

CONSTELLATIONS: A PARTICIPATORY, ONLINE APPLICATION FOR RESEARCH COLLABORATION IN HIGHER EDUCATION INTERDISCIPLINARY COURSES

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Submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy

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2015

Keywords

Constellations, interdisciplinarity, communication design, multimedia, interaction design, information architecture, digital learning tools, online learning, web 2.0, social and networked learning, learning design, participatory culture, content sharing.

Abstract

As programmes of study in higher education, the emergent fields of communication design and multimedia are, by their nature, interdisciplinary. A rich and burgeoning body of literature has established that learning and research in new fields, which extend beyond traditional disciplinary boundaries, present new opportunities for innovation and discovery. However, interdisciplinarity also introduces complexities into programmes of study. It means that educators must support their students to develop skills to explore the potential of unfamiliar fields, to integrate perspectives from multiple fields, to accommodate multidisciplinary working methods and processes in project teams, to share knowledge, and to situate their projects within an expanded field. This complexity means that traditional, discipline-centric digital learning tools may not provide the support that students in interdisciplinary programmes need. To effectively support students, digital learning applications for communication design and multimedia courses (and indeed any interdisciplinary field) must accommodate multidisciplinary perspectives, enable hybrid projects, support collaboration, and facilitate the positioning of outcomes at the intersection of discipline boundaries.

The research design for the study employs a practice-led methodology that combines evolutionary software prototyping with observational and reflexive data collection techniques. As a multi-method study the PhD integrated findings derived through a range of qualitative and quantitative data collection techniques. The work was catalysed through two case studies of interdisciplinary learning contexts and expanded through a contextual review and discourse analysis of e-learning platforms. This was further developed through participant observations, think-aloud protocols and student interviews and focus groups. This was subsequently expatiated through narrative analysis of critical the reflective practice and correlation with quantitative network traffic monitoring and analysis data.

The PhD makes a contribution to knowledge about learning design for interdisciplinary project-based learning contexts. It does so through the

establishment of a set of core principles and priorities for designing new, online tools for supporting interdisciplinary student work. The principles were formulated through the iterative conceptual development and evolutionary software prototyping of an exemplary web application entitled the Folksonomy. Modelled on a metaphor of constellations, the Folksonomy enables students to draw a unique configuration that situates their practice at the intersection of disciplines, and thereby to differentiate their practice from that of their (differently situated) peers. The background research, key design considerations, development process, and implementation of this learning tool, as well as its evaluation by students and academics, are presented in this exegesis. The PhD includes insight about learning design, which can be generalized beyond the particular circumstances of the enquiry. In addition to the publishing of the publically accessible Folksonomy learning tool, which is designed to be used in any interdisciplinary field, the work also defines a core set of learning design principles and priorities, which have the capacity to be used more broadly within generic e-learning contexts.

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

QUT Verified Signature

Signature:

Date: 21 November 2015

Dedication

Dedicated to my brother Craig Perkins, 16 May 1960 – 12 January 2011, who, in his world ending, left my world a much emptier place.

Supervision

Principal Supervisor: Professor Jillian Hamilton (Creative Industries Faculty, Queensland University of Technology, Australia)

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Acknowledgements

I am indebted to Jillian and Barbara for their guidance and support with what has proven to be one of the most challenging exercises of my life. Their guidance and insight has provided invaluable support both through the depth of their understanding and the precision of their analysis and criticism. They have broadened my perspective of what is possible and given me agency to affect change.

Thank you so much Valeria Marti for being the dynamo that constantly recharges my batteries and to Mia Thornton whose initial encouragement helped me to see the potential of this PhD research. Thank you to Terry Shave and Brian Griffiths – you helped to ensure that my research maintained its art and design relevance. My thanks also go to the NTU Multimedia students who joined in discussions about my PhD and gave of their time to participate as research volunteers.

IPEd-accredited editor, Kerry Davies AE, provided copyediting and proofreading services according to the guidelines laid out in the university-endorsed national “Guidelines for editing research theses”.

Chapter 1: Background to the Research

1.1 SITUATING THE RESEARCH PROJECT: THE PEDAGOGICAL CONTEXT FOR THE RESEARCH

As the Internet has emerged as a primary tool for information gathering, commerce and social interaction over the past two decades, the design of online services has come to incorporate a number of traditional as well as new design fields. They include visual communication, film, animation, sound design, persuasive and technical writing, and information technology, as well as aligned fields such as visual arts, media studies, humanities, and business management. Designing for online media therefore requires collaboration between disciplinary specialists. This means that graduates of higher education courses such as multimedia and communication design are, by their nature, interdisciplinary. As they prepare for professional roles, students must not only develop specialist skills, they must develop the capacity to collaborate, and they must be able to integrate the perspectives of other specialists as they work together to achieve a common, interdisciplinary goal and design outcome.

Interdisciplinarity has many advantages. As pointed out by a rich and expanding body of literature, learning and research that extends across disciplinary boundaries can shed new light on old problems, challenge long-held disciplinary assumptions, and provide new methods and research processes. It can thereby lead to new insights and discoveries. Indeed, collaboration across disciplinary boundaries has provided advances in many fields that were once considered discrete. Clear benefits also arise from new, interdisciplinary approaches to curriculum design in communication design and multimedia courses. Such courses tend to include innovative pedagogies that involve socio-constructivist learning; that is, learning experiences that model the complex frameworks of interdisciplinary professional practice.

However, alongside such opportunities, interdisciplinarity also introduces many challenges for professionals, as well as for 'professionals in training'. Integrating working methods, the collective negotiation of discipline boundaries in team projects,

establishing in-common languages and work practices, knowledge sharing, exploring the potential of unfamiliar fields, and situating projects in an expanded field are all crucial aspects of professions that rely on interdisciplinary collaborations. For students, this all requires navigating a range of disciplinary knowledge domains, nomenclatures and assumptions, and, at times, divergent approaches to processes and methods.

To reduce this complexity, individual students within a multimedia or communication design course tend to explicitly anchor their practice within a specialist field – for example, filmmaking, animation or web design.¹ They become expert in a particular disciplinary framework, and align themselves with its attendant discourses, theoretical models, methodologies, and professional practices. However, they must also understand and respect the research methods, processes, and contextual and theoretical frameworks of aligned fields for, throughout their careers – from undergraduate study through to professional practice – they will collaborate with specialists in complementary fields in order to fulfil the needs of the complex, interdisciplinary projects they will inevitably encounter. That is, students must not only acquire detailed specialist knowledge within a disciplinary field, they must also gain fluency across fields by acquiring the knowledge, languages and practices of multiple domains, as well as skills in negotiation and collaboration.

This means that university communication design and multimedia programmes must provide each student with the opportunity to specialise as well as the agency to formulate an individual perspective on the nature of professional practice. At the same time, however, they must also provide a broad understanding of a range of fields, and opportunities for integrative practice. Curriculum within multimedia courses is therefore, necessarily, both multidisciplinary and interdisciplinary.

For academic staff, the complexities are therefore magnified. Within a given cohort enrolled in a multimedia course, each individual student may specialise in a

¹ For example, all NTU Multimedia students are required to nominate a particular sub-discipline in their second year which, although not mandatory, tends to be the basis of final year project work.

distinct field (and some may be actively interdisciplinary). This means that students must each be afforded a tailored learning experience. In addition, students must be taught the skills to collaborate with specialist peers in other fields. Academics in such courses must therefore be fluent in multiple fields (to the extent at least that they are able to offer students flexibility).

Academics must also support their students to access and evaluate a variety of knowledge domains. They may need to guide each individual student to situate their work within a specific disciplinary context but, at the same time, encourage them to avoid limiting creative and professional agency by thinking of it as a discrete field with hermetically sealed boundaries. That is, they must support their students to explore aligned fields, and to consider the potential of a range of research approaches for each project at hand. This places complex demands on academics in such courses, for they must juggle diverse knowledge domains, technical understandings, practices, and methodologies in order to support students to acquire specialisations and to negotiate the boundaries of their fields.

In a critique of the disciplinary model, Roger Mourad (1997) refers to a post-disciplinary era in which many disciplines face similar opportunities and challenges. He argues that a number of contemporary fields of education and research are affected by impinging fields and discourses that place stresses and strains on long-held assumptions, and disciplinary boundaries, as well as the curriculum. So multimedia and communication design are not alone in the contemporary higher education setting. However, to add to their interdisciplinary complexity, multimedia and communication design are constantly transforming fields, with new innovations and advances rapidly reshaping the applications, mediums, and design perspectives they incorporate. As Jon Kolko explains:

... the subject of design is the humanization of technology, and as long as technological advancements continue, so the pragmatic and day-to-day jobs of designers will continue to morph. And so must design education continue to evolve.

(Kolko, 2010)

The perpetual, rapid advancement of the field means that staff and students must be agile – not only able to combine traditional design principles and approaches, but also able to integrate new practices and processes as they emerge.

The combination of varied disciplinary specialisations among each cohort, the interdisciplinary requirements of projects, the collaborative nature of the fields that students will enter on graduation, and the need to stay abreast with and prepare students for work in an emergent field leads to unique pedagogical challenges. Curriculum content and project methodologies must be individualised but, at the same time, must be expansive and inclusive. To provide authentic learning opportunities, project teams must be constantly reformed – each with a new configuration of specialists. And advancements in technologies may push into new, expanded fields, even as projects unfold.

In such contexts, the capacity for knowledge sharing – between academics, between academics and students, and between students – is crucial. Sharing understanding and perspectives can enable each student to be uniquely situated and specialised and, at the same time, enable them to access, negotiate, and integrate the insights and perspectives of others, as they retain currency in emergent fields.

1.2 THE RESEARCH PROBLEM

As interdisciplinary and emergent disciplines, communication design and multimedia have pedagogical complexities, which means that they are not adequately served by commonly used online learning and teaching models and technology-enhanced learning (TEL) tools. Virtual Learning Environments (VLEs), Online Learning and Teaching (OLT) and Learning Management Systems (LMSs), such as Blackboard, Desire2Learn Incorporated, and Moodle, are ubiquitous in university learning and teaching contexts. Primarily information delivery mechanisms, they broadcast learning content, in what Claude Shannon and Warren Weaver (1949) refer to as a *transmission model of communication*. Assuming a didactic approach, they cast students as “passive recipients of knowledge” (Gulati, 2004). Or, as Nola and Irzik explain, “teaching essentially consists of the transmission of [a body of knowledge] from the teacher to the pupil” (Nola & Irzik, 2005, p.175).

Moreover, to expediently conform to their inflexible structures, academics must generalise curriculum to a one-size-fits-all form and present discipline-specific, narrow, and closed curricula. While LMSs, VLEs and OLT have increasingly begun to make concessions towards collaboration by providing in-application discussion spaces and facilitating content sharing, such tools are ultimately grounded in a systems-design approach. As Krishna B. Misra (2008) explains, a systems-design approach to problems, materials, and interaction is one of simplification. It involves a reductive and mechanistic process that is designed to identify constituent parts or cause-and-effect relationships within a closed system. That is, they are hermetically sealed, reductive, and constrained.

Because such massification models of online learning and teaching are unidirectional and discrete, they cannot support the conceptual relationships that are required for interdisciplinary learning, which is individualistic, expansive, open, and relational. They limit learners' ability to tailor content for their own specific needs or to venture across discipline boundaries. In other words, such tools do not enable learners to co-create their own, unique learning experiences. And this is essential to students in interdisciplinary fields.

Interdisciplinary courses require an open system that supports students to establish and locate their individual specialisations and learning goals and, at the same time, to draw relationships between an array of aligned fields and knowledge domains, to collaborate with specialists from other fields, and to adapt to rapidly evolving fields. In short, there is a need for them to map contingent relationships between disciplinary fields and to establish a conceptual framework for understanding such relationships from different vantage points according to varied and changing contexts and needs. Educators working in interdisciplinary and collaborative fields such as multimedia and communication design must therefore rethink the digital learning tools they employ to support their students.

It was from first-hand experience of the complexities that arise when teaching interdisciplinary, emergent and practice-based fields that this PhD project arose. As an academic in communication design and multimedia courses, I saw the challenges that such courses present to established online learning (e-learning) models. I first

encountered and defined these issues as an academic in the Communication Design Bachelor of Creative Industries (BCI) and double degree in Information Technology and Communication Design (BFA) at Queensland University of Technology (QUT) between 2002 and 2006. I then went on to research alternative models of online delivery upon my relocation to the BA (Honours) Multimedia course at Nottingham Trent University (NTU) in 2006.

The PhD research has been undertaken on a part-time basis in parallel with my professional responsibilities as a full-time university academic. These circumstances have allowed me to consider my research questions through a number of roles: first as programme leader for the NTU BA (Honours) Multimedia programme, then as course leader for the BA (Honours) Graphic Design course, and currently as programme leader for the BA (Honours) Digital Media Design programme at Bournemouth University, UK. Working on a PhD on a part-time basis has also presented challenges in a fast-moving field, of course. For example, concepts such as Web 2.0 and e-learning 2.0, which hadn't been articulated when I began the PhD, have since crystallised and are now fundamental to debates about online participatory cultures and learning engagement through online interaction.

Through experience and research conducted in these roles during a period of intense change, I realised that online, interactive learning approaches need to be configured in new ways if they are to adequately support interdisciplinary courses. While this PhD project arose from my insights into the complexities of teaching communication design curriculum specifically, it is my hope that its findings will also benefit other interdisciplinary areas, which face similar pedagogical pressures.

1.3 RESEARCH QUESTIONS, AIMS AND OBJECTIVES

In response to the problem of a lack of adequate and appropriate e-learning tools for teaching interdisciplinary, emergent and practice-based fields, this PhD project was organised around the following core research question:

How might we design online learning environments that are appropriate to, and effectively support students' learning requirements in interdisciplinary courses of study, such as communication design and multimedia?

This central question gave rise to other contingent questions, such as:

What can be drawn from existing models, and how might we evaluate their capacity for effectively supporting these contexts and tasks?

What key contextual factors and goals must be taken into account when designing online learning environments for interdisciplinary learning and research tasks?

In turn, what are the key considerations, priorities and principles for designing new online learning tools for interdisciplinary courses?

What alternate structural, conceptual and theoretical frameworks might be drawn upon to design an appropriate and effective online learning environment for interdisciplinary contexts?

And, what might such models look like – in practice?

These questions have driven the project design and the outcomes of this research project, and the understandings they have given rise to, are presented in this exegesis.

1.4 APPROACH TO THE RESEARCH: CASE STUDIES

To provide a foundation for this investigation, I have taken Queensland University of Technology's (QUT) BCI Communication Design course² and Nottingham Trent University's (NTU) BA (Honours) Multimedia course³ as case studies. As an academic within both courses, I have considered the changing nature of scholarship and pedagogy in them, including the evolving pressures faced by students, academics, and departments. I have observed how such courses have responded to design-industry expectations that students will graduate with interdisciplinary expertise and the skills needed for project collaboration. Therefore, this project might be considered to take an embedded case study approach, an approach that has enabled me to identify the key considerations required for interdisciplinary pedagogies and appropriate supporting technologies in such courses, as an invested stakeholder. However, I have

² The Communication Design discipline at QUT was revalidated in 2008 and is now the Interactive and Visual Design Department: <http://www.creativeindustries.qut.edu.au/study/areas/interactive-visual-design/index.jsp>

³ Recruitment for the NTU Multimedia course was suspended in 2012.

also drawn on the perspectives and insights of academic peers and students within these contexts, as well as contextual and literature reviews of the field.

Understandings drawn from these case study contexts led to a needs analysis, which in turn led to an evaluation of commonly used online learning tools, and their capacity to support the learning needs of students in emergent, post-disciplinary knowledge landscapes, as a literature review of online learning pedagogies. Seeking models for the design of alternate tools then led to a review of options offered by Web 2.0 and e-learning 2.0, as well as a literature review of wider fields that offer alternative conceptual and structural models. Together, primary research, in the form of a needs analysis, and secondary research, in the form of contextual and literature reviews, provided the foundation to establish the rationale and approach for the design of a new model, as well as a set of principles or priorities for online learning tools for interdisciplinary courses.

This culminated in the design of a new tool, which is presented as a major outcome of the research project. Besides the contribution to the needs analysis, the case studies provided a context in which to implement, trial, and evaluate the new tool as it was iteratively developed.

1.5 THE FORM OF THE RESEARCH OUTCOMES: CREATIVE PRACTICE AND AN EXEGESIS

This is a practice-based research project, which is presented in the form of 50 per cent practice and 50 per cent written exegesis. Primary research in the form of a needs analysis, the triangulation of research findings, and the development of design principles, along with secondary research in the form of theoretical and contextual reviews, has resulted in a practical research outcome: a new online learning tool for interdisciplinary courses. Entitled the Folksonomy, it is accessible at: <http://folksonomy.co>. Besides arising from the research, it can be understood as an instantiation of the research outcomes: an exemplar of a new model developed for online learning for interdisciplinary contexts. Its conceptual framework, design principles, development process, form, and evaluation are presented in this exegesis.

1.6 THE STRUCTURE OF THE EXEGESIS

This exegesis first presents the research that led to the design and development of the Folksonomy. It includes this introduction (Chapter 1: Background to the Research), which provides a background to the research problem and the research questions. Chapter 2: Literature and Contextual Review then provides a review of relevant literature and a discussion on design archetypes and the theory underpinning Technology Enhanced Learning, e-learning 1.0 and 2.0. It includes a contextual review, which establishes a needs analysis for online learning approaches to effectively support new design fields in higher education, such as those that sit at the centre of the investigation as case studies. And it presents a review of available web applications in the field of e-learning and an evaluation of their fit for purpose for new, interdisciplinary design contexts.

Chapter 3: Research Methodology explains the practice-led design approach to knowledge creation and the research methodology, including the selection of methods for the creative practice and data collection used in the realisation of the project outcomes.

Chapter 4: Priorities, Principles, and New Models for the Design of E-learning Tools to Support the Needs of Emergent Interdisciplinary Fields provides an overview of theoretical models drawn from the areas of sociology, cultural studies, critical theory, and philosophy, which have provided an analytical framework for the advancement of research in the form of a design solution. For example, Theodor Adorno and Walter Benjamin's metaphor of constellations, which describes a network of juxtaposed rather than hierarchically ordered interrelations, has been pivotal to the conceptual design of a new model. The chapter concludes with the triangulation of the background research developed through the needs analysis and contextual and literature review, and distils them into a set of design principles.

Chapter 5: The Iterative Design and Development of the Project's Creative Outcomes explains how the design research has unfolded in practice, provides a descriptive account of the iterations of the project during its development, and details the culmination of the design process in a high-fidelity, functional prototype. The chapter provides an account of the theory that has ultimately inspired the

underpinnings of an alternative conceptual and structural model for e-learning applications for new, interdisciplinary fields of design.

Chapter 6: Implementing and Evaluating the Folksonomy in a Learning and Teaching Context, reports on the trialling of the Folksonomy with multimedia students in the Multimedia Research Project module of their final-year coursework, at Nottingham Trent University in the UK. It presents qualitative data in the form of reflections by students on the value of the tool for the set task of drawing upon a variety of disciplinary domains and integrating them into their research projects.

Together, this explanation of the project's preliminary research, design considerations, design and development process, outcomes, and evaluation serves to position the discrete contribution of the Folksonomy and the overarching principles for its design, as a practice-led research outcome. It enables conclusions to be drawn about the software architectural affordances that must exist to support pedagogies in the emergent interdisciplinary fields of multimedia and communication design.

Chapter 7: Project Outcomes, the final chapter, then presents evaluative data, including measured usage statistics and backlinks or inbound links (IBL), and draws conclusions about the impact of the research. The chapter presents an explanation of the contribution to knowledge that the PhD makes in the form of a new model for online learning, which supports academics to enable students' knowledge acquisition through the integration of a variety of disciplinary domains, enables students and researchers to situate their individual practice in relation to aligned fields, and fosters collaborative research relationships.

Table 1.1 chronology of the PhD research as it evolved in parallel with other related theoretical issues and relevant technological innovations.

Table 1.1

A short Chronology of parallel developments

2005

After presenting a paper in 2005 at a QUT Online Learning and Teaching (OLT) Conference entitled 'Towards a Socio-Constructivist Approach to Learning and Teaching Within OLT Environments' and to the QUT Faculty of Creative Industries

Flexible Fantasies seminar about my Virtual Heteroglossia, I submit my PhD Proposal, Stage 1 and 2 documents.

