitan university’ in the context of UK higher education. The term itself is more often used in the USA, where 46% of universities are located in ‘metropolitan’ areas (Goddard & Vallance, 2011). ‘Publicly funded’ universities might be another way of looking at this type of higher education, or one might look at a widely used source of where one might find a definition: the Wikipedia entry for ‘Urban university’ states: *P.E. Mulhollan […] defined a metropolitan university, in its simplest terms, “[as] an institution that accepts all of higher education’s traditional values in teaching, research, and professional service, but takes upon itself the additional responsibility of providing leadership to its metropolitan region by using its human and financial resources to improve the region’s quality of life”.*

For the purposes of this research, then, a metropolitan university was considered to be an institution located in a large urban area, with a remit to educate its local population, as well as those from farther afield. While striving for research excellence, it would likely also have strong business and knowledge partnerships with the local economy and work force, preparing students for employment and social contribution, most especially in its local area. Goddard & Vallance make several interesting connections about the importance of the renewed purposes of the ‘civic’ university, which may be a more appropriate term in the UK.

Relevance to metropolitan universities is significant in a number of themes present in the literature, (especially in the top six themes analysed). A variety of aspects all of core importance to the existence and purpose of metropolitan universities are present, including factors listed below:

- Inclusivity

- Diversity
- Accessibility
- Learner Differences
- Equivalency
- Flexibility
- Student centered learning
- Student developed learning
- Personalised learning
- Work based learning

These terms were used to either define themes themselves or as indicators for contextual category presence (which were then allocated to themes) when interpreting data, and are therefore listed here as general factors most relevant when considering urban or community universities and colleges.

Diversity and inclusivity might be said to be at the core of metropolitan university life and purpose. For example, several of the texts refer to colleges with a remit of widening participation, or fulfilling the requirement of much wider access to higher education (not quite the same thing) and that technology is a very significant player in the achievement of those aims and purposes (Lynch 2008, Oblinger 2013, Tate & Klein Collins 2013, Altbach et al, 2009). But diverse student populations have a number of considerations and issues which tend to multiply the more diverse the student body is, and this makes for increased potential problems when using technology. The use of technology in learning and teaching throws up sometimes major new issues and problems which may not be present when technology is not used, principally those of accessibility.

Accessibility can involve complex considerations: digital efficacy, physical or other impairment access requirements, other learner differences, any required equivalency of provision and relevant intellectual property, data privacy and security legislation. These may often be of most significance to universities with very diverse student populations, which again involve a number of factors: of gender, age, work and family commitments, other differences such as language, culture or health and disability. In other words, '*non-traditional learners*'. Full consideration of these issues in relation to uses of technology in learning and teaching would merit its own research project (or several), so in this more limited context it might be more suitable to acknowledge them and suggest other work of relevance in these areas that is known to this researcher, such as that by Taylor & Newton (2013) previously covered in the literature review, and sources listed below, which would form the basis of any follow up to this research, and have variously been referenced in this project or used as background advice.

- Ali Tarhinia, Kate Honea, Xiaohui Liua, 2013, User Acceptance Towards Web-based Learning Systems: Investigating the role of Social, Organizational and Individual factors in European Higher Education, UK, Procedia Computer Science 17 (2013) 189 — 197 ***(for computer self efficacy, usability, flexibility)***
- Wattenberg, T, 2004, Beyond legal compliance: Communities of advocacy that support accessible online learning, Internet and Higher Education 7 (2004) 123—139 ***(accessibility online)***
- Kanwar, A and Uvalic-Trumbic, S (ed), 2011, A Basic Guide to Open Educational Resources (OER), UK, Commonwealth of Learning ***(for Open Education Resources organisational planning concerns, policy directives and advice, intellectual property issues)***
- Beetham, H & Sharpe, R (ed) 2007, Rethinking Pedagogy for a Digital Age, Designing and delivering e-learning, UK, Routledge, Taylor and Francis Group ***(for learner differences, design and pedagogy issues for equivalency and efficacy of access)***
- Sharpe, R, et al, 2009, Learners Experiences of Elearning Synthesis Report: Explaining Learner

Differences, UK, JISC ***(in depth learner differences)***
- Dabbagh, N., & Kitsantas, A., 2011, Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning, Internet and Higher Education (2011) ***(for personalised learning)***

Issues surrounding equivalency, equity of access and legislation requirements also impact other themes noted from the literature such as cost and policy, both institutional as well as national and even international. These potentially have more impact on a metropolitan university, as they may have the widest remit to educate both local, and internationally diverse student populations, and yet have the least and perhaps most precarious funding. Metropolitan universities are often also at the brunt of national policy, being a reflection of changing ideologies as governments and national priorities change.

