

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.

| <i>Theme in Literature</i> | <i>Problem or Benefit (literature setting)</i> |
|-----------------------------------|-------------------------------------------------------|
| 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.

| <i>Contextual Scope</i> | <i>Types of context in scope (examples)</i> | <i>Description</i> | <i>PBH Factor</i> |
|--------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------|
| CONJECTURE, SPECULATION, ASSUMPTION | PA - Personal Assumption | <i>statement from a personal or individual standpoint with no evidence or expertise present</i> | [PBH:Imagined] |
| | DC - Data Conjecture | <i>statement being attributed to data which is not adequately evidenced</i> | |
| | HS - Hearsay | <i>statement attributed to ‘everyone’ or similar, which is only assumption</i> | |

| | | | |
|----------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|
| CONTEXT ASSOCIATION, STRENGTH AND FREQUENCY | IAL - Contextual interpretation/association low strength & frequency | <i>occurrence measurement of theme in research - low</i> | [PBH:Intermittent] |
| | IAH - Contextual interpretation/association high strength & frequency | <i>occurrence measurement of theme in research - high</i> | [PBH:Persistent] |
| EVIDENCE AND EXPERTISE | EK - Expert Knowledge | <i>statement made from deduction or logic using expert knowledge, but not directly connected to research evidence</i> | [PBH:Real] |
| | RE - Research Evidence | <i>statement made as a result of research evidence</i> [PBH:Real] | |
| SYSTEMS, CHANGE, THE PAST | P&C - Refers to the past or need for change | <i>statement about the past, or requirement for change in systems or central strategies, policies or provision</i> | [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 of 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.

RG2: Category Response Allocation (LinkedIn)

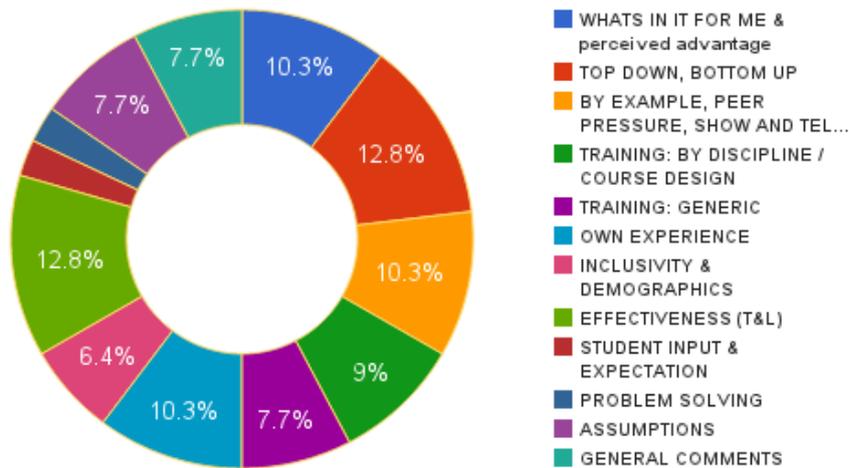


Fig 1: Showing percentage of responses per category, RG2 (LinkedIn)

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).*

RG3: Category Response Allocation

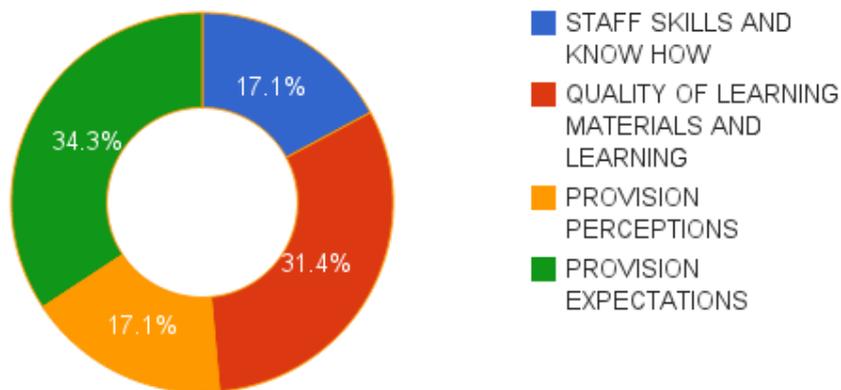


Fig 2: Showing percentage of responses per category, RG3

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 'benefit' 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 perspective 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.

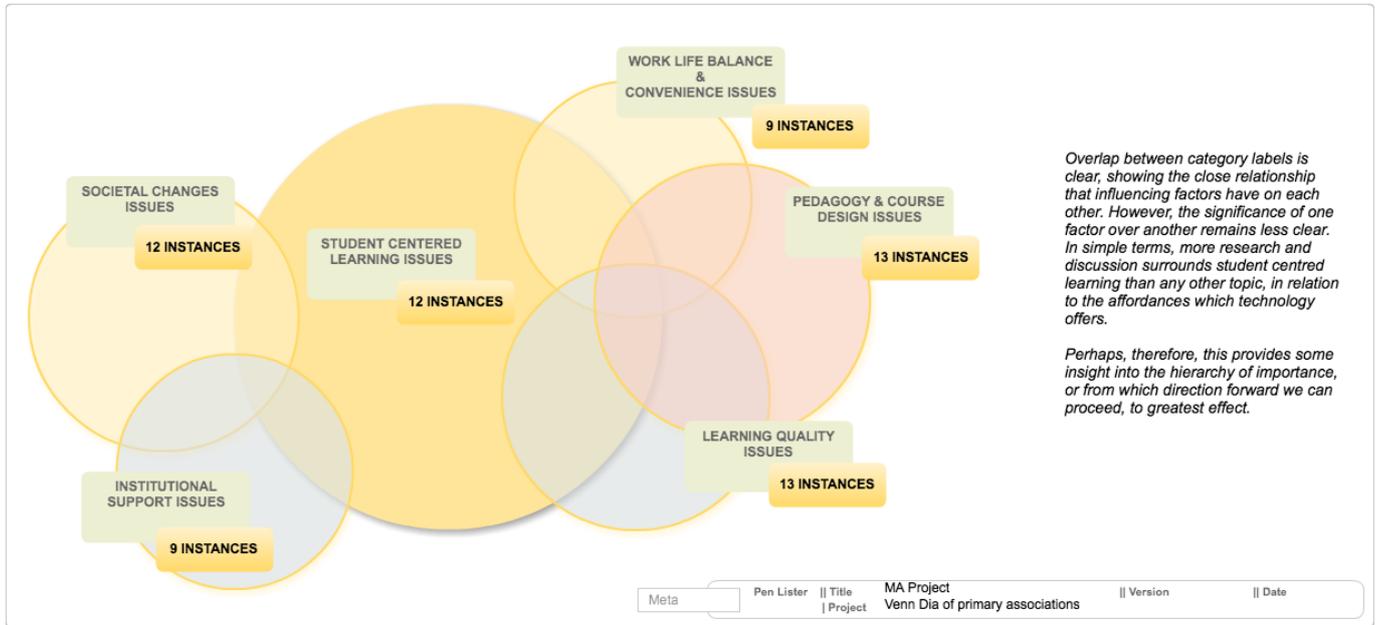


Fig 1: showing visual representation of student centred learning at the centre of top theme overlap

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 today's *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'.