I am involved in an e-learning project called 'Towards Critical, Collaborative and Creative ICT Literacies: Integrating Innovative on Campus and Online Learning Environments' funded through the QUT Teaching and Learning Development Large Grant Scheme. In parallel with this, George Siemens' publishes his milestone article entitled 'Connectivism: A Learning Theory for the Digital Ages' (2005), and Tim O'Reilly and Dale Dougherty publish their description of the 'Web 2.0' phenomenon (2005). The UK Higher Education Academy announced the introduction of their UK Higher Education e-Learning Benchmarking Exercise and Pathfinder Programme during a joint Academy/JISC session at ALT-C. 'The facebook' (2005) becomes 'Facebook.com' in August, continuing to restrict new registrations to North American universities and high schools up until September 2006 when it opens up to general user registration (Phillip, 2007).

2006

Upon successfully completion my PhD Confirmation and presenting the work to NTU colleagues I register the Reflective Journal domain i.e. <http://reflectivejournal.co.uk> and initiate a weblog pilot project with NTU Multimedia colleagues. The pilot is used as both a teaching resource and as a data collection tool for two subsequent conference papers (2009) (2009).

I am appointed Programme Leader for the Multimedia course at NTU, which gives me a more holistic insight into whole of course needs. In parallel, academic Bryan Alexander presents his discussion paper on the use and potential of Web 2.0 for education. In doing so he observes a dramatic shift away from the utility of linear metaphors such as the 'book metaphor' and the rise of 'microcontent' forms characterised in terms of being user-generated, open to revision and extensively hyperlinked (2006, p.34). The World Wide Web Consortium (W3C) released their working draft specification for the XMLHttpRequest object (2006), which is a

central component in the AJAX (Asynchronous JavaScript) technique (now popularised by Google's Gmail and image search content auto loading as well as Tumblr's infinite page reloading technique). The free education provider the Khan Academy, which would come to be recognised as a forerunner of Massive Open Online Courses (MOOCs) is founded (Finley, 2012).

2007

Researchers at the University of Mary Washington (UMW) created the UMW Blogs project entitled 'A Domain of One's Own' (2015). Barbara Dieu and Vance Stevens publish their comprehensive survey of freely available social networking platforms and tools as they are being commonly used by academics in their teaching practice (2007). In May Apple announce the launch of their iTunes U educational resource (2007). I present my Confirmation seminar via videoconference in December and set about creating a social software survey tool i.e.

<http://socialsoftware.folksonomy.org.uk/> as well as a prototype codenamed 'Gleaner' that would become the Folksonomy.

2008

I run a focus group with final-year Multimedia students to discover their perspectives on a late Folksonomy 1.0 prototype before finalising it on 1st October. I then deploy the tool with final-year NTU Multimedia Research Project students in the first term of the 2008 (UK, October to December) academic year. In parallel with this I concluded a pilot project on Multimedia students using weblogs to record their critical reflections on their creative practice.

Evernote and the research sharing platform Academia.edu launch in June (Libin, 2008) and September (2015a) respectively. Both are significant, Evernote because of its popularity for students as a cloud-based note taking, clipping and archiving service and Academia as a publishing platform/social software hybrid for university academics.

2009

I complete development on the revised Folksonomy version (2.0) in early October and deploy both versions 1.0 and 2.0 with final-year NTU Multimedia Research Project students in the first term of (UK) of the 2009 academic year. In parallel with this I also observe students in seven final-year Research Project tutorial groups over the course of the first term of the academic term. I conduct an interview in June with the Digital and New Media Manager for the UK arts organisation Sound and Music with David Rogerson at Somerset House in London.

I co-author a conference paper with Jools Ayodeji entitled 'Rehearsing Identities via Online Journals' which we present at the Australia and New Zealand Communication Association Conference: Communication, Creativity and Global Citizenship conference (ANZCA09) in Brisbane in July. Following this we co-author a subsequent paper, which I also co-author with Ayodeji entitled 'Rehearsal as a Naming Process Central to the Development of Creative Identities', which we present at the Designs on e-Learning International Online Conference that is hosted by the University of the Arts London. In parallel with this, the free zoomable online slideshow service Prezi is launched in July (2009). The tool quickly becomes a favourite for students and academics (as a replacement for the ubiquitous Microsoft PowerPoint).

The content curation tool Paper.li launches in April (O'Hear, 2013) and is subsequently adopted as a publishing platform by many academics. Gardner Campbell publishes a key journal article on the importance of open systems for enabling students to shape their own learning experiences, entitled: 'A Personal Cyberinfrastructure' (2009, pp. 58–59). Educational technology expert Swapna Kumar publishes her paper revealing significant differences between the perceptions of academics and students of the true value of using Web 2.0 tools in undergraduate education – concluding that academics have tended to overestimate students' interest in new technology-enhanced pedagogical methods (2009, p.312).

2010

I continued using the Folksonomy with my students, monitoring its use and actively re-blogging content based on their learning needs as well as in response to unfolding issues.

Eva Dobozy and Patricia Reynolds present a paper entitled: 'From LMS to VLE or from supermarkets to airports: Classifying elearning platforms using metaphors' at the 5th International Learning Activity Management System (LAMS) Conference in Sydney (2010). This is significant because it was used to elaborate the discussion in Chapter 2: Literature and Contextual Review about the awkwardness of e-learning platform metaphors. In parallel, Pinterest, the interest-based/photo sharing platform launches their first prototype in March (2015b), quickly becoming popular with many design students for creating virtual moodboards.

I continue to use the Folksonomy with my students, monitoring its use and actively re-blogging content based on their learning needs as well as in response to unfolding issues.

2011

I present my research on the evolving Folksonomy version 2.0 platform at the NTU Second Annual Art & Design and Built Environment Research Conference and Festival and make a presentation about the research to the School of Art and Design Research Committee. The process enables me to discover further insights into the work through feedback from peers. I presented my PhD final seminar in Brisbane, Australia.

2012

Massive Open Online Courses (MOOCs) generate widespread interest in higher education circles (George Siemens and Stephen Downes are widely recognized as the originators of the model through their initiative at the University of Manitoba in 2008). A conceptual model exploring the use of Web 2.0 technologies for promoting

collaborative learning in higher education is proposed that asserts the close integration of Web 2.0 tools with curriculum design (Exter, Rowe, Boyd, & Lloyd, 2012).

2013

IBM publish their 'Global Technology Outlook 2013' paper pointing to the innovation potential of e-learning through what they describe as 'personalised education'. Google introduce their content attribution system called Google Authorship (2013), which I have used as an example in Design Principle 6. I continued to work on the revised PhD exegesis.

2014

LinkedIn nominated 'Influencers' Don Norman and Scott Klemmer publish a critique entitled: 'State of Design: How Design Education Must Change', in which they call for the overhaul of design education so that it is more explicitly interdisciplinary (2014). LinkedIn, the professional reputation site makes it possible for all LinkedIn members to publish essays/long-form posts (Roslansky, 2014). Since then many research students and university academics (as well as industry professionals) have started to use the facility to build their professional academic profiles.

2015

I submitted my final exegesis for examination in February 2015. Facebook announce an e-learning initiative called Personalized Learning Plan (PLP) that is intended to scaffold learning for US Public Charter and Summit high school students (C. Cox, 2015; Goel & Rich, 2015). It remains to be seen what parallels this will have with the Folksonomy.

Chapter 2: Literature and Contextual Review

2.1 FIRST- AND SECOND-GENERATION APPROACHES TO E-LEARNING

The past two decades have seen the ubiquitous adoption of learning management systems (LMSs) across the higher education sector (Bacsich et al., 2010, pp.10-14). Information and communication technology (ICT) infrastructures, which include e-learning tools such as Desire2Learn Incorporated, Blackboard, and Moodle are the market leaders and are the most commonly used.⁴ They each provide an architecture or infrastructure that enables academics to upload course materials and learning resources for enrolled student cohorts online. Souer, Weerd et al. describe them as “a content repository for the reuse of information and integrated workflow for structuring the process of creation and publication of information” (2007, p.425). In broad terms, we might say that such tools mediate information organisation and information delivery through communication technologies.

As business tools, ICTs can increase productivity, most notably in the case of content management systems (CMSs), which provide a means for domain experts (who may not necessarily be technically adept) to manage files and publish content over a computer network. Their efficiency arises from a process of organisational abstraction and categorisation, which involves, according to Souer, Weerd et al. (2007), the strict separation of content and structure. This separation has three distinct application layers: one that handles the storage and retrieval of published content; one that manages the business logic that controls all transactions, data calculations, and user interactions; and one that involves the presentation of information to the user (the user interface). Buchanan argues that such tools

⁴ Philip Hill, Executive Vice President of management consulting company Delta Initiative, explains emerging trends in the LMS / Ed Tech Market. (Philip Hill, 2011)

therefore discretely identify and formally represent problems in a generic manner, as problem classes (Buchanan, 2001). ICTs can therefore be recognised epistemologically as the outcome of a logical or rationalist aim.

In the context of education, managing content delivery and access through an ICT involves a particular ontology and organising metaphor, which ensures that an organisational structure is consistent across courses, while each instance of use by a particular academic or subject provides a unique, self-contained repository of course materials and learning modules. As Stephen Downes, from the National Research Council of Canada, explains, “[the] learning management system takes learning content and organizes it in a standard way, as a course divided into modules and lessons, supported with quizzes, tests and discussions” (Downes, 2005). That is, the core attribute of what has come to be known (retrospectively) as e-learning 1.0 is the enabling of contextually specific organisation and production of content by individual academics, within a consistent framework. Because such tools enable individual teachers to present tailored learning content in response to local curriculum needs and, at the same time, provide an expedient, centralised means of consistent and generic course delivery, they have become standard infrastructure for university courses.

Put simply, ICTs provide a mechanism for information delivery. While they extend pedagogic possibilities beyond the mass distribution of static, one-size-fits-all topic materials (exemplified by self-contained CD-ROMs or websites on generic topic content, for example) by enabling the contextual customisation of curriculum, they continue to operate in a radial fashion, broadcasting information according to a one-to-many logic. In the model, students are cast as passive recipients of knowledge, which is transmitted to them in a generalised form by instructors and academics via electronic means.

Eva Dobozy and Patricia Reynolds note that some ICTs attempt to simulate real-world learning situations by enabling user interaction through a series of metaphors produced within widgets. This includes, for example, virtual learning rooms, electronic portfolios and virtual galleries, complete with schedules and calendars to order the content (Dobozy & Reynolds, 2010). However, while such

designs may extend information delivery into more interactive models, interaction by users or students is largely limited to navigating through content and responding to set, multiple-choice questions and tasks. They ultimately continue to replicate the well-established transmission model of communication, as outlined by Shannon and Weaver through their pioneering work at Bell Telephone Laboratories (1949). Despite a profusion of contemporary real-world simulations in other realms, learners continue to engage in the curriculum according to a now outdated and overly simplistic structural model.

That is, e-learning 1.0 produces a hierarchical relationship in which lecturers broadcast information, in a unidirectional manner, to their students. Its inherent structural model assumes that: curriculum content can be organised, communicated and received in explicit and unambiguous terms; knowledge is finite and stable; and information is not open to an interpretative response. It conceives of learners as subject to, rather than participants in, curriculum design, content selection, and course objectives. Without the ability to co-create their learning experiences, students become mute recipients of learning. By restricting their capacity to respond, contribute to, or reconfigure the information within the system, the interaction model and technology affordances of e-learning 1.0 mean that students can only develop methods for integrating published curriculum content into their own learning spaces or processes. They cannot *write into the pedagogical space*. Therefore, they cannot fully engage with it, and neither can they engage in dialogue with their peers from within it.

2.2 E-LEARNING 2.0

A new paradigm for e-learning has recently emerged (since this PhD project commenced). It has been labelled e-learning 2.0, although this term has so far been variously defined. E-learning 2.0 has antecedents in distance learning, and library and learning sciences. While it shares characteristics of computer-supported collaborative

learning (CSCL) and computer-supported cooperative work (CSCW),⁵ its evolution is perhaps more directly an extension of Web 2.0 technologies (Noss & Selwyn, 2008, p.4).

Tim O'Reilly from O'Reilly Media and Dale Dougherty from Medialive International provide a useful definition of the concept of Web 2.0.⁶ They explain that the phenomenon is part of an evolving trend towards designing for *hackability* and *remixability*, which is epitomised by the rise of open-source software movements (O'Reilly & Dougherty, 2005). They elaborate that Web 2.0 is less concerned with design formalism (media, modes, and platforms) than an "ethic of cooperation ... [provided through an] architecture of participation ... and the perpetual beta" (ibid.). Theirs is an argument that the value of Web 2.0 technologies is contingent upon the capacity of the service brokering they enable in terms of the ethos of participation and collaboration. O'Reilly and Dougherty signal an advance in technical innovation that broadens the previously narrow definition of the Internet as a publishing medium, into a technology for sustaining engagement through social and cultural interaction and participation. Or, as David Beer explains, the concept of Web 2.0 represents a "large-scale shift toward a 'participatory' and 'collaborative' version of the web, where users are able to get involved and create content" (Beer, 2009).

Prominent examples of Web 2.0 tools that enable social interaction through content posting, sharing, and commenting include Facebook, MySpace, Tumblr, and Twitter, which are micro self-publishing and personal status sites. Other applications that enable users to share and promote their creations of text, video, and images include YouTube, which facilitates the upload and sharing of videos, and Flickr, which facilitates the publishing of photographs. Others facilitate the collection of bookmarks and collation of interests, including Delicious, which prompts users to collect and share Internet links, and Pinterest, which *pins* sites or posts of interest as a collection.

⁵ CSCL and CSCW both involve the use of technology or groupware to enable users to work together to perform a common task. Gerry Stahl's book is a useful primer here: (Stahl, 2011).

⁶ Note that, according to Joan Curtis and Barbara Giamanco, the term *Web 2.0* was originated by InfoWorld editor-in-chief Eric Knorr not Tim O'Reilly and Dale Dougherty et al. as it oft-cited, see: (2010, p.23).

Each of these applications solicits recommendations and comments on content, and enables further sharing. The dramatic growth in the use of social software highlights the value that such web applications offer for communication, collaboration, and social and community interaction.

E-learning 2.0 adopts a similar participatory and social approach. It enables learners to not only read, but also write into, the pedagogical space. In contrast to LMSs, which cast students as passive information recipients, e-learning 2.0 tools enable learners to upload, share, comment, respond, engage, and interact. An e-learning 2.0 model enables learners to interpret, analyse, and actively inscribe (write) and share meanings, and to arrange content and content nodes as they participate in the production or sharing of learning materials. While e-learning 1.0, like Web 1.0, is hierarchical, linear, and unidirectional; e-learning 2.0, like Web 2.0, is integrative, interactive, participatory, and social.

E-learning 2.0 approaches to learning are commonly concocted by individual academics from existing applications. As an example, students may be encouraged to produce and publish commentary and reflection through online tools such as blogs (for example, WordPress, Tumblr, Blogger). They might share content and resources through video and image galleries (for example, Vimeo, Flickr, Pinterest). Additionally, they might be required to collect social bookmarking and bibliographic sources for referencing (for example, Delicious, Diigo, Zotero). A student group might decide to collaboratively develop ideas through authoring tools and open-source platforms (for example, Mozilla Popcorn Maker, SourceForge, GitHub), where they might distribute outcomes through podcasting (for example, SoundCloud, iTunes and so on) and engage in dialogue and exchange and share with peers through social media applications (for example, Digg, Reddit, deviantART). Because of the free availability of online tools, an individual academic might decide to integrate any such combination into the learning experience.

Applying such a suite of tools can enable students to write into the pedagogical space in multiple ways, and this is a central feature of the e-learning 2.0 model. As Downes explains, “content is reused and remixed according to the student’s own needs and interests” (Downes, 2005). This enables students to assemble and

organise their own collections of learning content. However, Web 2.0 technologies can also enable them to: respond to existing content by annotating it; produce and publish their own perspectives alongside the sources they find; and share their views, learning experiences, discoveries, and working methods with their peers. Moreover, e-learning 2.0 tools have the potential to provide a *porous* learning environment, in which students absorb content from within, as well as from outside of their subject, course or discipline. That is, they afford *extra-institutional* learning: learning that is connected to what students already know, including knowledge from outside the classroom (Downes, 2005). Put simply, e-learning 2.0 supports students to construct their own learning frameworks by affording them the agency to manage their own learning processes and to contribute to the learning of others.

The ability to organise and write into the pedagogical space can be aligned with Roland Barthes' concept of writerly texts, which describes the plurality of a text⁷ (Barthes, 1975, pp.4–5). Barthes explains that, whereas readerly texts provide a smooth, linear, contained interpretation, writerly texts enable a plurality of meanings and prompt interpretation and response. Although Barthes articulated this concept before the wide uptake of the Internet, the concept can be extended to characterise the inflection of meaning and responsive interpretation enabled by e-learning tools. While e-learning 1.0 models might be understood as presenting readerly texts, e-learning 2.0 models might be understood as facilitating writerly texts. Or, as Gardner Campbell has argued, through them, "students are able to shape their own cognition, learning, expression, and reflection" (Campbell, 2009, pp. 58–59).

We might also take this further. As I established with a colleague in an early publication during the course of this research project, through the implementation of Web 2.0 technologies and applications, learners can be supported to act autonomously, as they integrate collections of their own research, and work with the collections of others (Ayodeji & Perkins, 2009, p.113). This approach aligns with the concept of *personalised learning*, which is defined by the Teaching and Learning in

⁷Barthes' post-structural analysis of Honoré de Balzac's short story "Sarrasine" is an example.

2020 Review Group (2007)⁸ as a process that characterises learners' knowledge, skills, understanding, and attitudes as the key priorities of pedagogy.

Furthermore, using some Web 2.0 technologies, users can locate themselves and their interests within an expanded field of social relationships. Similarly with e-learning 2.0 contexts, students can locate themselves and their interests within an expanded field of practice. In doing so networks are formed from nodes of intersecting discipline connections, which can be understood as the connection between individuals and groups. Students can situate their practice in relation to other learners within their peer group, as well as researchers from the outside world – both within and beyond their discipline (Ayodeji & Perkins, 2009, p.114).

In this sense, Web 2.0 tools can be characterised as networked and rhizomatic because they enable an interconnectedness of individuals within relational communities of practice. *Rhizomatic structures* are described by Gilles Deleuze and Felix Guattari as a form that has “no beginning or end; it is always in the middle, between things, interbeing, intermezzo” (2002, pp.24–25). They are composed of *lines of flight*, which may constantly take new directions and extensions within the network. In relation to learning, rhizomatic structures privilege relational interests (collective and shared interests) and the continually evolving networks between them, over individual or centralised agendas.

Such relational networks might also be related to the connections between discipline content and between fields, as well as the interconnection of specific tools such as weblogs, with other collections of tools. All of these networks of relationships form and reform, evolve and re-centre, as they are constantly (re)shaped by students' changing needs and knowledge circumstances.

Through their networked, relational structural model, Web 2.0 tools afford users agency to control their own knowledge relationships according to the formation of connections of commonality – which are neither static nor stable.

⁸ The Teaching and Learning in 2020 Review Group was a working group for the UK Labour Government's Department for Education and Skills (DfES).

E-learning 2.0 then offers the potential to refocus online learning around the individual student, who is situated at the centre of organisational relationships for the purpose of their learning, while also providing the opportunity to develop connective knowledge relationships and in-common interest networks between students. Tracing and reconfiguring rhizomatic paths between content nodes can help students to situate themselves at the intersection of multiple, expanded fields as they rehearse and gradually consolidate their personalised narratives of practice and narratives of place in relation to those of others, and as they assimilate into an interdisciplinary educational and professional environment.

While e-learning 1.0 tools fulfil a useful function in terms of curriculum delivery, they are characterised by a focus on enabling academics to manage and publish content for *generalised* learning and learners. E-learning 2.0, on the other hand, offers the promise of supporting learners to independently manage their individual learning needs and to construct their own learning frameworks and pathways – which may be relatively similar to, overlap, or be distinct from, those of their peers within the same learning context. It potentially enables students to manage their own learning processes and priorities, and to form relational networks between themselves and their peers – both within and beyond the classroom, and in both the world of research and the students' (future) profession.

However, while e-learning 2.0, as a concoction of social media applications offers this significant promise, it also has limitations. It requires academics to gain, and continually update, their knowledge of diverse publishing options and web tools. Such a situation presumes a capacity to make sense of the appropriateness of each of them for their own, often complex, classroom circumstances. As is the case with all technologies, the logic and structure of e-learning 2.0 applications determine their affordances (functionality and use) and this, in turn, determines their potential application, as well as their limits, which must be evaluated on a case-by-case basis. Moreover, any unintended consequences for learning must be anticipated, mediated and defused. This all places additional demands on individual academics, which extend beyond content expertise and broad pedagogical understanding.

The benefits of integrating Web 2.0 technologies into the curriculum are so far unproven, and their potential use in interdisciplinary learning contexts is so far under-theorised. Therefore, while an academic may elect to use one or multiple Web 2.0 tools in the curriculum for a specific purpose, the problem of designing online learning environments that aggregate such possibilities into a purposeful application that is appropriate to, and comprehensively supports, interdisciplinary learning contexts such as communication design and multimedia remains unresolved.