Student centred learning, including student developed, work based and personalised learning, may also be of greater significance to metropolitan universities, i.e. those that might be most concerned with professional skills degrees, which often benefit from such aspects of student centred learning. The metropolitan university is at the forefront of these approaches, and could perhaps increase learning quality (another top 6 theme) by the more effective use of those technologies suitable for such purposes (for example Dabbagh & Kitsantas, 2011).

We see these (student centred) issues echoed across multiple themes found through the literature review and other data from this research, and it is difficult to single out any one theme above any other in this respect. However, noting that at least 4 of the top 6 themes analysed are directly relevant to this area is in itself demonstrative of the impact of technology in these pedagogical approaches. In contrast, data derived both from the literature review as well as data from RG2 and RG3 gave a worrying picture as to student input and engagement in the learning design process. For example, Brown (2011) reported that student influence was minimal in encouraging academics to utilise web 2.0 applications, and from RG2, only two comments were made about student input – one negative. RG3 were not especially enthusiastic about technology use in their learning either. Whether this is fully relevant to student centred learning as a pedagogy is questionable, however, it does show that on the ground, ‘the jury is still out’.

Conclusions Summary

The main conclusion from the findings is that institutional support together with learning design considerations are perhaps the most significant forces surrounding adoption of TEL, as drivers (when present) and restrainers (when absent). The need for centralised support for academics in terms of time and professional assistance in order to learn new skills and develop new curriculum and course design so as to most benefit from potential uses of technology appears highly significant to that technology being adopted. How this is done perhaps remains the crux of the issue.

Conclusions from the research may in part then be ‘telling us what we might already know’ but the research may also have highlighted a need to think much more about approaches to analysing multiple sets of data which are relevant as a whole to this field. To then be able to put that data to use in practical ways in order to help overcome the issues found to be restraining TEL adoption remains the challenge.

Recommendations are made about how the RDI indicator, along with primary stakeholder and literature data, contextually prioritised (such as in the Problems and Benefits Hierarchy developed here) might be used to deliver smart training to individual personalised requirements. The online support model used by Facebook and Google, emphasising the ‘zero tolerance training’ of those applications when introducing new functions or design changes whilst providing comprehensive online help information, is also part of recommended ways forward deserving further consideration in relation to providing the ‘always on’ specialised support that academics and literature express a need for. Smart delivery discussed elsewhere in the literature is used as a comparison of such a shared sector-wide system being a possibility.

A suggestion is made of a separate study involving only metropolitan universities (literature and primary data) to further establish if forces do have particular significance, as no definitive outcomes are clear in this respect, beyond what might be assumed of any urban institutions perceived requirements.

Conclusions & Recommendations

All research is subjectively interpreted to an extent, in as much as a 'reality' can only be experienced and 'known' subjectively and interpreted subjectively – "(critical realism) holds that the world is characterized by a kind of duality in which (intransitive) objects […] have their own existence (and agency) outside of human knowledge and interpretation, but can only be known in their specific contents, rich textures, and nuances in and through (transitive) scientific inquiry and human interpretation/construction", (Hedlund-de Witt, 2012). This research used mixed methods, some of which may have over-relied on subjective interpretation, though attempt was made to standardise those interpretations with a simple approach of categorisation used for all qualitative data. Some quantitative data could only contribute more limited input to the overall findings, however this was useful to provide further context.

It was felt that by looking at literature themes, assigning contextual categories to each theme and then contrasting those with data derived from actual people was a useful way of thinking about how to collect, analyse and interpret such data over time and from a wider pool of data sources if future research were to be conducted. By challenging with real feedback the likely common (mis)interpretations of current literature research (using interpretivist contextual categories) more might become known about what may act as an influence over those individuals taking account of such data in order to develop policy, technical provision or training and support for TEL. We might then achieve more effective and sustainable support provision. This is central to the concept of developing the priorities hierarchy used in this research, with multiple types of data analysed as a whole.