2.3 THE CONTEXTS OF THE RESEARCH PROBLEM: TWO CASE STUDIES

As I have established in the introduction, to determine the learning needs of interdisciplinary students, and to test potential approaches, two specific university learning and teaching contexts have served as specific instances of, or case studies for, this research project. They are the Communication Design Bachelor of Creative Industries (BCI) course at Queensland University of Technology (QUT) and the BA (Honours) Multimedia course at Nottingham Trent University (NTU). Both courses sit within the field of digital design and both teach students to conceive of and design digital products and services. To do so, their curriculum broadly covers a range of skills, practices, and theories for: visualising and creating user interfaces that engage the user, communicate effectively, and ensure ease of access to information and resources; designing structures or architectures that make meaningful relationships between content and tasks; and developing interaction design processes that ensure ease of use and access to the inherent functions of technologies and digital applications.

Like many similar courses globally, both courses began in the 1990s following the advent of the Internet and interactive media. It was a time in which many design companies began to seek a new type of design graduate with a combination of traditional design understanding and new digital media production skills. There was increasing demand for: visual designers with skills in new software tools such as Adobe Photoshop, Illustrator, and InDesign; interaction designers capable in Adobe Flash, Director, and (more recently) Processing; motion graphics and computer animators proficient in Autodesk Maya, Adobe After Effects, and Apple Final Cut Pro; and web architects skilled in HTML and (more recently) CSS3, XHTML, HTML5,

jQuery, and so on. Universities and technical colleges across the world responded to this demand by establishing new degree programmes to equip graduates to develop new approaches to design using emerging technologies and to contribute to what would become known as the information revolution.

Universities interpreted this eclectic field differently, as they placed emphasis on different discipline areas, adopted a range of naming conventions, and placed such courses in different schools, such as Creative Industries, Art and Design, Media and Communications, Science and Technology, and so on, according to local factors such as student demand, industry expectations, institutional priorities, and interpretive paradigms. Steven Heller, editor of *Voice: AIGA Journal of Graphic Design*, has noted the lack of uniformity that arose in North American courses. He argued that, while there is lack of public familiarity with the field, because universities take inconsistent approaches to curricula and naming conventions, students seeking university entry can be confused by the array of options presented to them (Heller, 2005). This has parallels in the UK, where the online portal provided by the UK Universities and Colleges Admissions Service (UCAS)⁹ to support candidates applying for university places leads to a raft of options that obfuscates rather than clarifies choice. For example, searching *communication design* in England (excluding Scotland, Wales, Northern Ireland, and European Union) leads to 91 distinct degree titles, including Visual Communication and Media Design; Art/Visual Design; Advertising Design; Interactive Entertainment (Digital Art); Computer Network Technology; Computing and Systems Development; Digital Communication Design; Art and Design History, and Media and Communication; Creative Writing Led Community Practices; Communication Design (Graphic Design or Illustration); Interactive Animation; Web Development; Network Management and Design; Digital Visualisation (Art and Design); Electronic Engineering – Communications and Ethical Hacking. Entering *multimedia*, on the other hand, leads to a staggering 248 matches awarded across

⁹ Undergraduate university enrolment is managed by UCAS (UCAS, 2014). Prospective students must discover appropriate degree courses through the UCAS website: <http://wwwucas.com/>

Bachelor of Arts, Bachelor of Science, and Foundation degree¹⁰ programmes (157 of which are uniquely titled).¹¹

However the curricula of communication design and multimedia courses are named and located within a particular university, they are necessarily design oriented, practice based, and digitally mediated. Rapidly evolving, they have had to keep pace with a rapid expansion of online communication, desktop applications, and advances in software engineering. In addition, with curricula located at the intersection of multiple disciplines, they necessarily embrace a broad range of design theory and practical skills, and integrate them into their programmes. That is, students in the case study courses, like others in communication design or multimedia programmes more broadly, are required to draw on understandings from a range of traditional and new design perspectives, develop a range of digital media skills, and acquire a variety of professional practices. In addition, because universities (as a point of differentiation from technical colleges) aim to provide design graduates with the capacity to lead innovation, they must develop analytical skills, independent research strategies, and the capacity for innovation in this emergent field.

The two case study examples are useful in explaining how this configuration operates in practice. They provide insights into two specific situations – those of second-year students (QUT) and final-year students (NTU). In both situations, students are required to make sense of indistinct, cross-disciplinary, and shifting knowledge domains.

Midway through a course, second-year students might be asked, for example, to design and produce a web application for a commercial client. Typically, they would first be required to analyse the business needs of the client and then establish a project management plan. They would evaluate potential users' access, needs, and practices, and then ascertain visual and interaction design requirements, explore

¹⁰ This is equivalent to the first two years of an honours degree: <http://www.ucas.com/how-it-all-works/explore-your-options/different-types-study>

¹¹ This data is derived from listings published on the UCAS website via their search tool for prospective students.

software options, and consider theoretical models for conceptualising the project. They would then go on to apply visual design, information architecture, and interaction design principles to develop a design solution, which would then be tested and evaluated. That is, they would need to integrate an understanding of project management and knowledge of an analytical method (such as ethnographic enquiry), design acumen, technical skills, and evaluation techniques.

Students typically require support for such activities through a combination of lectures and a design studio or atelier method, through which, as Ashley Hall and Tom Barker explain, “design is taught in a vocational manner to mirror industrial activity and practices” (2010). They also need to supplement their curriculum materials through course materials, textbooks, online learning tools, and self-directed research.

For second-year students, this complex situation requires breadth of focus and understanding. This potentially limits their capacity to assimilate deep specialist knowledge across the various subjects they must draw on. Moreover, it threatens the coherence of their learning experience and means that defining their professional identity, as a specialist, is likely to be deferred.

In later years, students begin to specialise in a particular field (say graphics, information architecture, or animation) and they begin to define their professional identity as they work as a domain specialist within project teams. At this advanced level, they must also engage in sustained theoretical, conceptual, and technical discovery processes, and they must demonstrate scholarship. They must be able to situate their practice within the broader design field through a written text that is produced in tandem with their design practice. To do so, they must draw on a range of disciplinary fields to produce a literature and contextual review, and they must develop a conceptual and theoretical framework for their uniquely situated design approach.

An example final-year subject, which represents a specific case study for this PhD project, is a third-year NTU subject, entitled Research Project. A 50-credit-point module (each year of study is composed of 120 points), it is designed to support specialisation and research training. In it, students must not only evidence a command of their chosen field of specialisation, they must demonstrate the capacity

to construct conceptual models through applied research; implement design knowledge and technical skills to produce functioning prototypes; and plan, manage, and realise creative outputs. At the same time, they must evidence a scholarly approach and engagement with established academic theory, the capacity for independent research, and the ability to situate their project outcomes within the broader fields of (often interdisciplinary) theory and practice. Furthermore, they must evidence the efficacy of their design outcomes through evaluation and data presentation. They are required to present their claims through academic writing, which demonstrates how they have contributed to the (expanded) field of practice.

This context brings into sharp relief the interdisciplinary tensions and rapidly evolving contexts that threaten communication design and multimedia students' ability to locate their specialist practices and knowledge domains within the broader conventions and discourses of what is an interdisciplinary field. They must develop a rich, multifaceted sense of their location at the intersection of aligned and impinging specialist fields in order to understand the opportunities for, and potential of, their contributions to the field. To do any less would limit their identity formation as new researcher-practitioners.

Since students typically pursue an individual specialisation and are uniquely situated within the field of multimedia, they tend to rely on personalised support from academics to develop their practice, and individual guidance towards the direction of texts and resources most relevant to their particular research needs. The range of students' specialisations across several disciplines (such as graphic design, interaction design, IT, animation, filmmaking, information architecture, persuasive marketing, and project management) places complex expectations on the educators teaching in this final-year programme. They must support interdisciplinary teams, as well as provide support to individuals who are integrating disciplinary crafts, technical skills, and theoretical understanding. To do so, they must understand the specific focus of each individual student (which may evolve with the changing needs of each new project), and they must have the capacity to support students to locate themselves at (varied) disciplinary intersections. Moreover, because these fields constantly change in form, as well as in terms of the mediums and technologies that drive and define them, academics must stay abreast of new technical developments

and encompass new fields as required (for example the need to embrace cartography with the recent advent of locative media).

2.4 THE CHALLENGES OF CLASSIFICATION AND FRAMING

Theorists, designers, industry practitioners, academics, and university career counsellors have variously attempted to make sense of the emergent, interdisciplinary fields of communication design and multimedia. Some have offered detailed descriptions of the issues, while others have given accounts of their uneasy contextualisation within the academy (for example, discussions by Mourad and Kolko mentioned in the introduction). A particularly useful theoretical framework for understanding this complexity is provided by Basil Bernstein, who characterises interdisciplinary contexts as those in which the former boundaries between discrete disciplines have dissolved into “regionalised discourses” (Bernstein, 2000, p.52).

To explain regionalised discourses, and the tensions and problems that underpin them, Bernstein sets them against the concepts of *classification* and *framing*. Classification, according to Bernstein, shores up the traditional university discipline model. By defining and delimiting disciplines, classification protects discipline boundaries. Traditional disciplines, like the natural sciences, law, and architecture, seek to maintain their identity by defining their specific intellectual field, key texts, specific practices, rules of entry, forms of examination, and licenses to practice (Bernstein, 2000, p.52). Bernstein explains that classification “maintains the relations between the categories and their distinct voices [while suppressing inherent] contradictions, cleavages and dilemmas” (Bernstein, 2000, p.6–7). That is, classification legitimises a discipline by codifying its inherent academic scholarship, discourse, rules, and practices, while simultaneously working as a strong insulating force, and explicitly and implicitly excluding other marginal practices. Indeed, the identification of a distinct discursive and practice-based field is a strategic function of disciplines, through which knowledge is territorialised, regulated, and stabilised.

For students, classification establishes order as it effectively situates them within a particular professional field. Pedagogical discourses maintain classification by framing curricula in relation to the discipline’s core texts, practices, registration

requirements, and qualifications. Framing thereby provides a means for pedagogic codes to be internalised and assimilated by students (Sadovnik, 2001, p.689). In concrete terms, students must demonstrate the recognition and application of the distinct attributes of their discipline within a localised learning environment. They do so by interpreting disciplinary codes in order to apply them.

Bernstein describes the process as one in which students must perform a kind of triangulation, correlating their learning needs with the needs of the discipline and the requirements of the academy. They must purposefully operate at this intersection as they produce appropriate, discipline-defined assessment outcomes. He concludes that the strong, centrifugal force of a discipline “regulates relations within the individual” (ibid. p.7) and goes on to explain that students “organise meanings and their expression at the level of the individual in specific contexts” (Bernstein, 2000, p.105–106). That is, the evaluation of academic performance is the correlation of a student’s ability to reconcile the specific requirements of a given disciplinary context with the mastery of disciplinary cues and practices, while fulfilling academic standards.

As I have discussed elsewhere (Ayodeji & Perkins, 2009, p.112), classification, and the pedagogical framing of disciplinary discourses and practices, confer discursive and productive agency to learners as they develop their professional practices. They produce individual learning identities within the framing of classification, which they enact through engagement with particular learning situations. Being situated within a discrete disciplinary context enables learners to interpret complex and interdisciplinary situations from a singular perspective, and to act, as a professional would, within set boundaries and practices. That is, students exercise their agency as discipline professionals through the realisation of processes that govern their performance within an ascribed disciplinary context.

Put simply, Bernstein’s theory of disciplines centres on professional identity formation based on differentiation, which is established through clearly defined disciplinary attributes, knowledges, conventions, and practices. Classification regulates access to disciplinary structures, while framing confers the ability to produce legitimate scholarly practices and texts within them.

Interdisciplinary courses challenge this traditional disciplinary model, as they undermine the maintenance of rigid and impervious epistemological boundaries. They corral knowledge from across the disciplinary spectrum, including knowledges that might traditionally be thought to reside within a core discipline, as well as multiple aligned (and even tangential) fields, according to changing circumstances. In the case of communication design and multimedia programmes, this includes perspectives from design, computing and information technology, visual arts, media studies, professional writing, humanities, and business management.

In such contexts, which are eclectically transdisciplinary, porous, absorptive, and fluid, students do not have the anchor of a unified and strongly defined disciplinary discourse. Instead, they are presented with theoretical and conceptual models and processes derived from a variety of different disciplinary domains. Moreover, these discourses and practices are recontextualised, and perhaps even reinterpreted and redefined, over time.

Bernstein explains that such instability gives rise to a problem of disciplinary nomenclature, which he calls *weak classification*. He describes weak classification as disciplinary contexts in which the boundaries between traditional knowledge areas have broken down. He goes on to argue that weak classification presents difficulties in pedagogical transmission and assimilation (framing) due to multifarious, and often inconsistent disciplinary practices (Bernstein, 1973, p. 205). This limits students' ability to recognise disciplinary norms (classification) due to the convergence of an array of conceptual and cultural factors associated with multiple discipline domains. For the student, the problem of interdisciplinarity arises from weak classification and the general destabilisation this causes to their disciplinary location and cultural context. This not only impacts on their capacity to classify and frame their practice, but also to act as a "legitimate" professional in their field.

While Bernstein relates the problem of weak classification to learning contexts, it can be argued that its effects are also endemic within the broader field of communication design. The shifting terms of reference that constantly redefine this field's discourses and practices impinge on professional designers because they can change, project by project. Moreover, this ambiguity is exacerbated by the fluid and

emergent nature of the field. Its effects are encountered by designers as they negotiate the various languages and practices of project collaborators. It also produces challenges to effective communication between businesses commissioning creative projects and the designers who execute them. As the former chair of the UK Design Council, Sir George Cox, explains in the oft-cited *Cox Review of Creativity in Business* (2005), the problem of communicating through differing terms of reference is the “inability of business people and specialists to speak the same language, a failure to understand how a combination of engineering, technology, creative and business skills can contribute to a business, and a misunderstanding about what ‘creativity’ is and how to manage it” (ibid., p.28).

This problem of weak classification, or what might be more broadly called an expanded and as yet ill-defined field (collection of fields), has led to calls for clear and explicit guidelines to be produced through external verification and professional certification. For example, in evidence supplied to the UK Government’s Culture, Media and Sport Select Committee, the Creative Skillset¹² explains that there is considerable variability across the creative industries, especially in the area of professional skills training and development (2012). In response, agencies such as the UK’s Chartered Society of Designers¹³ are actively working to alleviate definitional uncertainty and the UK Design Council has published a range of guides to support businesses. These guides foreground the economic benefit of design and pay considerable attention to communication requirements for commissioning projects. The World Wide Web Consortium (W3C) – the industry body that develops web standards and advocates for integrated information technology infrastructure – might similarly be considered to have been established in response to the weak classification of the field of web design, and the attendant array of languages, practices, and disciplinary assumptions that this has given rise to. In its mission

¹² Creative Skillset is the UK Creative Industries’ Sector Skills Council (SSC) (<http://www.creativeskillset.org>).

¹³ The Chartered Society of Designers (<http://www.csd.org.uk>).

statement, W3C explains that its goal is to “lead the World Wide Web to its full potential by developing protocols and guidelines” (World Wide Web Consortium).

Despite the advantages of establishing definitions, guidelines, protocols, and regulation, they have not yet been widely or uniformly adopted across the rapidly changing communication design disciplines. Therefore, while attempts have been made to frame this new field, they have encountered challenges due to its emergent and evolving nature. Such challenges are writ large for academics and the students they teach.

2.5 OPPORTUNITIES

If classification and framing confer access and agency to learners as they develop their professional practices, then weak classification found in interdisciplinary contexts has the potential to have the opposite effect and lead to difficulty in professional identity formation. However, it also has the potential to be a liberating force. Communication designer and educator Neal Haslem explains the opportunities that weak classification presents for the field of graphic design, which has expanded from the traditional medium of print to incorporate mediums in which designers must consider temporality, interactivity, motion, space and sound. He argues that, along with the broader cultural concerns that these domains bring with them, their modalities impinge on the production and interpretation of visual forms (Haslem, 2009). Haslem goes on to explain that a transformation of the field has occurred as graphic designers explore new ideas unrestricted by traditional definitions, and approach design as a methodology for constructing meaning and shaping experience. That is, the weakening of classification has released graphic designers from the need to define their practices wholly in terms of media or material form.

Lucila Carvalho, Andy Dong, and Karl Maton similarly describe the design professions as constantly reinventing themselves, as knowledge deemed valuable to the field is continually revised and recontextualised. However, they go on to define design in terms of knowledge specialisations and particular sub-disciplinary understandings, or *differing grounds*, which enable designers to meaningfully manipulate objects in accordance with the practices of their discrete fields. Drawing

insights from interviews with designers from various fields (including engineering, architecture, digital media, and fashion design), they employ Legitimation Code Theory (LCT) to provide a sociological framework for understanding the changing nature of design. They explain that differing grounds constantly redefine what is considered relevant to both the design disciplines and design practitioners (Carvalho, Dong, & Maton, 2009, p.485). This takes into account the effect of rivalries that shape the discourses of the field, as well as the shifting identities of practitioners. Providing a means for analysing the structures of knowledge and practices that are shaped by the struggles of practitioners for status and resources, they argue that differing grounds provides a means for “competing claims to legitimacy [according to] what should be considered the dominant basis of achievement within the field” (ibid., p.487). However contested, differing grounds also provide an impetus for criticality, and a trigger for new knowledge production and innovation in practice.

Awareness of such issues and the challenges and opportunities they present is an important part of learning what it means to be a professional within an evolving interdisciplinary field. In a pragmatic sense, by the conclusion of their course, students in a Communication Design or Multimedia programme must become expert in a specialist disciplinary framework and adopt its theoretical models, discourses, methodologies, and professional practices; alongside this framing they must also become fluent in, and respect, the contextual and theoretical frameworks, methods, and processes of aligned fields (for they will collaborate with specialists in complementary fields throughout their careers). This necessitates providing students with the opportunity to formulate individual specialist perspectives on the nature of professional practice as well as the opportunity to develop the capacity to collaborate and to integrate the perspectives of other specialists as they work together towards a common goal (Bonk & Cunningham, 1998).

Curtis Jay Bonk and Donald J. Cunningham describe learning that emulates the collaboration and knowledge sharing of an interdisciplinary professional field as *socio-constructivist* (1998, p.32). Socio-constructivist learning engages students in an authentic design process through a live or simulated design brief in which students assume specialisations in order to achieve a design outcome. It also involves them in a dialogic exchange with their peers, as well as in the process of integrating the defining

features of multiple relevant disciplinary discourses (discursive fields). That is, in design courses, real and simulated work-integrated learning practice must emulate interdisciplinary collaborative contexts, which requires students to work in teams of specialists to achieve a design outcome (Candy, 2000). It is in this way that multimedia and communication design students construct meaning and professional identity.

From these discussions, we can contextualise QUT's Communication Design and NTU's Multimedia courses as weakly classified because of the unclear and expansive disciplinary boundaries in which they operate. While, in Bernstein's terms, a collective, coherent disciplinary language, set of discourses, and in-common practices would enable student practitioners to more readily recognise and adopt appropriate behavioural cues (recognition rules), and would in turn enable them to more readily produce professionally recognised work, such disciplinary attributes are lacking in these design contexts. On the other hand, liberation from established discipline constraints, opportunities for sub-specialisation, and collaboration in a socio-constructivist learning context, and the potential for innovation through new mediums, technologies, and multidisciplinary practices, provide a counter-balance in terms of advantage.

Beyond the advantages and disadvantages of operating in a fluid, unstable, and expansive field, this situation creates a unique set of issues for students and academics. The complexity, change, and uncertainty of the field mean that students must develop ways of constantly re-articulating and reframing their knowledge requirements. Academics must provide scaffolding for students to not only develop traditional design understandings (aesthetics, user needs-analysis, fit for purpose, and so on), but to locate their individual practice within a specialisation, at the same time as positioning themselves at the intersection of named fields. They must support them to become skilled at assimilating new knowledge opportunities and to become adept at integrating input from other disciplinary perspectives – all within a constantly transforming learning context. This not only challenges academics themselves; it also challenges the capacity of existing pedagogical apparatus, including both the physical and virtual learning environments that academics draw on to support students in learning activities and self-directed research.

2.6 A FOUNDATIONAL PROPOSITION

When seeking to support the research enquiries of my students in the interdisciplinary and emergent Communication Design course at QUT, and then in the Multimedia programme at NTU, I was well placed to observe these pedagogical challenges first-hand. From these observations, combined with the literature review I have summarised above, I developed the foundational understanding that learning in multimedia and communication design courses is not only multidisciplinary and interdisciplinary, it is contingent, situated, and relational, and it necessarily involves networked, social, and collaborative processes of framing.

I was also well placed to evaluate the capacity of online learning environments to accommodate and support the complex teaching and learning needs that this gives rise to. The affordances of e-learning ICT infrastructure profoundly influence the opportunities that are available for institutions, academics, and students. When adopting e-learning 1.0 models, which are ubiquitous and often mandated in universities, academic and student users must limit themselves to (or learn to co-opt or hack) the options they provide for learning engagement. It became clear that such digital learning tools that have been designed for, and widely taken up in, higher education cannot entirely serve students' learning needs in emergent interdisciplinary design contexts. Because they have been designed to accommodate, and perhaps even reinforce, the classification models of traditional disciplinary structures, they are inadequate for complex, interdisciplinary, and evolving pedagogical landscapes.

The limitations of e-learning 1.0 models are particularly apparent in the learning contexts that characterise the QUT Communication Design and NTU Multimedia courses, in which: the hermetic boundaries of disciplinary content are constantly under siege from all sides; the intersection of disciplinary fields produces knowledge structures that are inherently unstable; and traditional scholarly perspectives are challenged by new technologies and theories. Students in such situations must be able to articulate their unique, individually situated knowledge requirements at the intersection of multiple disciplinary domains. They must be able to renegotiate pedagogical codes and reconcile contradictory and changing contexts caused by weakened classification. These students must be afforded the agency to construct

personalised knowledge models within a socio-constructivist learning framework. None of this is possible in the information delivery model provided by e-learning 1.0.

The evolving features of Web 2.0 are better aligned with the needs of interdisciplinary fields within higher education courses. Significantly, Tim O'Reilly and Dale Dougherty published their Web 2.0 definition (2005) in the same month that I presented a conference paper describing an initiative I ran at QUT to facilitate socio-constructivist interaction through the use of such tools during the early phase of this PhD project (Perkins, 2005). That is, while it was not yet named, this PhD project emerged in parallel with the Web 2.0 paradigm. It might therefore be understood as an expression of e-learning 2.0 and be explicitly located within it.

As I have established, Web 2.0 technologies, and e-learning 2.0 approaches that incorporate them, can potentially support learner differentiation, afford students' agency, and support socio-constructivist approaches to learning. However, while generic social media applications such as Facebook, Twitter, Flickr, wikis, and blogs may each realise some of the attributes that are required for interdisciplinary fields, their purpose is broad and generic, rather than tailored to learning needs and contexts. Moreover, it is unlikely that any one of them can comprehensively support the learning needs of communication design and multimedia students on their own, and in combination, as a concoction, they are limited by incoherence.

Despite the structural and conceptual capacity of Web 2.0 applications and their extensive uptake in social and business contexts, there remains a lack of coherent, fit-for-purpose technological learning tools for the complex, interdisciplinary, and socio-constructivist learning contexts of digital designers. The potential of e-learning 2.0 is yet to be realised within coherent, agile and relational applications. It was from identifying this gap in the field of online learning for interdisciplinary courses such as communication design and multimedia that I embarked upon designing a bespoke, purpose-built application that has the specific purpose of supporting student learning in such evolving interdisciplinary courses. I set out to apply principles of learning design, along with Web 2.0 principles and capabilities, to an experimental approach to developing a new application to facilitate

the expression of uniquely situated knowledges, afford learner agency, and support socio-constructivist approaches to learning in interdisciplinary courses.

This practice-led PhD project has centred on the design of a bespoke online learning tool, which has evolved over the course of the research in parallel with a number of publically funded knowledge management projects and online services and tech start-ups. Despite its humble scale, my initiative can be compared quite favourably with such influential projects and in doing so helps to add some perspective about its potential and impact.

Chapter 3: Research Methodology

3.1 INTRODUCTION

Because this project has involved seeking solutions to complex problems associated with teaching interdisciplinary curricula within rapidly evolving multimedia and communication design courses, it might be characterised as pedagogical research. However, given that the central question of this research project is *How might we design new online learning environments that are appropriate to, and effectively support, the learning requirements of interdisciplinary courses of study such as communication design and multimedia?* the primary research focus is on a design solution. That is, while the project outcomes have been developed to benefit teaching and learning, the primary research problem was one of facilitating engagement with learning through technology, and this is fundamentally an interaction design problem. The project therefore is a design investigation.

At its heart, this is a practice-led research project that has explored solutions to a research problem through the design and development of a creative artefact. Practice-led research involves the production of creative practice that embodies, or instantiates, knowledge acquired through the research process. As Liora Bresler (2009, p.17) notes, the artefact is created systematically and animated through the deft use of tools and materials. A practice-led research project that involves finding a solution to a known problem might more accurately be called practice-based or problem-based research, as it serves to research and then enact a particular, responsive design solution. In the case of this research, this has involved investigating the problem of effectively designing an e-learning framework for enabling learners to develop their capacity as design practitioners and researchers, to recognise the distinct features of their specialist communication design or multimedia fields, and to acquire interdisciplinary expertise. The designed outcome, which instantiates the findings of the research, is a web application.

As is usual in practice-led design research, this project has involved a multi-method approach, and sequenced project phases. It first involved situating the research project within the field of e-learning, interdisciplinary learning frameworks, and socio-constructivist learning through a literature and contextual review. Discourse analysis – of both written texts in the field and other types of “texts”, namely e-learning applications – also served to establish an interpretive paradigm and conceptual framework for the research. Preliminary research in a practice-based research project typically also involves focal or primary research into a particular instance or instances of the research problem. In this project, courses at QUT and NTU have served as exemplary instances of the research problem, and have provided the contexts for a user needs analysis (outlined in Chapter 2).

The triangulation of the literature review, contextual review, and user needs analysis served to establish a theoretical framework and a foundational proposition that, because learning in interdisciplinary multimedia and communication design courses is a contingent, situated, relational, networked, social, and collaborative process, neither current discipline-centric e-learning 1.0 approaches, nor a concoction of e-learning 2.0 approaches adequately addresses the needs of such courses, and that a new approach is needed to more effectively serve them. In brief, this is the design problem that the project has set out to resolve.

A conceptual framework was developed from principles derived from a review of Web 2.0 applications (detailed in Chapter 2) in combination with ideas and structural models from social science and critical theory (detailed in Chapter 4). This resulted in a set of design priorities to underpin the propositional design solution (detailed in Chapter 4).

The creative practice ensued through a process of evolutionary software prototyping. Experimentation through the application of the principles in practice led to a design resolution to the problem. The research experimented with speculative approaches to supporting learning through software design within interdisciplinary contexts (described in Chapter 5). This resulted in functioning prototypes, which were tested in context, and in use, within the case study contexts. Social science data collection techniques were used to ensure the robust management, analysis, and

validity of the data collection, selection, interpretation, and analysis phases (that is, the use of multiple measures to derive meaning from the same phenomenon) (explained in Chapter 6).

This chapter provides a detailed description of the project's methodology and this sequenced, multi-method approach to the research.

3.2 OVERARCHING METHODOLOGY: PRACTICE-LED RESEARCH

The overarching research methodology of this project was practice-led research. In practice-led research, the research enquiry centres on the production of an artefact. In the field of design, it does so through an investigative praxis, which involves producing new knowledge through preliminary research and analysis (of the field, the problem, and its contexts), then applying the insights gained into the formulation of design principles, which in turn underpin the design of the form and function of an artefact. The resulting artefact operates as an instantiation of the principles that have been formulated for solving the design problem (the new knowledge), and it can be tested for its effectivity (and hence the efficacy of the principles) (Hamilton & Jaaniste, 2009, p.6).

Bruce Archer (2004) and Christopher Frayling (1994) both conceptualise research through design practice as harnessing design tools and methods to transform (new) knowledge into concrete form. Archer explains that art, design and technology research activity involves enquiry that has similar goals to traditional research. While practice might be primarily intended to serve an instrumental purpose, it can also provide insights that are explicit, systematically obtained, and generalisable – albeit in different ways from theoretical or analytical research. Arguing that such research should be evaluated on its own terms, and not limited by historical conventions, Archer explains that:

Most academic institutions with higher level art, design or technology departments can point to at least a few cases of practical activity where an effort has been made, successfully, to meet these criteria. So can a few research institutes and professional design offices. In these cases the activity can properly be equated with research, and should be recognised and rewarded accordingly.

In this way, Archer argues that design research can offer research outcomes that are as valid and impactful as other fields of research.

For Frayling, the practice-led research process is one in which “the end product is an artefact – where the thinking is ... embodied in the artefact” (1994). As such, the design and production processes not only provide a means of investigation and mechanism for investing new knowledge in material form; they provide a way to directly access the knowledge, when it might otherwise be limited to abstract and theoretical conceptualisations. In this way, the knowledge invested in the artefact can be refined and also be extended through an iterative design and analysis process. Moreover, because research through design is enacted in the world, it can be tested in terms of its outcomes and efficacy, so it can provide rich data for reflective analysis and interpretation.

3.3 REFLECTIVE PRACTICE

As is often the case with practice-led research, the research process of this project has unfolded through a reflective cycle. Reflection has informed the iterative development of the research, both in the context of the practice and through successive post-hoc reflections on the practice. Donald Schön’s account of reflective practice is perhaps best known. He describes it as “a conversation with the situation where understanding the back-talk from the situation is essential to the process of inquiry itself” (Schön, 1983). For Schön, knowledge formation is an ordered coalescence, in which generative cycles of invention intertwine with iterative cycles of reflection. It involves an ongoing interpretation of theoretical frameworks and the specific circumstances of the research problem and, at the same time, reflection on each iteration of the practice as an exemplary solution to the problem. It is this cycle that drives the research project forward. As Leonard Waks explains, “new moves have to be tried out and assessed, and thus thought about and talked about” (Waks, 2001, p.42). This is an approach to theory building that involves sustained critical engagement with, and about, practice. Theory production is primarily understood as a process rather than an output of the research.

That is, this PhD project has evolved through insights revealed through successive reflections on theory, process, and practice. Through the integration of theory and practice, the project has evolved through a process of critical analysis, contestation, and reflective engagement, in which outcomes have been formed and re-formed. It has evolved in a pattern similar to that described by David Kolb, in which “each act of understanding is the result of a process of continuous construction and invention through the interaction processes of assimilation and accommodation” (1998, p.26). As a result, this PhD is a product of theoretical engagement that has been instantiated through design processes, which have in turn been exposed through reflective commentary within this exegesis, and have contributed to new knowledge and understandings, invested in material form in the artefact.

3.4 EPISTOLARY NARRATIVE

Epistolary narrative is the form through which reflection has been captured. As Stephen Goddard (2007) suggests, the epistolary form is useful for reporting on creative research practice. The process of epistolary narrative is a writing technique borrowed from narrative fiction, where stories are formed through the collection of letters and/or diary entries, but other forms can also be used (Goddard creates video postcards for example). In this PhD project, the research narrative took the form of first-person commentary in a series of blog posts published in the project’s online journal. These blog posts document the design experimentation and discovery process, and describe the creation of a series of design prototypes, from low-fidelity paper prototypes through to functioning web applications.

Once generated, these narratives were subjected to a narrative analysis technique of emplotment. As Catherine Riessman explains (1993, p.186), through the process of emplotment, meaning is derived from selectively grouping narrative events around representative themes and considering them in terms of their consequences. While the first exposition process reveals the general features of the design process, as Hayden White notes, narrative analysis through the activity of emplotment offers a process for understanding events through their purposeful selection and ordering (2002, p.193). While key design actions or events are described as discrete instances,

their relationships to each other, and to the whole research project, are also identified. In this way, the enquiry is described as a series of incremental reflections, which are subsequently charted as an evolving trajectory of methods and practices designed to produce conclusions and outcomes that address the PhD research question. This provides a means for making explicit the tacit and accreted knowledge that is progressively and more clearly embodied in the artefact.

It is important to note that epistolary narrative is quite distinct from *connoisseurial evaluation*, or critical appraisal of finished artefacts. Rather, it can be aligned with Estelle Barrett's critique of research reporting, as an effort to "shift the critical focus away from the notion of the work as product, to an understanding of both studio enquiry and its outcomes as process" (Barrett, 2006). Narrative analysis describes the artefact as a whole by linking key research actions and events through their selective emplotment within the broader narrative arc of the creative practice research. Recognising the holistic nature of creative production, the narrative analysis technique presents the artefact and its process of invention as fundamentally irreducible.

3.5 RESEARCH DESIGN: AN OVERVIEW OF PROJECT PHASES

This research project unfolded as a sequence of investigation (of the field), interpretation (of the context of the problem, potential existing solutions, and conceptual frameworks), formulation (of design principles), application (of the principles in practice), reflection (on iterative outcomes), and evaluation (of the resulting artefacts). A variety of methods – each appropriate to these project phases – was employed. It should be noted that these phases were not strictly linear but often overlapping. However, for the purposes of clarity, they can be summarised as follows:

3.5.1 Phase 1: Preliminary research – Review of the field, and interpretation of needs

The initial research phase involved a range of investigative techniques, including analysis of the literature in the field of e-learning and a contextual review of available technologies for e-learning. This analysis was complemented by two case studies – with participant observations used to establish the working methods and needs of

academics and students in the fields of communication design and multimedia. This outcome is commonly described as a user needs analysis. The correlation of the literature and available technologies with the identified needs of the case study participants formed the basis for identifying an attendant design problem and a gap in the field.

3.5.2 Phase 2: Creative practice – Design methods and practices

Discourse analysis – this time of structural and conceptual models drawn from the fields of critical theory and Web 2.0 technologies – provided a set of recommended design principles for new approaches to designing digital tools to address the needs of the academic and student stakeholders of the study.

An iterative design approach and evolutionary software prototyping then provided the methods for implementing the design principles through experimentation with potential design solutions, and the working through of ideas. The design process was captured through the method of epistolary narrative. It resulted in a series of iterative design outcomes: first a simple web application – the Virtual Heteroglossia – with an integrated website and content management system; then the Constellations website and the relationally organised Folksonomy (Versions 1.0 & 2.0).

3.5.3 Phase 3: Implementation and evaluation

The case study approach was again employed to implement the resulting design outcomes in context. Quantitative methods (analytics of use) and qualitative methods (interviews) were used to evaluate the usability, fit for purpose, and efficacy of the developed tools in practice and in use in this context. This evaluation provided the basis for conclusions to be drawn, new knowledge claims to be made, and recommendations for future research to be proposed.

3.6 METHODS

3.6.1 Phase 1: Preliminary research: Review of the field, and interpretation of needs

Discourse analysis

In the preliminary stages of the research investigation, discourse analysis was employed as the primary method to reveal insights and draw out particular features of key texts on e-learning, interdisciplinarity, and social-constructivism. Discourse analysis involves identifying and qualitatively describing important aspects of a text. It is an interpretative process that may be used narrowly to analyse patterns in written texts (in the case of textual analysis) or more broadly to recognise features and themes in a communication form. In this research project it was used to understand and characterise the current state of the e-learning field and to identify the particular pedagogical philosophies and design principles that have tended to underpin software tools for e-learning, as well as to understand the key features of interdisciplinary courses.

Contextual review of available technologies

A contextual review of available technologies for e-learning was conducted to establish available options for academics and students and to establish their in-common conceptual and structural features. Evaluating their viability and appropriateness for the needs of interdisciplinary courses (as determined by stakeholders within the case studies) has provided a means for establishing a rationale for the research, and has contributed to the underpinning design principles of the creative practice or design outcome.

Case studies

Two case studies were employed in the preliminary investigation phase as well as the application phase of the research. Both case studies provided insights into the approaches and methods that students use to inventively integrate existing theory and practice to generate new ideas during the concept development stage of their projects. The first case study involved second-year students in the discipline of Communication Design at QUT during 2005. Within their subject of study, these

students were required to search for theories and examples of practice to increase their understanding and to contextualise a design brief. The second case study involved third-year NTU Multimedia students who were involved in constructing a research project. They needed to conduct research to situate their practice and provide a foundation for a practice-led enquiry. Both contexts required the students to draw on knowledge from multiple disciplines, theoretical perspectives, and creative practice domains.

Sample selection and recruitment

Purposive sampling was used for the selection of subjects for both case studies. This approach is distinct from a probability sampling method, which aims to create sample groups according to statistical selection criteria. Instead, respondents are selected strategically because of their contextual relevance and, therefore, their potential for contributing insights to the specific research problem. As Ted Palys (2008) explains, purposive sampling includes a number of potential strategies to select representative subjects – in this case students whose learning needs are directly served by the research question and the resulting design outcomes. This involved students whose learning needs require them to integrate literature as well as exemplars of contextually relevant practice from across a range of disciplines. I enlisted them through a presentation on the research project and a call for participants in the introductory lectures to the relevant modules.

Using purposive sampling made it possible to develop a richer, focused understanding of specific students' needs and, subsequently, to develop a more robust, contextually specific tool and to analyse it in practice, observations and interviews

Within the case studies, participant observations were conducted to obtain insights into the pedagogical practices of the subject group, and to develop greater clarity around their needs as well as the limitations of existing approaches and tools they use (for example, the use of online searches). Raymond Gold describes four theoretical stances of the participant observer conducting fieldwork (from complete participant to complete observer) (1958). When conducting participant observations of the final-year Multimedia student group at NTU, my observations focused on the learning and

teaching practices of Multimedia students and academics, and included myself as a member of the academic stakeholder group. However, as a researcher, I was primarily interested in the process of observing rather than participating in the group and its activities. Nonetheless, as a member of the stakeholder group I acknowledge that the data being gathered was inevitably biased by my presence (indeed all observational data is biased to some extent, as an artefact of the discovery process). I chose to mitigate some of this bias through reflexivity; that is, by considering how my intervention may have caused distortion and interference in what was being observed.

The observations at NTU were conducted over the course of an academic term (12 October to 18 December 2009). They involved students from the seven final-year Research Project tutorial groups – including students in the two Interactive Media groups that I supervised. The observations were carried out to enable me to develop greater sensitivity to the shared practices of the group: how they organised and prioritised their learning requirements; how they interrelated with each other and with the academics; and how they interacted with technology. In so doing, special attention was paid to delineating discrete differences and in-common information discovery practices.

Through participant observation I was able to identify relevant follow-up questions for the interviews, which were conducted to develop a deeper understanding of the specific needs of the stakeholders. The interviews were conducted at NTU in 2009 with a small sample of representative student volunteers from the group of final-year Multimedia students. They represented each of the three Multimedia pathways; that is, Virtual Environments, Moving Image, and Interactive Media.

The interviews were informal and conversational, using open-ended questions. This approach meant that students could ask questions and seek clarification and I was able to drill down into more detail when necessary. Questions focused on the discovery or research phase of final-year dissertation work and they were designed to gather information about the particular learning needs of students when they worked to assimilate knowledge, theoretical constructs, and practices from across disciplinary fields into their own practice context. More specifically, interview questions focused

on techniques used by students to discover information online during the research phase of their honours degree dissertation writing. In particular, the students were asked how they locate and select information through literature searches and linking. Special attention was paid to the relevance of search findings (search criteria); the value of establishing relationships between interlinked content; and the benefit of serendipity for revealing unexpected results. The interviews were recorded on video (for the purposes of later recollection and analysis), with the full knowledge and consent of the participants.

This research phase resulted in a user needs analysis and a proposition on the requirements of learning in multimedia and communication design courses. It also formed the basis for identifying an attendant design problem and gap in the field.

3.6.2 Phase 2: Creative practice design methods and practices

Applied research

As a research methodology in design fields, practice-led research positions creative practice at the centre of the research process. It draws on insights revealed through the preliminary research processes – the literature and contextual reviews as well as the observations, informal interviews, and user needs analysis. Engagement with the qualitative data gained from these fieldwork techniques makes it possible to develop rich representations of need and to respond to the specificity of the context of that need through the process of applied research (as distinct from pure research).

Practice-led research

This research phase began by considering alternative structural and conceptual models for the development of e-learning applications. The fields of humanities and philosophy served to provide new ways of thinking about relational, contingent, multifaceted, rhizomatic, and dialogic models that would help to consolidate propositional design principles for designing effective technologies in response to the research problem.

The process of creative practice then began. While it was based on clearly defined design principles that were derived in response to specific identified needs, it involved an experimental and speculative approach. Creative practice (practice-

based) methods were employed to drive discovery and invention. The open-ended nature of creative discovery means that design practice can sometimes be a particularly effective approach to speculate about and imagine new possibilities. The creative process enables opportunities to emerge without restriction, while being guided through a kind of *knowing in action*. Each incremental step follows a progression within a general purpose but, through loose compliance, is free to wander and to span. In this way, it provides an opportunity for innovation and invention to emerge, which can in turn be refined and folded back into the central work. Importantly, the developing artefacts provide a tangible means for testing ideas and, as outcomes, they can be reflected on to generate tentative hypotheses, and then examined to draw broad conclusions and instigate new or refined approaches.