The results themselves showed quite clearly which were the top six themes that were most talked about and of common concern or interest. Generally speaking, consideration of *institutional support* and *learning design* might be most relevant to technology uptake in learning and teaching, with the provision of allocated time and professional assistance to the redesign of curricula (or 'courses') in relation to best use of technologies being seen as most useful to encourage more uptake of uses of technology in teaching scenarios.

TEL support, now, in the future

It is becoming widely accepted that providing face to face support for academic staff, whether it be for ICT training or for e-learning training, is no longer sustainable (Taylor & Newton, 2013). This may be particularly true for the metropolitan university, who have less strategically allocated funding, tend to use more part time or visiting lecturers, and may have other restrictions such as older technical infrastructure. Continuing to develop such training and support, often aimed at a generic 'everyone', risks the disengagement of many stakeholders (Moser, 2007), and is therefore not only unsustainable but also ineffective, (though this may deserve further research). Two concepts might be considered in relation to training support provision, in the light of unsustainable current models, and generic unfocused training: the concept of the 'zero tolerance training window', and the idea of 'smart training' delivery.

The ***'zero tolerance training window'*** in this case refers to the tolerance level by the implementor of a technology application towards the users of that application, and the time window it may take to train them to use that application (the training window). The expression seeks to encompass an idea of a level of tolerance *towards* users by those implementing technological applications, not tolerance *by* users, of the ease of use and perceived ease of use of an application. This type of approach is increasingly utilised by popular online platforms such as Facebook, Google or others like Del.icio.us, and used in conjunction with comprehensive online help systems, appears to be growing in popularity as a way to deal with change in connection with using

technology to achieve tasks.

The concept of ***'smart training'*** here is referred to as a method by which training can be recommended and delivered to the personalised specific requirements of a user, in part based on data gathered from use of online applications, or profiles built up through job application data gathering or in some similar way. It would work in the same way as systems such as Spotify, Google personalised search, or an Amazon purchase history.

'Zero Tolerance Training'

Looking to other areas of computer life, it might be of value to investigate approaches now being taken by others in relation to teaching users about technology applications. The example of Facebook, which appears to have what might be termed a 'zero tolerance training window' to its *persistent user interface and functionality changes* is a possible area of new research which could further investigate the relationship between technical applications purpose, functionality and required skills, and the intended user groups for those applications. In the case of Facebook it appears that 'perceived usefulness' outweighs 'ease of use' (Davis, 1989), i.e. the persistent challenges of interface change in relation to previous familiarity is accepted by the user, and the learning of new functions, interface layouts and settings is a constant experience, with no apparent end. The user accepts this condition of using the application as they deem its usefulness to outweigh the inconvenience of constant and persistent ease of use challenges.

This tells us much about new attitudes towards using 'very useful' technology (Google also employ similar techniques to changes and additions to their services, with some caveat). Both these technologies, arguably the largest of the Internet, have also created extensive online support, with often highly effective search mechanisms to aid a user in their ability to solve a problem while using the technology. Google user support forums are sometimes supported by Google employees, though not often in relation to numbers of users, and Facebook also rarely support their user forums, perhaps again because of sheer numbers of user queries, so users are left *to help each other*. Facebook and Google do not often even announce new changes prior to implementing them. Yet, after a short period of complaint by the users, new changes are embraced and later fully accepted into the user experience as standard. In this the reliance is on user 'self-training', not the provision of training by others towards users.

Therefore, it might be said that Facebook and Google have ***zero tolerance towards their users*** in relation to any period for learning new interfaces or functions. It should be noted that the time it takes for users to adopt new interface familiarity is becoming shorter, though may merit further research. Perceived use and ease of use in relation to an application are demonstrably of significant importance in relation to future training and support models for any technical application, and this would also apply to any TEL, including pedagogical aspects, which might be part of the perceived usefulness. This may prove a rich vein of future research.