In this way, practice-led research revealed new insights through the constant moving back and forth between specific and general issues governing the design and use of technology and the practice or outcomes of the research within a particular e-learning context. The knowledge in the PhD was therefore in a constant state of hermeneutic situatedness, whereby meaning was inferred and transformed through a constantly evolving series of vectors of research, which moved from the general to the specific, and from theory and practice and back again, through abductive reasoning to make sense of the incremental findings of the enquiry.

Evolutionary software prototyping

Prototyping was used as a tool for externalising design thinking and experimentation, and not simply as a means for creating a finished product. Prototyping is a reflexive process, which enables the designer-researcher to incrementally explore and test ideas. Prototyping serves a similar purpose to drawing. It enables a process that Gabriela Goldschmidt (1991) describes as “sketch-thinking”, in which designers constantly switch between two reasoning modalities – a formal representational mode, and a more abstract or conceptual mode. Goldschmidt explains that, for designers, “the process of sketching is a systematic dialectics between the reasoning modalities ‘seeing as’ and ‘seeing that’” (ibid. p.131). In the case of this research project, prototyping was used as a way of concretising theoretical understanding – which would otherwise remain abstract and inaccessible – into concrete form.

Specifically, evolutionary software prototyping was selected to develop the functional aspects of the design outcomes. An evolutionary software prototyping process was chosen because of the ability it affords to reflexively respond to changing requirements brought about by progressive feedback and reflective practice. This method contrasts with the more structured Software Development Life Cycle approach, which mandates compliance with strict software engineering processes and protocols (International Organization for Standardization, 2008, p.9). Evolutionary prototyping can be used to develop complex projects, which must be managed systematically but where the requirements are not easily defined in advance, but can be developed responsively, and incrementally from the ground up – from concept sketches through to functional designs.

The process has a sequential iterative structure that includes a number of key stages covering problem elicitation and description, analysis and planning, design and modelling, implementation, and testing and review. A number of prototypes are generated over the course of the project, each representing various stages of development. Feedback and review are core features of the evolutionary design process and insight gained from reflective practice is progressively incorporated into successive iterations and revisions of the project.

Despite necessitating significant software code refactoring to retrospectively edit and refine the programming of the application, evolutionary prototyping was chosen for this project because of its facilitation of agile responses to the changing needs of the PhD, according to incremental feedback, reflections, testing, and findings.

This creative process resulted in three successive creative practice outcomes: the Virtual Heteroglossia; the Constellations website; and the Folksonomy prototypes. Each implemented the findings of the previous outcome in an iterative and evolutionary process, but each also incorporated expanded research and theoretical understanding.

Epistolary narrative

As detailed above, an epistolary narrative (in the form of a project design blog) was used to document the design process and the iterative series of prototype

developments. This approach was selected because of its expressive richness and its ability to capture context-specific insights (as an alternative representative form to coding). Its open and adaptive episodic structure meant that incremental reflections were recorded.

Narrative analysis

Narrative analysis was used to interpret the epistolary narrative and report on the design and prototyping process. The analysis operated in an inductive manner, seeking to discover patterns and regularities, which exist in the data but which are not immediately evident. These were revealed as an emplotment of significant design moments, which were undertaken chronologically and were then interpreted as a causally linked sequence of design events. This process made it possible to identify thematic relationships and associations that were fundamental to the design and development of the prototypes, as reported in Chapter 5.

3.6.3 Phase 3: Implementation and evaluation

Case study implementation

The design outcomes of the prototyping phase were implemented within the case study contexts. Both the Virtual Heteroglossia and Constellations website were deployed within the final-year QUT Communication Design programme with students using it during the first semester of the 2004 academic year (Australia, March to November). The Virtual Heteroglossia was used to support approximately 100 students undertaking the Design Project A course unit,¹⁴ while the Constellations website was deployed as a resource for approximately 30 students undertaking the Informational Arts course unit.¹⁵

The Folksonomy Version 1.0 was created in October 2008 and Version 2.0 was created in October 2009. Both versions were deployed in the final-year NTU

¹⁴ The Design Project A course unit is ostensibly intended as an opportunity for students to apply their design knowledge and skills in the creation of a major design production.

¹⁵ The Informational Arts course unit is intended as an opportunity for students to demonstrate their research and concept development skills through the exploration of speculative propositions.

Multimedia programme within the Research Project module in the first terms (UK, October to December) of the 2008 and 2009 academic years. Each of the two cohorts of approximately 70 students enrolled in the Research Project unit at NTU had access to prototype versions 1.0 or 2.0.

3.6.4 EVALUATION METHODS

Quantitative data collection

The design outcomes (Virtual Heteroglossia, Constellations, and Folksonomy) were evaluated through the multipronged strategies of: ongoing reflective practice (detailed above); quantitative methods (such as monitoring the percentage of students using the tool and their frequency of use); and qualitative data in the form of *think aloud* observations and direct user feedback captured through focus groups.

Quantitative methods of analysis involved network analytics (monitoring network traffic), employed to track use both within the case study contexts as well as more broadly (when the prototypes were publicly accessible). This was done through ClustrMaps, Advanced Web Statistics (AWStats), and Google Analytics. ClustrMaps is a widget that counts website visitors, along with their geographical locations, which are overlaid on a world map. ClusterMaps' real-time visitor-tracking feature provides a snapshot of the relevance of the site to users (which is especially apparent when new content is published and access to it appears concentrated in different geographic regions).

AWStats is a web server log file analyser that displays data generated by the Apache web server as a daily list of commonly accessed links (permalinks) and the frequency of access (which is broken down according to country location and frequency). It provides a snapshot of use, along with insight into popular search terms and phrases (including the frequency with which they are used to access content in the prototype). Such information is useful for understanding the audience of the prototype, identifying recurring themes in search behaviour, and verifying the relevance of content published through the prototype application.

Google Analytics is a web traffic analysis and measurement tool, which complements AWStats with a greater level of reporting granularity. While AWStats

derives its data through the analysis of web server log files (which are generated through web server requests), Google Analytics derives its data through a system of page tagging (user interaction with discrete page elements). The tool is particularly useful for understanding visitor flow (traversal of web site pages by users) and cohort segmentation (by correlating interaction with particular page attributes tracked over a specific time period). The ability to analyse visitor flow is useful for understanding integrative strategies used by students, as evidenced by their browsing behaviour and traversal decisions.

It is important to note that cohort analysis features have rapidly improved since the data collection period of this project (October to December 2008 and 2009). While it would have been ideal to monitor the specific usage patterns of individual users for each prototype, due to the bespoke (and nonstandard) nature of the prototype, this was not possible at the time. It was possible, however, to discover more general insights into the use of the prototypes, including search words and phrases, link or page popularity, country access location, and frequency. By correlating this data, it was possible to develop an understanding of the frequency of use and operation of the tool, both within a local learning context and more generally as a globally accessed online resource.

3.6.5 Qualitative data collection

Qualitative methods were used to evaluate usability and the efficacy of the design outcomes in engaging and supporting learners. The methods of participatory evaluation and focus groups were selected to provide a direct means of exposing usability issues and understanding the benefits of the tools to stakeholders. The method of participatory evaluation is explained by Monique Jaspers as one that “require[s] actual end users to employ a user interface as they work through task scenarios and explain what they are doing” (Jaspers, 2009, p.341). Students were observed as they navigated through the prototype interface, performing common user tasks.

Besides direct observations, *think-aloud* protocols were employed. This method involves users vocalising their thoughts as they interact with a prototype. As Maarten van Someren, Yvonne Barnard, and Jacobijn Sandberg explain, “the think aloud

method avoids interpretation by the subject and only assumes a very simple verbalisation process” (1994, p.30). Jillian Griffiths, Richard Hartley, and Jonathan Willson argue that evidence of, and conclusions about, both learning and discovery strategies and production skills can be obtained through think-aloud elicitation (Griffiths, Hartley, & Willson, 2002).

Video recordings were made of each session. The shot was framed to include both participants and the computer screen. Audio was included to capture think-aloud verbalisations. The videos were then reviewed, with special attention paid to the browsing, searching, and content and keyword selection decisions that were made. This helped to reveal insight about the conceptual processes of users through their organisational, integrative, and selection strategies. In this way, student users provided direct insights into their interaction with, and use of, the prototypes, while I could gain insights into individual encounters with them, identify patterns of use, and draw broad conclusions on usability.

Besides direct observations and think-aloud protocols, students also participated in focus groups, which provided the opportunity for them to share their reflections, and for me, as the researcher, to drill down into issues identified during the observations and to contextualise these findings. A focus group of three Multimedia students was undertaken on 29 May 2009 (towards the end of the 2008–09 Northern Hemisphere university academic year). They answered open-ended questions related to the use and relevance of the prototypes to the discovery phase of the final-year Research Project unit. Participants were also encouraged to talk to one another during the focus groups, to exchange ideas and anecdotes, and to comment on each other’s experiences and points of view, which I documented as the researcher. In this way, it was possible to discover, in detail, how students solved problems and formulated ideas as they discussed their approaches to using the prototype to browse, search, and select keywords.

3.6.6 Peer feedback

Besides my own reflections on project outcomes, and feedback from student users, feedback was also elicited from the second group of key stakeholders in the project outcomes. Informal discussions with fellow design academics were complemented by

formal academic presentations. These forums provided opportunities for peer review to obtain wider insight into the use, benefits, and refinement of the prototypes. The perspectives of fellow NTU design academics were captured through critiques of the design and technology implementation of both prototypes, as well as discussions about their use for catalysing student learning. And the presentation of the Folksonomy Version 2.0 in formal academic contexts, such as at the NTU Second Annual Art & Design and Built Environment Research Conference and Festival, Nottingham, on 7 July 2011, and to School of Art and Design Research Committee members on 16 October 2012 facilitated critical review of the prototype by peers who have a deep knowledge of the field.

Feedback was also elicited through an interview with David Rogerson, a Digital and New Media Manager for the UK arts organisation *Sound and Music*, conducted at Somerset House in London on 22 June 2009. The feedback included an evaluation of core prototype features and an assessment of the potential use of the tools in broader learning organisations.

By capturing the perspectives of invested stakeholders and design leaders, such feedback enabled reflection and suggested new tangents for the practice. As Hamilton and Jaaniste write, “feedback might be sought from respected colleagues, and gathered in an informal setting (in the manner of a peer ‘critique’)” (Hamilton & Jaaniste, 2009, p.9). The purpose of gathering such insights is to enable the artist to reflect upon the project and “to see their work through the insights of others, which may shed new light on the practice and its possibilities” (ibid.).

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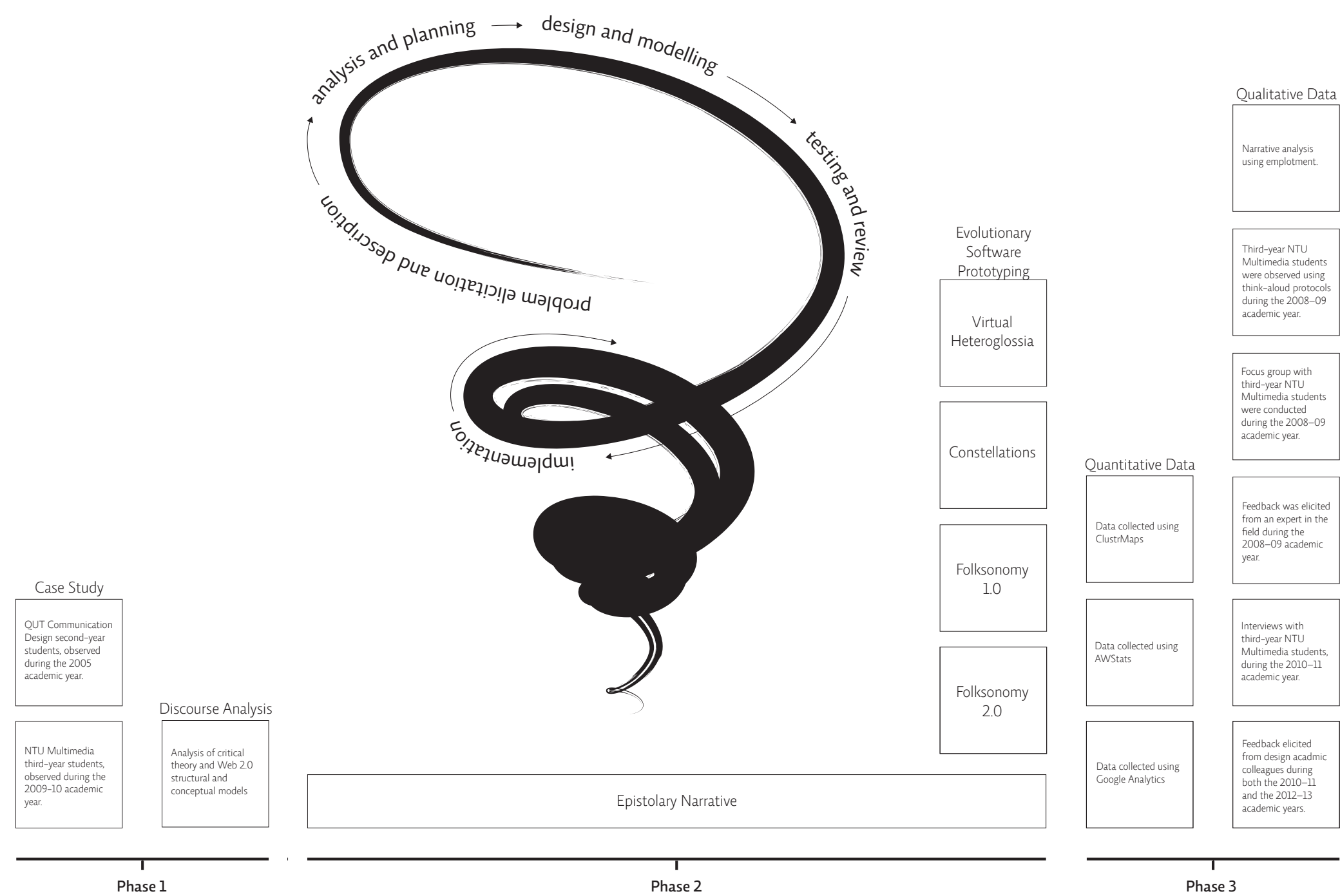


Figure 3.1 PhD research design diagram

3.7 CONCLUSION

The mixed methods outlined in this chapter were instrumental in formulating the research question and problem, investigating the field in which the problem sits, and developing a strategy and principles for experimental resolutions, as well as developing a sequence of design resolutions, and testing the resulting practice outcomes in context as part of an iterative design process to ensure the relevance, applicability, and efficacy of the project resolution.

Chapter 4: Priorities, Principles, and New Models for the Design of E-learning Tools to Support the Needs of Emergent Interdisciplinary Fields

In Chapter 2: Literature and Contextual Review, I established that the characteristics of interdisciplinarity and the rapid transformation of the fields of communication design and multimedia give rise to particular needs in terms of pedagogical approaches and that this, in turn, places demands on academics within such courses, as well as on the e-learning technologies and infrastructures that support them. I established that, unlike traditional fields of study, communication design and multimedia sit at the intersection of a number of disciplinary fields, and combine a range of disciplinary practices and theoretical and conceptual models. I also established that, because these fields of design are rapidly evolving, practitioners must constantly reinvent themselves, and continually revise and recontextualise their knowledge base and the scope of their practices. This means that students must develop the skills to constantly re-articulate the codes, practices, and conventions of their disciplinary field as they evolve.

I went on to argue that these characteristics give rise to particular needs in terms of pedagogical approaches. In communication design courses, academics must scaffold learning in ways that go beyond traditional problem-based approaches (which rely upon stable design principles and practices), and they must draw insights from multiple disciplinary perspectives. To avoid the problems of what Bernstein calls “weak classification”, namely assimilating the deep specialist knowledge required for establishing a professional identity when one must traverse a breadth of practices, students must establish a broad foundational understanding, then gradually specialise as they progress through their studies. This complexity is resolved, in part, by pedagogies that engage students in a socio-constructivist process. This means that, emulating professional practice, the curriculum is designed to enable them to

work within multidisciplinary project teams composed of a range of collaborating specialists who work together on authentic project outcomes.

Through such learning opportunities, students can rehearse their creative identities and bring them into being through a specialist practice, while they engage in dialogic exchange and negotiation with peers who adopt the defining features of other specialist fields as they integrate the defining features of multiple practices and discursive fields into a single project.

In short, communication design and multimedia students must gradually develop a deep understanding of one disciplinary area of expertise and be able to articulate their individual and unique situation at the intersection of multiple disciplinary fields (and so a range of aligned theories and practices); but they must also become adept at communicating across disciplinary boundaries and so must become *fluent* in the specialisations of others in order to collaborate productively and integrate their contributions with those of others into project outcomes. In addition, they must also develop the skills to constantly re-articulate and reframe their knowledge requirements and renegotiate disciplinary codes.

In turn, this introduces challenges for academics working in such courses, as they must be able to support a broad range of individual specialisations, help students to situate their specialisation in relation to others, and support interdisciplinary teams to achieve in-common goals. Moreover, they must afford students the agency to construct personalised knowledge domains within a socio-constructivist learning framework. To do so, they must develop pedagogical methods and employ classroom techniques and technology infrastructures that have the capacity to engage communication design and multimedia students as individuals according to their particular learning needs, as well as in teams working collaboratively to achieve specific interdisciplinary project requirements.

I concluded that the ubiquitous technologies and infrastructures deployed across university courses, such as Blackboard, do not adequately serve these complex needs of students and academics working in emergent interdisciplinary fields. This is not only because the conceptual frameworks that underpin predominant e-learning environments infrastructures have been conceptualised around a didactic model of

information delivery, which assumes a unidirectional broadcast of learning content, but also because they assume that disciplinary boundaries are hermetically sealed and inherently stable in both knowledges and practices.

4.1 A SET OF PRIORITIES FOR THE DESIGN OF NEW E-LEARNING TOOLS FOR INTERDISCIPLINARY CONTEXTS

Based on the particular needs of students and academics in emergent, interdisciplinary, weakly classified disciplines such as multimedia and communication design, it is possible to propose a set of essential attributes, or key priorities, for e-learning applications to effectively support their students' learning and research needs. These priorities can be summarised as follows, along with the principles that they each gives rise to.

Priority 1. Because it is crucial to enable students to build and establish connections according to their subject materials but also in relation to broader cultural circumstances and a range of related contemporary discourses and practices, learning applications must extend beyond didactic content delivery of contained discipline knowledge. A suitable learning environment must facilitate the formation of content nodes by individual students according to their specific learning needs, and relationships between their own specialist practice and the specialisations of their peers, academics, and researchers more broadly. That is, learning environments must be flexible in terms of their organisational structure. They must enable students, as content arbiters and information architects, to assemble and integrate collections of learning nodes, to organise them according to a networked, rhizomatic logic, and to locate themselves at the centre of a constellation of content.

Enabling students to take responsibility for their *situated* position within the broader field in this way can help them to develop personal autonomy in their learning. The ability to draw together and establish priorities and relevant content, and to define, regulate and reconfigure the breadth and depth of their relationships to aligned fields (and their attendant practices, theories, and methods), can help to promote greater self-awareness of relevant and associated discourses, and to place their own contribution within the shared network of knowledge exchange.

An application with such affordances must be designed with a decentralised, networked architecture. Such a system might operate more as a connection broker than a content management tool, and enable students to integrate heterogeneous content node collections, regardless of information-sharing method or system protocols, and it should be inclusive of media types.

It should be noted that such a software architecture might potentially be perceived as a content management risk for academics as it would limit the ability for any single user to oversee the entire network of possible extensions and content inclusions that students produce. This presents a potential data security risk for institutions as it may compromise the quality and integrity of sources. To mitigate such risk, institutions might provide a suitably regulated system with defined content sets, which students' could choose to integrate as they see fit. Alternatively, academics (and indeed students) might assume the role of *moderators* who verify and endorse contents and links.

Design principle 1. This priority gives rise to the principle that an online learning environment for interdisciplinary courses must be decentralised and, more specifically, be user centred, in ways that enable students to amass personal collections of references, exemplars, and media, and to organise content, topics, and fields into unique configurations according to their relevance to their own self-identified specialisation. It must also enable them to construct relationships with their peers and form conceptual networks between specialist domains. This is an expansionist and rhizomatic approach, which facilitates the building of constellations of interrelated content nodes, which might be moderated, verified, and endorsed by others.

Priority 2. To enable a research-driven process, an online learning environment must support students to contextualise and synthesise new ideas. This involves a process of collecting and associating content, and patchworking it together to create multifaceted and uniquely personalised digital scrapbooks. It is important that the process of synthesising content according to an organising logic is foregrounded, however, to avoid creating open-ended collections devoid of any prospect of consolidation. While the gleaning process can lead to some interesting finds, it is

editing, selection, and co-presentation that brings order, and ultimately meaning, to the collection.

Such a curation process can help students to gather a personal reference base, to foreground relationships that exist between concepts (and their various cultural interpretations), and so to develop an awareness of the contingencies and organisational strategies that inform such relationships and shape cultural meaning. This can, in turn, support them to make meaningful organisational decisions and to develop new contextually relational responses to existing ideas.

Design Principle 2. To enable students to draw meaning from a range of collected sources, an online learning environment must enable the co-presentation of ideas, and enable students to create an organisational logic, establish priorities, and create meaning through the development of relationships between collected content.

Priority 3. While it is important for students to be able to map content according to its relevance to their unique situation and practice, it is also important to recognise that this will inevitably evolve and change over time. The evolving formation of students' professional identities must be enabled, as they *try on* different perspectives and specialisations over the course of their studies (or even after them). It is also important to accommodate shifts in technologies and discipline formations as they change over time.

Enabling students to take responsibility for continually reconfiguring their relationship to the discipline in response to shifts in professional identity, cultural circumstances, and changing disciplinary fields necessitates providing the mechanisms for them to emerge and evolve over time. The active recognition of patterns and connections that come to light engages students in the learning process, as they synthesise and model knowledge and information structures according to transforming learning needs.

Design Principle 3. To facilitate the emergence of an evolving professional identity, and to accommodate an evolving discipline with changing technologies, fields, practices, and potential career trajectories, learning environments must be flexible and reconfigurable. They must enable students to remodel the content nodes and relationships they have made at a series of *moments* in their course, and in

keeping with an emergent design field. That is, they must be afforded the capacity to constantly remodel the learning environment, as their learning needs change, as well as to monitor developments in the field as they are identified by their peers.

Priority 4. If we are to enable a deep learning experience, we must move beyond conceiving of students as passive recipients of content, or even as simply curators of content. We must afford them the agency to actively contribute to interpreting and annotating texts and exemplars from their field. This is important because, as a process, it enables students to take ownership of their learning through responsive engagement with key texts and sources. Moreover, by *handling* the discourses of the field, they can begin to feel that they can actively contribute to them. Through such reflexive engagement, they can begin to construct and rehearse their creative and academic identities in their own voice. Further, a dialogic responsiveness has the additional benefit of the production of a contextually specific, collectively produced, and evolving knowledge base for the course. Shared reflections on texts and exemplars of practice can provide useful insights for peers, as well as for subsequent year groups.

Design Principle 4. This gives rise to the principle that students and academics must be given the agency and capacity to write into the pedagogical space. In terms of designing a learning environment or application, this means that they must be afforded the agency to go beyond a sorting or structuring regimen. It requires the inclusion of text and media publishing options, with levels of access permissions that enable users to respond to, annotate, and produce published content.

Priority 5. A socio-constructivist learning environment, in which students respond to an authentic design brief, as a team of specialist professionals would, requires the support of a learning environment that enables them to create ad hoc peer groups, to develop a shared conceptual approach, and to share resources and insights. In later years, as students sharpen their discipline focus and develop a specialisation, they might also begin to align themselves with similarly oriented specialists or a community of practice. Again, this may involve sharing perspectives, sources, and approaches. In both cases, students must be able to form relationships with their peers based on a collective goal, or in-common strategies and perspectives.

Enabling students to create professional associations with their peers can help them to establish communities of practice that advance their understanding as a group. These might form temporarily to support short-term project goals, or they might emerge over time and potentially span year groups, as students come to identify themselves as specialists that are theoretically, philosophically, or conceptually situated. Moreover, establishing communities of practice with peers can provide a means for students to build support networks, to locate themselves according to their common interests and values within the course, and to foster links between current students and alumni.

Pedagogically, it is important that such specialist and professional associations are defined in relation to the learning context, rather than independently through the use of social (or professionally focused) software tools such as LinkedIn, Coroflot,¹⁶ Behance Network,¹⁷ or Cargo.¹⁸ To draw associations through curriculum reinforces to students the nature and purpose of such association as primarily providing intellectual and professional support above social interaction and self-promotion.

The formation of student groups and communities of practice might be facilitated by drawing attention to in-common interests across the cohort, based on algorithmically interpreted links, metadata or key words that students use for searches. Automated techniques of association filtering and recommender systems are widely used in online retail and online dating systems to recommend related products or people, and they might be adapted to a learning environment to enable students to create learning and project groups based on shared learning needs and conceptual interests.

Design Principle 5. To support collaboration within a socio-constructivist learning environment, to develop communities of practice, and to build specialist associations, students must be able to form relationships with their peers through the learning

¹⁶ Professional creative portfolio site located at: <http://www.coroflot.com/>

¹⁷ Showcase for professional designers located at: <http://www.behance.net/>

¹⁸ Online creative community platform located at: <http://cargocollective.com/>

environment. Such groups might be based on a collective goal, resource sharing, or students' developing specialist expertise.

Priority 6. To enable the development of a shared resource, and to enable students to align themselves with the perspectives and specialisations of their peers, it is important that each student's specialist location, as well as their collections of content and array of content nodes, are visible to other users within the system. Attribution is therefore important as it provides a means for students to represent themselves and to identify others in the establishment of groups and associations.

Attribution and being able to locate specific student authors and distinguish their individual contributions is also important for a number of other reasons, including building personal confidence and reputation, assessment, and identification by peers. It also helps students to become more accountable for their perspectives, and it provides a reference for reflecting on their contribution to collective endeavours.

While it is important that students are able to profile themselves within learning environments through the attribution of their situation within the discipline, array of content nodes, and content contributions, this process shouldn't be confused with developing public personas and social media followers. It is important that students primarily seek to locate themselves within established academic discourse and contemporary professional practice, and to contribute to the unfolding discourse of the field, rather than set out to develop celebrity.

Design Principle 6. To enable shared learning and the alignment of specialisations with others, student users of a learning environment or system must have the capacity to view each other's contributions – both individually and as a collection. Contributions made by students to the shared knowledge space must be attributed to them as content authors to ensure acknowledgement, responsibility and recognition.

4.2 A SUMMARY OF DESIGN PRINCIPLES

Underlying all of these principles are in-common traits. They all involve ensuring that students have the agency to co-create their learning experience, to build their

understanding from a uniquely situated perspective, to relate their learning to that of their peers and to contribute and respond to discourses in the field. This means that learning environments must be designed to enable students to self-identify specific learning needs and to make unique links to discipline-specific discourses and practices. It must afford them the agency to form, rehearse, and amend their creative identities and specialist practices through the integration of the defining features of multiple practices and discursive fields. And, as part of a socio-constructivist learning framework in which students encounter real-world design briefs, it must support them to work with differently specialised peers, and to employ team-based practices as they respond to an authentic task. In so doing, learning environments must be designed to facilitate dialogic exchange within, and beyond, peer groups, and the capacity to write into the pedagogical space.

That is, within the complex learning contexts of communication design and multimedia, e-learning applications require extended forms of interaction, which afford students the agency to construct, negotiate, and renegotiate their own personalised knowledge domains, and to productively collaborate and contribute.

4.3 THE CAPACITY OF WEB 2.0 DEVELOPMENTS TO SUPPORT KEY PRINCIPLES FOR ONLINE LEARNING IN INTERDISCIPLINARY, CONSTRUCTIVIST AND EVOLVING COURSES

In Chapter 1 I argued that E-learning 1.0 (ubiquitous content delivery platforms such as Blackboard), supports the flow of information from lecturer to students, but does not adequately support the learning needs of interdisciplinary emergent subject areas. The design principles required for such contexts, which are articulated in the previous section, serve to highlight reasons for inadequacies of E-Learning 1.0 models, and why they do not serve any of these priorities for learning environments. They do not afford the agency to collate, respond to, or present ideas; they do not effectively facilitate the formation or enactment of teamwork in real-world learning contexts, and their capacity to adapt to fluid fields is limited.

In Chapter 1, I went on to suggest that the conceptual models of Web 2.0 technologies and the participatory social media approaches that they facilitate can

better support the learning needs of students in such courses because they provide a more open approach to content and topic presentation, richer user interaction and the potential for deeper engagement through opportunities for response and dialogue with peers. For these reasons, I suggested that a range of Web 2.0 technologies, which were created for other social and business purposes, might be repurposed, adapted and combined to offer solutions in the form of E-learning 2.0 approaches.

During the timeframe of this PhD (2005 to 2014) we have seen enormous advances in open-source software and Internet technologies, particularly in relation to applications that have come to be categorised as Web 2.0 solutions. It is useful to consider the potential solutions they provide more closely, in line with the specific user needs (priorities) and design principles I have outlined above. By so doing, it is possible to draw attributes from them, which can contribute to potential solutions and pedagogical innovation in online learning tools.

In relation to **Design Principle 1** (that is, the learning environment must be decentralised and user centred, in ways that enable students to establish priorities and organise content, topics, and fields into unique configurations according to self-identified specialisations and specialist domains), a number of recent social software tools could be adapted to facilitate such a curated, rhizomatic approach to learning. Tools that enable users to index and interlink content include the hashtag¹⁹ linking function that has been made popular by Twitter. It enables users to associate their content with other online community members through shared inline keywords.

The open-source tool WikkaWiki²⁰ is one tool that supports users to make associations between content through inline keywords, and then to associate selected content with other community members through a process of hypertext interlinking. Wikka provides a salient example of the potential of wikis to be employed as tools for students to incrementally develop complex structures of interrelated fields, ideas, and

¹⁹ Hashtags are commonly used in the following social software services: Facebook, Flickr, FriendFeed, GitHub, Google+, Instagram, Kickstarter, Orkut, Tout, Tumblr, Twitter, VK, YouTube and Vine.

²⁰ Lightweight open-source wiki engine initially created by Jason Tourtelotte, which is available for download here:

<http://www.wikkawiki.org/HomePage>

professional associations, which can emerge and grow over time without the need to follow an intransigent logical hierarchy. Wikka expands the participatory content coproduction intent of wikis. It also includes its own simplified mark-up language for easy page linking and formatting, as well as for embedding Adobe Flash content and RSS feeds.

Importantly for this principle, Wikka has a nodal structuring architecture that allows content to be organised into information vectors (as opposed to hierarchies). That is, unlike traditional taxonomic structures (for example, the content page of a book or the index of a Blackboard site, in which content is organised according to predefined (and usually hierarchically arranged categories), such functionality enables users to construct rhizomatically expanding content relationships according to their specific interests and/or needs. If used within a learning context, such functionality could enable students to construct personalised arrays of content nodes, which they might flexibly reorder according to their individual learning needs and changing discipline locations and circumstances.

In explaining this principle in the previous section, I noted that such an open-ended approach to content compilation might compromise the quality and integrity of learning by the use of questionable sources, and suggested that academics might assume the role of moderators to verify and endorse content and links. Wikka facilitates such a process through multiple user accounts with different levels of privileges, as well as page access restrictions through Access Control Lists (ACL). These lists restrict access to specific pages so that only particular members can read them, edit them, or post comments to them. This means that institutions could regulate content nodes or moderate the curated collections through permissions hierarchies and access levels.

In relation to **Design Principle 2** (that is, the learning environment should support students to amass personal collections of references into a personalised digital scrapbook), tools have been widely adopted that associate content in a range of social software tools using the method of hashtags, but it is also possible to make content associations and to index content categories through *tag bundles*. An example

of such an approach is the online bookmarking service Delicious.²¹ It enables users to aggregate content into named groups through the use of metatags.²²

Another prominent example is Microsoft OneNote, a contemporary multimedia platform and note-taking tool. It produces familiarity through a book metaphor, organising content in terms of *pages*, *sections*, and *notebooks*. When used in a learning context, OneNote can complement supplied resources and coursework materials through the potential it provides to support students to amass and organise personal collections of text and media references. This tool also includes capabilities for sharing with peers online.

The Glogster EDU online subscription service has similar affordances.²³ It employs an open canvas or scrapbook metaphor and incorporates an intuitive drag-and-drop interface. It differs from OneNote in that it is primarily intended to be a structuring tool to support students to collect, and ultimately integrate, learning materials to create curriculum course-specific virtual *posters*.²⁴ Within Glogster EDU, a *glogpedia* gallery presents a repository of previous students' projects, which students and staff can link to and contextualise their projects in relation to a larger collection of categorised content.

Used in a learning context, such curation tools can enable students to gather and associate categories of content and produce their own, individualised reference sources, which they can expand over time, and they can share their collections with others.

In relation to **Design Principle 3** (that is, the learning environment should be flexible and reconfigurable, to enable students to remodel relationships between content nodes and connections between content, learning nodes and broader cultural circumstances according to their [changing] personal learning needs), some open-

²¹ (Thomas Vander Wal, 2012)

²² Unknown author. (2005). *What Is a Tag Bundle?* Retrieved 02 March 2014, 2014, from <http://delicious.com/help>

²³ The Glogster EDU tool is available from: <http://edu.glogster.com/>

²⁴ See Lydia Maciech's *The Elements of Art* at: <http://liidamac.edu.glogster.com/the-elements-of-art/?=glogpedia-source>

source projects are modelled on similar, albeit more generalised, requirements. WikkaWiki, which is described above, provides this capacity. As Lakhani and McAfee note, it allows “users [to] add, delete, or edit any part of a wiki in an ad hoc manner. [It uses a database to keep] track of all changes ... allow[ing] users to compare changes, and also to revert back to any previous version” (2007). In this way WikkaWiki enacts Ted Nelson’s concept of *intertwingularity* (Nelson, 1987, p. DM45), where ideas are interlinked and all revisions are intrinsic to a general development trajectory.

Another enabling tool for this principle is the architectural model that underpins distributed online social networking (DOSN) and Federated Social Networks (FSN). Both envisage an *ecosystem* of interconnected providers who share common technology interfaces and protocols. Unlike closed proprietary services (such as Facebook, LinkedIn, and Twitter), which have limited interoperability and so require users to create duplicate accounts in order to access their services, DOSN and FSN function in a manner that can be thought of as similar to email, in that users are able to send and receive electronic messages regardless of their choice of email clients. By prioritising open standards rather than proprietary features, and by separating out the process of storing user data from the tools used to access it, such systems offer the capacity for users to seamlessly move between multiple environments while maintaining access to their commonly produced user information (including published content and application customisations).

This is an important facility if students are to assemble, share, and reconfigure their personalised collections of learning nodes, rather than simply selecting tools according to closed and inflexible proprietary functionality, or modifying and reimporting content.

In relation to **Design Principle 4** (that is, students and academics must be given the agency and capacity to write into the pedagogical space, through the inclusion of text and media publishing options), a number of contemporary Web 2.0 technologies enable such facility. Online applications that enable the annotation of the texts of others include Dean Claydon’s Annotate That!, a web application that enables users to position and type text into overlaid virtual, repositionable notes and

to share their response online. Mooodoodle Limited's MoodShare online collaboration tool also enables users to annotate and interlink content, as well as to collaboratively produce photo and video collections, then share what they have produced through unique URLs.

Alternatively, the use of *blank canvas* blogs and wiki sites tends to focus on self-publishing assignments or critical reflections to a limited audience (such as a peer group). A notable exception is Jon Beasley-Murray's "Murder, Madness, and Mayhem: Latin American Literature in Translation" Wikipedia project in which his students' assessment task involved publishing Wikipedia articles (and receiving marks based on their acceptance for publication) (Beasley-Murray, 2008; Wikipedia.org). In this case, support for the project was provided by Wikipedia Foundation volunteers rather than by an institutional IT department, something that is clearly not sustainable in terms of universal adoption. Therefore, while the project gave students agency, it did so from outside the sanctioned institutional pedagogical space.

Another example of a pedagogical approach that has incorporated a user-centred learning environment is an initiative at University of Mary Washington (UMW). Within the UMW Blogs²⁵ project (2007) sits an initiative called "A Domain of One's Own"²⁶ (2013). The project began with the provision of a WordPress Multisite system, to enable students to publish online through a university authorised blogging tool. It now includes server space and the free registration of top-level domains, so students have autonomy to install and maintain their own publicly accessible publishing tools. This is significant both in practical terms, because it provides students with institutional infrastructural support (including extensive documentation and user guides)²⁷ to build and establish an online presence, and in symbolical terms, as it gives them agency to write into the institutionally sanctioned virtual space. This initiative is important because of the way it recognises students as

²⁵ University of Mary Washington teaching and learning technology support page with background information about the UMW Blogs project: <http://academics.umw.edu/dtlt/umw-blogs/> (Groom)

²⁶ Information about the UMW *A Domain of One's Own* project can be found at: <http://umwdomains.com/details/>

²⁷ Documentation wiki for users of the Domain of One's Own initiative available at: <http://docs.umwdomains.com/>

stakeholders in learning and entrusts them to run their own cyber infrastructures. This reframes their online engagement from passive recipients of information to actors who are responsible for the running and managing their own information systems.

Adopting self-publishing tools in the classroom gives students a voice and ensures they can take ownership of their learning by, for example, requiring them to responsively engage with key texts and sources in a scholarly essay for publication. Moreover, they can help ensure that students endeavour to reach a high standard of work because of anticipated peer perceptions of their outcomes. For many academics, annotation tools, personal weblogs, and community wikis (which are relatively straightforward to set up and use because of their common interface metaphors and system affordances) provide alternatives to, or complement, university sanctioned LMSs.

In relation to **Design Principle 5** (that is, to support a socio-constructivist approach to learning, digital frameworks and tools, and environments must enable the development of communities of practice, specialist associations, and relationships with peers for the purpose of achieving a collective goal, sharing resources, or developing specialist expertise), there have been a number of useful advances in web 2.0 technologies that can enable students to create ad hoc peer groups and maintain collaborative networks and relationships.

The formation of student communities of practice, and specialist associations based on a common goal, resource sharing, or developing specialist expertise, can be facilitated through recommender systems, which correlate and share individual attributes. An example is the online networking tool LinkedIn, which associates members through its Skills & Expertise feature. *Interest network* tools, such as Pinterest, Integra, Spotify, Goodreads and Quora are further examples that provide a means for users to coalesce around shared perspectives and interests and engage in a sustained way to share their interests, hobbies, or areas of expertise with like-minded people.

While associative and recommender systems are prevalent in a number of e-commerce tools (such as Amazon.com and Facebook) and dating sites (such as Guardian Soulmates²⁸ and Match.com²⁹), there has so far been limited take-up of such systems in education to support student peer networking based on shared interests and expertise (Dwivedi & Bharadwaj, 2013). Although such tools have been designed to share interests and hobbies to promote social engagement, they might be deployed to support the establishment and maintenance of learning networks in the form of communities of practice. For example, students might use Pinterest to build specialist associations and share their design inspirations with like-minded peers. In this way, they might reflexively articulate their in-common and complementary perspectives. Equally, students might use Goodreads to create study groups around particular topic areas, where individual students emerge as local experts who are able to support their peers and, by so doing, foster course collegiality and develop personal confidence.

With regards to enabling collaboration, a number of task allocation and project management tools exist. For example, the popular project management tool Basecamp³⁰ enables users to work as collaborative teams and share and comment on artefacts as they are developed. Such tools can be quite responsive to users' needs, allowing them to work in either a flexible or structured way, which makes them quite useful to a range of learning environments and contexts.

In relation to **Design Principle 6** (that is, all student users of a system must have the capacity to view each other's contributions to enable shared knowledge spaces, and contributions must be attributed to their content authors to ensure acknowledgement, responsibility, and recognition), there have been a number of recent social software developments in this area. For example, Google have provided a solution within their own systems, known as Google Authorship (Sternberg, 2013).

²⁸ Soulmates is an online dating site operated by The Guardian Online: <https://soulmates.theguardian.com/>

²⁹ The UK site for Match.com is: <http://uk.match.com/>

³⁰ This service can be accessed at: <http://basecamp.com/>. Users might instead choose to use alternatives as per the list: <http://drup.org/20-basecamp-alternatives-project-management>

This innovation associates Google+ users (and their profile images) with content they have produced. In this way, when search results present content, or content is republished on a website or weblog, it is mapped and attributed to its producer. While there are clear benefits for both Google and users of their search engine, online authors also receive the benefit of persistent attribution.

That I have been able to map exemplar tools against each of the principles I have outlined is possible because of the proliferation of, and new developments in, Web 2.0 applications and open-source software over the last decade. This revolution of Internet capabilities, which has largely occurred during the life of this PhD, has lowered the threshold for access to many users, affording them the agency to publish, to collate content in personally meaningful and agile ways, to respond to ideas of others, and to collaborate with each other online. By contrast, online learning environments have continued to consolidate their interests around a core set of tools, the affordances of which are designed to provide educators with a means for transmitting information and “managing” student learning. Therefore, it is perhaps not surprising that many academics have incorporated Web 2.0 applications and open software into educational contexts to either extend or supersede LMS systems.