Smart Training

Much of existing face to face training would also in most cases be offered regardless of participant level of technical efficacy (awareness and skills), and this may be another reason to add to those which indicate that new approaches are needed to technical and TEL support and training provision. This thinking is what was central to the development of the Rogers Diffusion of Innovations indicator from RG1 data, which added technical efficacy factors to the Rogers Adopter Categories (Rogers, 1995, 2003). In essence this turned out to almost form a separate arm of the research, though did add value to responses given to question sets that were used in the definition of whether a theme was a problem or a benefit. What began to become apparent was that the data being compiled which formed each technology profile was of itself useful, potentially. If this

kind of data was developed on a large enough scale, perhaps it might become possible to provide a system whereby 'the training finds you'. This could work on the same basis as any smart search, smart media provision or even smart advertising delivery model. Tate & Klein-Collins (2013) refer in some depth to new information technology systems being used in the USA to help students and others make much better informed decisions about where and what to study for their degrees, "…(T)here are also other online resources that […] match the student to career pathways and educational programs that build on the student's existing skills and knowledge." Giving an example of the Minnesota State Colleges and Universities System, with links to the VETS initiative, which shows ex or future military personnel "how their military training can count for credit at Minnesota State Colleges and Universities institutions", this demonstrates the value of 'smart' data provision based on prior data being available about the individual. Though this is not directly connected to training and support of TEL, it shows the power of smart data, and how delivery of products or services directly relevant and applicable to the individual makes for (potentially) much more effective use of those services or products. If this approach could be taken to the delivery of support to the individual for increasing their use of TEL, based on their technical efficacies, subject discipline and other relevant factors, it may be possible to provide them with much more focused and appropriate types of support. The RDI indicator is an attempt at standardising a set of technical efficacies, placing them alongside Rogers other traits for Adopter Categories and with some additional professional information concerning job role etc, could form an overall Technology Profile for each employee, on which training and support needs might in part be based and delivered online as suggestions to the employee.

After initial data gathering, application development and implementation investment time and costs of such a system had been met, a more long term solution might be consequently developed over time. This might then be shared by all institutions, thereby also sharing cost and even support systems and sessions themselves between institutions, in the way that shared resources for learning materials or library data repositories as discussed in the Tower and the Cloud, (various, 2008) or the shared IT and library infrastructures of Columbia University and Cornell University discussed by Oblinger in Game Changers (2013).

The Problems and Benefits Hierarchy

The Problems and Benefits Hierarchy developed from this research project was a reasonable success, in that it did show a possible way to evaluate factors of concern in relation to technology enhanced learning, and in some way indicate whether they were perceived as problems or benefits and the contextual setting for that perception. Though rather primitive in terms of academic rigour or robust analysis mechanisms, there is still worth in the overall hierarchy as a concept on which to base potential further research.

The PBH poses possibly more questions than it answers. But these are useful questions, in terms of how data which can be so widely varied in its perception (for example, what might actually constitute a good TEL support session) and how that data might be measured and interpreted within a more fixed set of criteria. The contextual categories (both the real, imagined, intermittent, persistent and legacy of the PBH itself, and the 'sub-categories' used to inform those, see Contextual categories to Theme Correlation) were overall deemed to be the most significant and useful aspect of the criteria used to develop the PBH, and would merit further development so as to be more robust and able to be accurately and repeatably used by individuals not directly connected with this research (i.e. to be used independently of the researcher who developed them). Whilst other response category criteria were used to initially categorise comments from RG2 and RG3, perhaps more ideally, this type of discourse qualitative data would in future be categorised only using the same contextual categories as those used for the literature, and which were used here as a secondary match to the response criteria. This would be more difficult, but would also help to develop the contextual categories to be more

efficient in a number of qualitative data environments.

The PBH also highlighted the question of how to quantify and interpret a theme that is both a problem and a benefit, and use of contextual categories again becomes significant, as the ranking in those categories, if separated into problem and benefit contexts, would define the predominance of whether the theme being analysed was overall a problem or a benefit. This study was too limited in nature to have been able to go deeper into the data, and the data itself was too limited in volume, but with a larger study, this would be possible and likely provide useful information to further inform the interpretation of the most significant problems and benefits, thereby establishing more clearly the strongest driving and restraining forces of uptake of technology in learning and teaching.

A final conclusion is that driving and restraining forces in relation to TEL uptake that might have particular relevance to metropolitan universities may best be specified by the differences between metropolitan universities and other institutions, for resources, reputation and mission statement. These factors are significant in that they are the defining controllers of funding, purpose and remit, and would be at the core of for example the approach to the diversity of the student population, the student experience, the resources available for learning, teaching, assessment and student life, and the pedagogical approaches that may or may not encourage the uses and potentials of TEL. Perhaps therefore, a study undertaken with only metropolitan universities might tell us more, which would first require a clear definition of what a metropolitan university is (and isn’t).

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