However, it should also be noted that such tools, which have been designed for other (primarily commercial or social) purposes, must often be adapted and repurposed to pedagogical needs, and that frameworks for use, and meaningful outcomes must be developed around them. Moreover, no single application currently provides the full range of capabilities demanded by the principles I have established. This means that an academic might create a bricolage or mash-up of largely unrelated tools – each with their own functionality, interfaces, and processes. Not only does this pose the risk of cognitive overload for students, who must come to grips with a suite of tools, academics must maintain familiarity with continual software changes and adopt new tools, while at the same time juggling shifts and changes in their curriculum and learning contexts. On balance, the benefits of using Web 2.0 and open-source tools beyond their intended purpose might be outweighed by the complexity of integrating their evolving functionality into a coherent approach to learning and teaching.

Table 4.1 The relationship between system functions, which have been modelled on PhD e-learning Principles and usage scenarios, which anticipate student user interactions.

Table 4.1

PhD e-learning Principles and usage scenarios

Principle 1	
Software feature	Usage scenario
Concept Filter (aggregating process)	A student wishing to amass a personal collection of references, exemplars, and media might do so through creating a 'concept filter'. Through iteratively defining and reviewing matching posts they would be able to automatically aggregate results based on their conceptual interests/needs.
Content Tagging (amassing references)	A student wishing to build a reference collection would aim to tag new posts so that they share tags with their chosen concept filter – thereby aligning new and existing content.
Clippings (reviewing personal collections)	A student wishing to review content, which they have contributed might decide to select their 'clippings' link. Doing so will allow them to isolate their contributions from those made by other students/members.

Principle 2	
Software feature	Usage scenario
Concept Filter (reviewing process)	A student wishing to locate their

for locating perspectives)	theory and practice might choose to review posts, which are grouped according to a common 'concept filter'. This process is particularly useful for helping students to discover relationships between their conceptual focus and a broader theoretical context because of the aggregated nature of concept filters.
Keyword Tag (reviewing process for locating perspectives)	A student wishing to locate their theory and practice might choose to review posts, which are aggregated according to a common 'keyword tag'. This is particularly useful for helping students to understand a concept through its similarity (and difference) to related ideas i.e. its analogues.
Search (concept discovery process)	A student wishing to generate ideas, which have the potential as catalysts for further creative work might use the Folksonomy 'search' feature. In doing so, the process would help to extend the commonly used visual approaches to divergent thinking such as mind maps and spider diagrams.

Principle 3	
Software feature	Usage scenario
Member Profile (demonstration process)	A student wishing to define and communicate their conceptual interests is able to do so through

	creating a 'member profile'. In such cases student are able to describe their interests through creating a profile statement as well as through having their conceptual filters automatically associated with their accounts.
Concept Filters (definition and review process)	A student creating and using a 'concept filter' engages in an iterative process, which requires them to dually consider and define a concept based on their understanding. Through foregrounding conceptual patterns and relationships, the process provides support for students to recognise, define and redefine concepts, which may be useful for their enquiry.
Concept Filters (defining and redefining)	A student who wishes to reposition themselves according to their evolving interests is able to do so through creating, editing and/or deleting existing concept filters.

Principle 4	
Software feature	Usage scenario
RSS Syndication (allowing content to be annotated in external publishing platforms through content integration)	A student wishing to comment on content references might choose to do so through posting reflections to content which have been integrated within their weblog through the use of a standard RSS feed reader widget.

	The process of doing so provides an opportunity for students to reflexively construct and rehearse their creative and academic identities in their own voice.
Clipping Posting (collecting and re-blogging)	A student who is seeking to develop knowledge about a particular subject might choose to do so through collecting references from key texts and related sources. In doing so, they must make editorial decisions about what to select and organisational choices about how to index it.
Clipping Posting (amassing reference collections)	A student wishing to develop depth of understanding in a particular area might choose to do so through amassing a collection of relevant references. In doing so, they are able to responsively evolve references, which are contextually specific to their changing knowledge requirements.

Principle 5	
Software feature	Usage scenario
Ad Hoc Groups Widget (communities of practice)	Students wishing to establish networks with peers might choose to do so through creating ad hoc peer groups. Doing so has the potential to allow them to discover shared conceptual interests, perspectives, sources and approaches.

Ad Hoc Groups Widget (following peers)	A student might choose to 'follow' a peer by adding them to an ad hoc group. Doing so makes changes to concept filters owned made by peers explicit.
Clippings (authorship)	A student wishing to maintain individual ownership of content publishing while contributing to a shared repository is able to do so through selecting their 'clippings' link. In this way, they are able to take advantage of the dual benefit of contributing to a shared repository while maintaining autonomy over their specific post streams.

Principle 6	
Software feature	Usage scenario
Member Profile (demonstration process)	A student wishing to discover possible allegiances might choose to review the member profiles of peers. Once identified they might choose to add them to an ad hoc group for further reference.
Clippings (resource development)	A student group wishing development a shared resource might do so through publishing to the Folksonomy. In doing so, they are able to share the benefit of creating the resource as well as providing a legacy for future student groups.
Clippings (philosophical alignment)	A student wishing to align themselves

	with particular theory and/or practice might choose to do so through selectively re-blogging content to their member account.
Concept Filter (definition process)	A student intending to locate their work according to established theory and practice might do so through creating a 'concept filter' in the form of a named list of keywords/phrase. In doing so, they would be able to define the concept filter through iteratively defining and reviewing matching posts.

4.4 A CONSTELLATIONS METAPHOR AS A CONCEPTUAL FRAMEWORK

So far, I have established that learning management systems (LMSs), which are now ubiquitous across universities, enable the efficient distribution of learning materials. While they provide some level of flexibility, in that content can be tailored by individual academics to suit the particular focus and scope of individual courses, because they do little more than broadcast information to students within discrete disciplinary contexts, they do not adequately serve students' learning needs in interdisciplinary fields. They do not afford learners the agency to map content across disciplinary fields according to their unique learning needs and interdisciplinary situations. In addition, they do not enable the kinds of collaboration that are crucial to socio-constructivist learning objectives. Moreover, they do not facilitate responsive or dialogic learning. These shortcomings arise from the conceptualisation of LMSs as tools to facilitate a didactic model of learning within a stable, closed, and contained field of knowledge.

Out of a literature and contextual review and the formulation of a needs analysis based on two instances, or case studies, I have gone on to develop a set of principles to inform the design of online learning environments for fluid interdisciplinary fields. They include, in brief, that learning applications must be user

centred in ways that enable students to organise topics and fields into unique configurations in line with self-identified specialisations, and to contextualise and synthesise new ideas by amassing patchworked collections of references. They must be reconfigurable to enable students to remodel connections between disciplinary content and broader cultural circumstances, according to their changing learning needs. They must afford students and academics agency to write into the pedagogical space, and so to move beyond passive receipt of content, to actively handling, interpreting, and annotating texts and exemplars of practice from the field and so contribute to the dialogue of the field. And they must support purposeful interaction and collaboration between peers in project teams if they are to achieve socio-constructivist objectives, and enable students to map their shared interests, learning needs, and experiences in assigned specialist roles.

Then, in the previous section, I have gone on to extend this discussion to consider the possibilities of adapting Web 2.0 and open-source tools to configure alternative approaches to LMSs. I have described the potential of expansive, agile, dialogic, and collaborative learning environments, which go some way towards facilitating the principles. I have argued that, while they have been largely developed for different purposes such as social interaction or commercial transaction, Web 2.0 tools offer the potential to support a more open, interactive, and adaptive learning environment. However, I concluded that these benefits might be limited by contextual factors, such as the need to integrate an array of quite different tools into a unified learning and teaching strategy, given that no single Web 2.0 tool facilitates all of the principles I have outlined. In addition, because such tools were not primarily designed for learning, they must be reconfigured in purpose. Furthermore, academics must be willing to constantly invigilate and adopt or adapt new software and hardware as it is developed and upgraded, as well as whenever learning needs and assessment tasks change.

In short, to design online learning environments that adequately support interdisciplinary learning requires a fundamental shift in the architectural models and affordances of e-learning applications. This requires thinking differently about the conceptual models of virtual learning frameworks and privileging relational and contextual, as well as dialogic learning, research, and knowledge production.

In this section, I will discuss ideas drawn from the fields of critical theory, creative practice, and the social sciences that foreground alternate ways of knowing and of presenting knowledge to hierarchical structures. These concepts and models have been fundamental to the development of a new conceptual model, which I describe in terms of a constellations metaphor. An integrative and relational architecture for online learning environments draws on concepts of similitude, interrelationships, and awareness of contingent relations.

Kevin Hetherington's concept of similitude provides a way of thinking that is quite different from models of online learning environments based on classification and structural hierarchies. In his account of the history of the museum, Hetherington explains that during the European Renaissance similitude was the primary mode of making sense of the world (1999). He cites the example of cabinets of curiosity (*wunderkammern* and *studioli*), which emerged during the 16th century and were popular with European aristocracy such as Francesco I de' Medici Duke Albrecht V of Bavaria, his brother Ferdinand II, and their nephew Rudolf II in Prague (ibid., p.112). As forerunners of the modern museum, these private collections denoted the wealth and power of nobility but, as Wolfram Koeppe explains, they were also used as teaching tools and to stimulate cultural interest (2000). Organisationally, they represent a type of associative and integrative model of ordering material. Their organisational logic was produced through similitude, or the production of "resemblances and circular relationships in which a diverse array of things is brought together" (Greenhill, 1992, p.105). That is, until the shift towards nomological strategies, and classifications of objects within a linear, hierarchical logic, which emerged with the Enlightenment and quickened pace with the rise of Modernism, meanings were derived from associations, relationships, and correspondences (ibid., p.65).

Hetherington's model of similitude is significant to this study because it reminds us that we are capable of ways of knowing and representing meaning that invite contextual and relative associative interpretations. It invites us to reconsider closed Cartesian perspectives on objective reality (Rodriguez-Pereyra, 2008) by reasserting the significance of contingent relational understanding and focusing on an exchange between objects and their *located* subjects. As a conceptual model for

understanding integrative knowledge construction within learning situations, similitude provides a model for privileging individually significant, contextually located collections. This provides a way of thinking about engaging students as producers of relation meaning, rather than simply as consumers of a static, closed interpretation.

Walter Benjamin's Arcades Project provides an example of the interpretative logic of similitude (Hetherington, 1999, p.58). It is a collection of annotated citations that are ordered, as Howard Eiland and Kevin McLaughlin explain, according to their shared affinity (2002, p.X). Benjamin draws on a metaphor of the shopping arcade (*passages couverts*), in which collections of individual shops constitute a single spatial entity as *a world in miniature*. It proposes grouping through loose association (in the form of *convolutes*) to draw together ideas. In so doing, it is a notable example of the potential of open organisational forms for structuring heterogeneous collections of references.

Walter Benjamin's constellation metaphor provides another key example. Rather than mapping a linear, causal, or teleological representation of history, as we have come to expect, it provides a spatial representation of historical events and their contexts. In so doing, it emphasises the significance of individual, localised histories, which are formed through a process of narrativisation and re-narrativisation according to local contingencies and a variety of situated perspectives. This conceptual model is one of integrative complexity and relational dynamics. As Graeme Gilloch explains, the metaphor is a spatial representation of "a figure constituted by a plethora of points which together compose an intelligible, legible, though contingent and transient, pattern" (2002, p.20).

Theodor Adorno reinterprets Benjamin's constellation metaphor to describe the circumstances in which objects and entities have polysemous meanings. For Adorno, a constellation represents the multiplicity of readings and interpretations of meanings of an object, which arise from the object's highly contingent and fluid interaction with cultural circumstances. As Linda Martín Alcoff and Alireza Shomali explain, "Adorno suggests that the mediations of an object will multiply and reverberate around it, forming something like a constellation. And thus, whenever we encounter an object

anew, we have phenomenal access to a constellation of concepts or connotations” (2010, p.54). That is, a constellation operates as a calculus and display of extrinsic relationships that arise as a function of *being in the world*. Martin Jay goes further, arguing that a constellation operates as “a juxtaposed rather than integrated cluster of changing elements that resist reduction to a common denominator, essential core, or generative first principle” (Benjamin, 2002). The constellation metaphor, then, shares much in common with Hetherington’s similitude. It represents an open organisational structure logic with changing relational frames making representational sense of an array of contingent and incoherent meanings.

Within the context of this research project, Adorno’s constellation metaphor offers an alternative model to the singular, closed, and static information structures of conventional e-learning environments. It opens up the possibility of accommodating a plurality of readings and interpretations, which can be represented in relation to each other as well as the object or subject. Such a flexible, integrative organisational model is important for accommodating the needs of students who are learning in changing, and sometimes contradictory, contexts.

A number of creative and speculative works employ such a logic of association. For example, Aby Warburg’s Mnemosyne-Atlas is an integrative work that departs from universal classification systems and organisational schemes. The atlas comprises a set of photographs that are pinned to wooden boards. Each grouped set of images is arranged according to a particular theme, but they can be flexibly reordered according to interest, allowing new associative meaning and relationships to emerge. Ordering and reordering photographs to create and compose composite displays, Warburg used the atlas as a tool to visually explore ideas of informal associations. As Martin Warnke explains, images in the atlas are “not ordered according to visual similarity, evident in the sense of an iconographic history of style; but rather through relationships caused by an affinity for one another and the principle of good company, which let themselves be reconstructed through the study of texts” (2003). In this sense, Warburg’s atlas operates as both a creative work and a tool for making and revising visual compositions based on changing relationships. It provides a tangible example of associative organisation and relational sequencing.

Warburg's atlas illustrates the value of open and flexible organisational structures for handling and presenting content to develop new associations and meanings, and in this it can be aligned with the process that students engage in through constructivist processes. It opens new ways of thinking about the structural logic of e-learning applications to enable open and reconfigurable displays of content, based on *affinity* and, with that, a means for engaging students with constructing meaning through discursive association.

Chris Marker's documentary film essay *Sans Soleil* (2012) is underpinned by an organising logic that is based on similitude. Reflecting the nature of human memory, the film sees meanings through the interplay of story ideas (fictions), symbolic references, and narration (in the form of personal correspondence between the narrator and a fictional traveller). Through skilful selection of content and editing, the film's concepts are relationally ordered as an intersecting constellation of related and unrelated concepts. Relationships unfold back and forth, across and between related ideas. As Orlow Uriel explains, the film functions as a type of thesaurus (1983), where an association of ideas correspond and intersect in defiance of both a Modernist taxonomic classification and linear modes of representation associated with sequentially unfolding film. In this way, Marker presents a precedent and potential model for non-hierarchical organisational structures and their capacity for communicating conceptual complexities and contingent relations.

While Marker's *Sans Soleil* provides an alternative to the linear organisation of content, Nelson's Project Xanadu challenges the worth and validity of *closed works* by explicitly revealing contingent relations, reformulations, versions, and revisions. Nelson asserts the importance of being able to visualise *parallel texts*, so that the meaning of a text can be understood through the consideration of all of the constituent iterations in the production of a work, as well as its culminating form. As Nelson explains, "We need this visualization for side-by-side parallel documents (from holy books to legislation); for detailed explication, commentary or disagreement; for comparing successive versions of a document" (Nelson, 1999). It is a model that reveals the inner workings of ideas to provide a deeper understanding of them.

Nelson's insistence on the value of parallel texts provides a rationale for designing open organisational regimens that potentially reveal contingent relationships between constituent parts and iterative text reformulations. If we prioritise an approach in which iteration and constituent parts of a processes are pre-eminent, then this can provide a conceptual framework for e-learning environments that supports a constructivist strategy, and enables students to develop greater awareness of contingent relationships between forms and expressions of knowledge. It can facilitate a deeper understanding of the variations that arise out of contextually located interpretations. In short, it could enable students to interrogate knowledge relationships as they work to construct their own revisions and reformulations of evolving discourses.

A conceptual model for the design outcomes of this PhD project has incorporated these concepts of similitude and constellation. It has drawn from the precedents of personal and reconfigurable thematic organisation in Warburg's Mnemosyne-Atlas; non-linear presentation of content in Marker's *Sans Soleil* (2012); and incorporation of parallel texts in Ted Nelson's Project Xanadu. Each of these exemplars demonstrates the potential of open organisational forms for representing contingent relations. A constellations metaphor brings them together in a general model that can enable engagement with multiple perspectives, interpretations, iterations, and contingent relations through linking and association, without the need for reduction to a common unifying order. This model underpins the design of the Folksonomy tool, which I present in the next chapter.

Chapter 5: The Iterative Design and Development of the Project's Creative Outcomes

The design and development of the creative practice outcomes of this project were underpinned by an iterative design process, as described in Chapter 2: Research Methodology. Building on and extending the ongoing process of theoretical and contextual research, the methods of practice-led research involved a cyclical process of proposition, application, implementation, evaluation, and evolution. A series of versions, each with sequential revisions, was produced between 2004 and 2010. Each sequential iteration was motivated by evaluation and reflection, informed by my developing critical awareness of online learning, theoretical concepts, and local pedagogical needs. This chapter explains the evolution of prototypes as unfolding events, which began with the design and development of an application I called a Virtual Heteroglossia, followed by a Constellations website in 2004, and an application I titled the Folksonomy, with its first version (Folksonomy 1.0) realised in 2008 and a refined version (Folksonomy 2.0) realised in 2009 to 2010.

It should be noted that, while I have adopted a sequence of metaphors to help explain the design and pedagogical function of various tools, I am aware of the awkwardness that comes from drawing on traditional or material things to describe a digital context (Lakoff & Johnson, 1980, pp.35). However, just as a web metaphor conflates the symbolic structure of a spider's web with the structural logic of an information network, representational analogues offer communication benefits by providing familiar cues for new users as they transition between known and new contexts. They do so by making concrete that which is not. The web, for instance, becomes envisaged as a stable form (an information resource), when it is in fact an intangible and dynamic coded system that is in a constant state of emergence. So it is with metaphorical names selected for the applications I developed.

5.1 BEGINNINGS: NETMEMORY

While the culmination of the design research in this PhD project is an application that facilitates participatory learning, its beginnings (from a technical design perspective at least) can be traced back to a relatively trivial tool I created in December 2003 for QUT Artist in Residence Agnes Hegedüs and her project Object Memory Archive (OMA). Entitled netMemory (as per Figure 5.1), it was a web application that enabled Hegedüs' research team to build a shared information node through which to draw together and map published theoretical works and creative works that were influences on the project. It enabled the team to post texts and images and to draw relationships between them by assigning content to in-common groups or clusters. In this way, an evolving collaborative map of the ideas that were drawn into the project was created. I called the tool netMemory because, while it facilitated sharing ideas between team members as a knowledge network, it was also useful for documenting the evolution of the project and situated it in the field of practice and related conceptual frameworks post-hoc. In this regard, it facilitated the production of an archive, or residual artefact, as a trace of the project's emerging contextual relationships.

| [add new item](#) | [add new subject](#) | [add new user](#) |
| [notes](#) | [metaphors](#) | [technology](#) | [cyberspace](#) | [information design](#) |

>>[walter benjamin: das passagen-werk / the arcades project](#)

Simon (2003-12-01)

Description:

The Arcades Project is Walter Benjamin's effort to represent and to critique the bourgeois experience of nineteenth-century history and, in so doing, to liberate the suppressed "true history" that underlay the ideological mask. Conceived in Paris in 1927 and still in progress when Benjamin fled the Occupation in 1940, The Arcades Project was constructed over the course of thirteen years---"the theatre," as Benjamin called it, "of all my struggles and all my ideas."

According to Benjamin, an arcade is a city in miniture catering to consumer needs. It is an abstraction that condenses a heterogeneous environment of shopping opportunities and goods into a unified experience.

Benjamin dispels teleological historicism in place of a constellation model of relations. For him the arrangement of the arcade is symbolic of general urban design. All aspects, despite their apparent significance have bearing on all other aspects. Classical Marxist economic and cultural causation is replaced with degrees of interrelation, experienced by a Flâneur (or stroller) as they traverse a given environment.

Reference:

book: Benjamin, W. (2002) *Das Passagen-werk [the Arcades Project]*, , : Harvard University Press.

collections

Agnes (2003-11-30)

Description:

Reference:

book: Benjamin, W. (1988) *Illuminations*, New York, U.S.A: Random House.

Figure 5.1 Screenshot of the netMemory web application prototype

The netMemory application was retired shortly after being created, due to the changing needs of Hegedüs' project, but I continued to be interested in the concept behind the project. I repurposed the tool as a pedagogical application, which I called the Virtual Heteroglossia, and I implemented it in my teaching. The title refers to Mikhail Bakhtin's dialogic theory. His notion of the heteroglossia refers to a collection of texts that are produced through unfolding dialogue and social exchange. Bakhtin

describes the process of continuous, responsive dialogue as a series of utterances. He writes:

Every utterance generates a response in the other who receives it, even if that response is only within inner speech. However, the initial utterance already anticipates that active response in the receiving other and so shapes itself to take it into account. But neither, of course, was the 'initial utterance' actually the first word in any real sense; inevitably its form is moulded not just by the future response but also as 'answer' to all relevant previous utterances.

(Bakhtin, 1994, p.5)

This theory seemed particularly relevant to the framing of knowledge in terms of the multi-perspectival viewpoints, the nature of collective, ongoing dialogue, and the plurality and mutability of meaning. While this encompasses key aspects of a research collaboration, it also applies to classroom contexts in higher education.

While Bakhtin's ideas were presented in relation to literature and the novel, I was especially interested in the broader concept, and the nature of what my QUT Communication Design colleague Jillian Hamilton described as "a hybrid construction that integrates the utterances of multiple narrator(s) and characters" (Hamilton, 2011). I was fascinated by the idea of an evolving polyphonic dialogue, with its push and pull upon sign systems and meaning as it evolves discursively through a process of conversational contestation and exchange (Bakhtin, 1994).

I saw the Heteroglossia as a mechanism for contesting and developing meaning, as much as sharing insights and information. It was important then that the Heteroglossia tool accommodated the contingent nature of progressive dialogue and, by extension, the production and evolution of meaning. As I redesigned the tool to support undergraduate design students to locate their practice within broader academic discourse, I was therefore mindful that, together with their peers, students might exert a push and pull on the meanings of their evolving discipline as theories from a range of established disciplines were deployed and adopted, adapted or contested in relation to the interdisciplinary field of communication design.

To achieve this, I made it necessary for users to associate each new post with those that already appeared in the Heteroglossia. That is, while all posts exist as

utterances (see the Motivation and Response sections enclosed within the green soft-box in Figure 5.2), new posts had to be responsive, motivated by an existing idea or text. In this way, each post was identified as a response to a preceding motivation (see Figure 5.3).

[respond](#) | [edit](#)

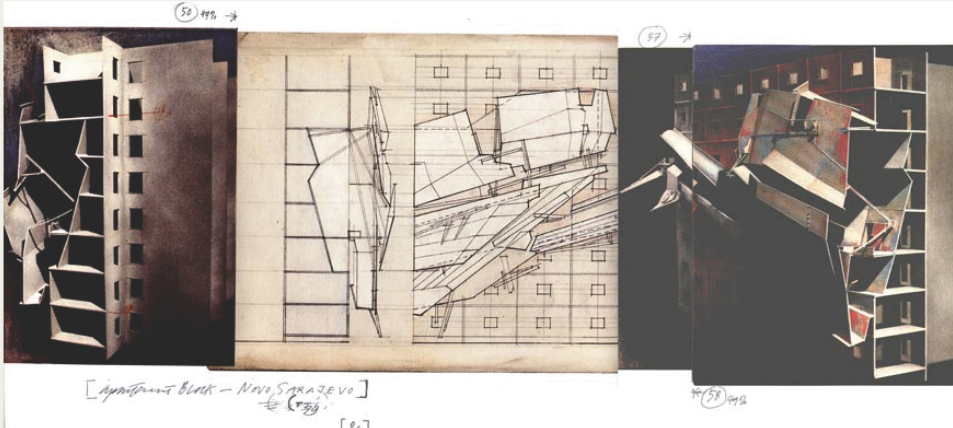
(39) LEBBEUS WOODS: SARAJEVO - APARTMENT BLOCKS

Simon Perkins (2003-10-08)

Concepts:
Woods, mutability, spatial order, webbing of cycles, distortion, destruction.

Position:
In spaces voided by destruction, new structures can be injected. Complete in themselves, they do not fit exactly into voids, but exist as spaces within spaces, making no attempt to reconcile the gaps between what is new and old, between two radically different systems of spatial order and of thought - (Woods, 1997, p.16).

a webbing of cycles intersecting in space and time



Motivation:

Web: [Lebbeus Woods](#) (2003-10-08).

Prompt: [Robert Delaunay: Le manège de cochons \(Carousel with Pigs\)](#)

Book: Woods, Lebbeus. 1997 p.80, 83. *Radical Reconstruction*, New York, U.S.A: Princeton Architectural Press. ISBN:0485120704

Response:

[theory]: [Futurist manifesto: War is beautiful](#)

[space/time]: [The Virtual Guggenheim Museum: liquidity, flux, and mutability](#)

[theory]: [tends to perfection: nature](#)

[interaction]: [Jean Tinguely: self-destroying machine](#)

Figure 5.2 Virtual Heteroglossia motivation and response links

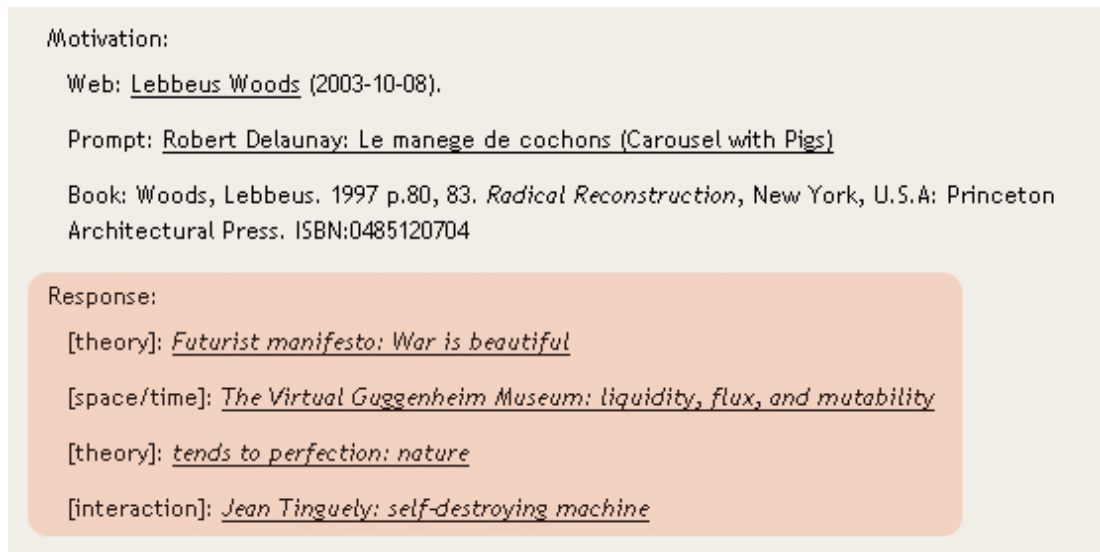


Figure 5.3 Detail of Virtual Heteroglossia motivation and response links

The revised Heteroglossia was trialled during the 2004 academic year with a cohort of (approximately 70) final-year undergraduate students who were studying the QUT Communication Design unit Design Project A. Through its use in class activities, we worked as collaborators to produce a collective repository of materials for the subject, with extended links to resources and content surrounding, as well as beyond, the curriculum.

As a tool, the Heteroglossia provided a means for design students to explore interrelated interdisciplinary ideas, and to work through a process of building an expanded, rhizomatic knowledge bank. As new posts (responses) were necessarily situated in relation to existing posts (motivations), the evolutionary development of the repository meant that the structural framework of the repository grew through the multifarious associations that were made between each motivation and a range of possible responses. This meant that all ideas could be traced back to a root idea. The relationship between motivation and response(s) is shown in Figure 5.4.

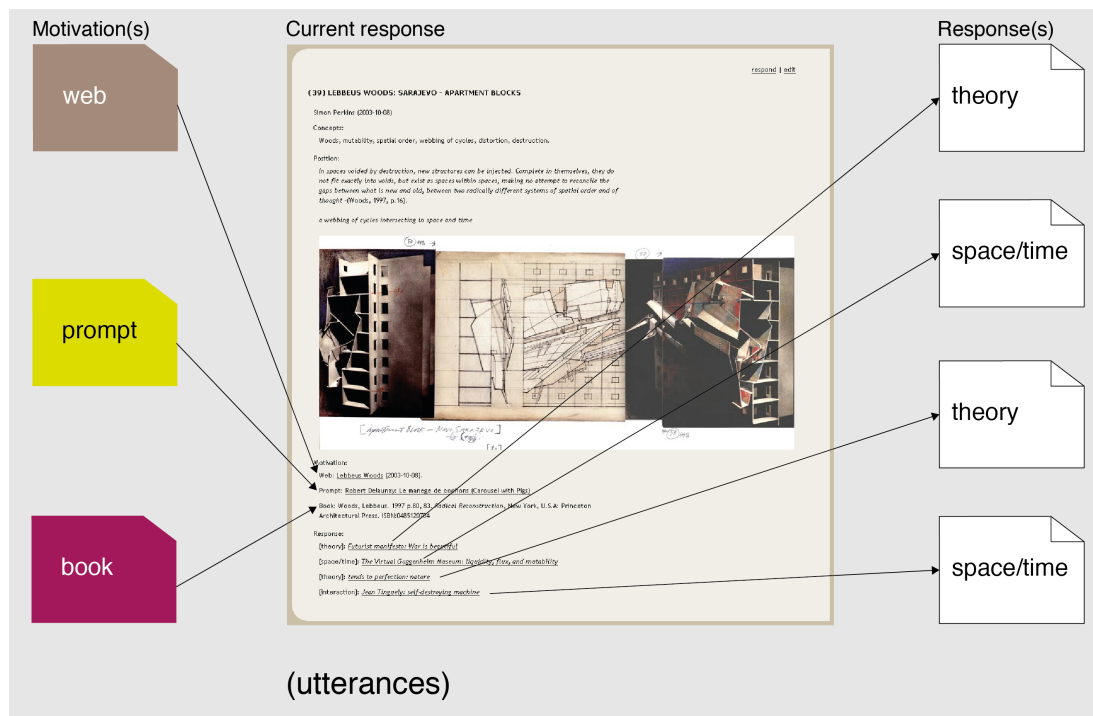


Figure 5.4 List of motivations and responses within Virtual Heteroglossia categories

I trialled the Heteroglossia prototype tool upon its completion, and evaluated it using an online questionnaire. The results indicated that students saw the approach as unique within their university experience, in which they typically responded to an essay question by referencing set texts and reading lists. It opened up for them the understanding that ideas are both relational and contingent.

However, the evaluation also revealed that the students did not fully recognise the value of locating their practice within broader academic discourse. Theory was less of a priority for them than practice, and they tended to prioritise their time addressing the creative and technical challenges of their projects.

In November 2005, I also received feedback when I presented the Virtual Heteroglossia at the QUT Faculty of Creative Industries Flexible Fantasies seminar, where I received critique from peers (academics and interaction design practitioners). Together with the feedback I had received from students, it prompted me to revise the tool.

Through a somewhat narrow and instrumental interpretation of Bakhtin's theories, I had conceived of the tool as producing an interrelated repository of references collated by and for students, but it could be more than this. I realised that

restricting access to students studying the subject was overly limiting and not highly incentivising for them. I therefore made changes to ensure that the repository (and by extension the students' contributions) was made publicly accessible. This meant that student contributions had the potential to reach a much wider audience, so they felt they were actively contributing to the discussions, debates, and definitions of their emergent field.

At the same time, I became aware of Jean Lave and Etienne Wenger's concept of Legitimate Peripheral Participation. In summary, it proposes that apprentices gradually assemble a general idea of what constitutes the practice of their community and profession from a largely peripheral perspective (Lave & Wenger, 1991). During an extended period of peripheral observation, they take opportunities to make a culture of practice their own, and they rehearse their involvement in it through the interpretation and assimilation of its ideas, rules, and practices. Importantly, this process requires that learners receive feedback, so they are able to reflect on their engagement as fledgling community members. From a pedagogical perspective then, access to the repository by casual browsers as well as by registered members could enable students, as new members of the design community, to assimilate the authoring practices of the community, while potentially receiving feedback and external recognition of their efforts as authors and co-contributors.

The site redesign would enable opportunities for discussion about the project with non-members. Advice on the redesign process was sought from Agnes Hegedüs, Jillian Hamilton, and Frank Chalmers. These particular peers were chosen because of their knowledge of the fields of digital creative practice and interaction design. Hegedüs is an internationally recognised new media artist (Schwarz, 1997; Shaw & Sommer, 2002; Shaw & Weibel, 2003) and was able to provide valuable insights from her considerable knowledge of the new media design field. Chalmers was a principal research investigator and project manager at the Australasian Cooperative Research Centre for Interaction Design (ACID). By critically evaluating the Virtual Heteroglossia, asking probing questions and exploring usage hypotheticals, he drew my attention to the importance of user interaction and usability. Hamilton was the creator of an early online pedagogical tool called the Virtual Tutorial Gallery, which applied Bakhtin's notion of the Heteroglossia (Hamilton, 1999). She helped to extend

my understanding of the theoretical model to recognise that learners must be provided with the means to locate themselves within the system as contributors to the dialogue. In Hamilton's online publishing system, students were afforded such agency by being responsible for the curation of fine art exhibitions and online catalogue essays, then linking to the ideas of each other and those of the larger field.

As a result of the significant insights I gained from the evaluation and review process, I reformulated the conceptual framework of the Virtual Heteroglossia.

5.2 CONSTELLATIONS

I redefined the organisational structure of the Heteroglossia tool to privilege the relatedness of the ideas of peers, rather than direct and responsive dialogic in the form of affirmation or contestation of previously presented ideas. These conceptual changes were operationalised through the tool's functionality. I removed the requirement for users to explicitly associate their posts with existing posts, and instead introduced a process of self-selected keyword tags and an attendant process of automated aggregation of posts into categories of association. In addition, I created a What's Popular page, which automatically promoted posts based on recent, as well as frequently accessed, posts. I also added user profiles, so that participants could identify and situate themselves in terms of their practice and in relation to their published contributions to the Heteroglossia.

These were substantial changes and, because they made the application fundamentally different, I renamed it. I called this new iteration Constellations,³¹ in acknowledgment of the influence of Theodor Adorno's constellation metaphor on the project. As I have discussed in the previous chapter, constellation describes a network of interrelationships that are not hierarchically ordered or dependent on a unifying or totalising logic. As Martin Jay explains, the concept of constellation offers an alternative form of organisation that facilitates the potential of open and relational content to make new associations and meanings that might arise when content is

³¹ A function version of the Constellations website is available here: <http://constellations.folksonomy.org.uk/>

presented as “juxtaposed rather than [as an] integrated cluster” (1984, pp. 14–15). Then they “resist reduction to a common denominator, essential core, or generative first principle” (1984, pp. 14–15). Figure 5.5 provides an indication of how the site was revised to reflect this new conceptual and structural approach.

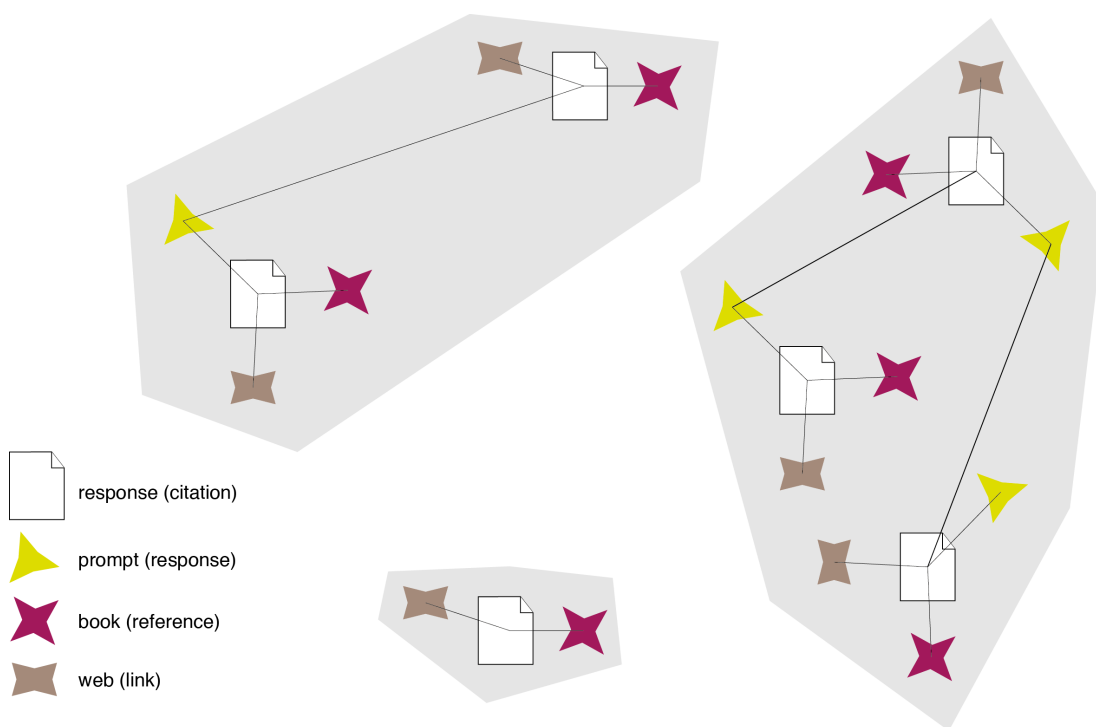


Figure 5.5 Associative logic of the Constellations website

Whereas the logic of the Heteroglossia mandated that all new responses (posts) were associated with existing responses, this requirement was removed for the Constellations website. By doing so, different-sized groupings of interlinked sets of responses (constellations) were able to evolve as a result of the relevance of constituent ideas according to the interests of site users. This change meant that new responses could be added and, while they might be initially separate from the rest of the repository, they might become the basis of new constellations (depending on their conceptual currency). Alternatively, new responses could be added that, through their association with existing responses, served to extend established constellation groupings.

The Constellations website proved to be very effective in my teaching practice. Whereas my Heteroglossia received a mixed reception in 2004, the change of context (from the theoretical lecture to studio environment) and change of use (from

knowledge sharing to conceptual framing), along with the change in the conceptual (relational) model and open publication, meant that students were more readily able to incorporate it into their existing practices, as well as more incentivised to do so. In the context of interdisciplinary research-based studio teaching, the site enabled students to situate their ideas within a broader conceptual frame and this allowed me, as their teacher, as well as their peers, to contextualise student projects against the background of existing published or exhibited works.

Besides situating the students' work for the benefit of themselves and others, the site also provided a growing repository of ideas and references, which students could access as well as contribute to. The studio environment requires students to work through a number of ideas in quick succession, evaluating them according to project objectives, and through reference to broader circumstances and perspectives. This repository enabled rapid contextualisation and was therefore of particular value in this environment.

The tool also provided much needed continuity in my teaching as I relocated from Brisbane in Australia to Nottingham in the UK at the end of 2005. Instead of being reliant on course PowerPoint slideshows of material, I was able to quickly adapt content in the Constellations website for use within my teaching. This was primarily because of the open and flexible form of the repository, but also because of my familiarity with both its content and organising structure.

5.3 FOLKSONOMY 1.0

A further advance in the emerging conceptual framework for the project was instigated by discussions with a visual and sonic artist, Luke Jaaniste. His review of the concepts, information architecture, source code, and interface design of the Constellations web application drew my attention to the site's organisational taxonomy, and what constitutes the meaningful presentation of content from the perspective of students. He asked questions about the ability of novice professionals to meaningfully situate the content they published within the keyword tag categories that I had provided on the site. I realised that, without an explicit understanding of the site's ontology, the students were likely to make arbitrary decisions in relation to

tagging their contributed content, which could obfuscate the categorisation process and, in turn, diminish the clarity and coherence of the site's organisation. Jaaniste suggested a possible solution – instead of using keywords to index content implicitly (where tagged content was collated invisibly by the site's administrator or editor), content could instead be categorised explicitly by users in an ad hoc manner according to their own criteria. This would become a central aspect of the next design iteration.

In essence, the proposal that arose out of this review of the Constellations website was to create a folksonomy, in the sense of Thomas Vander Wal's use of the term. Vander Wal describes a folksonomy as a framework through which users index content according to "personal free tagging of information and objects (anything with a URL) for one's own retrieval ... and where the value in this external tagging is derived from people using their own vocabulary and adding explicit meaning" (2012). Here Vander Wal describes a model in which non-expert users can organise and make sense of their content in a direct, personally meaningful way. This is relevant to the needs of the revised Constellations website because, rather than being required to categorise content using predefined categories (a taxonomy), users could contribute using their own naming systems (as an ontology).

I adopted a more expansive and associative means of user generated content tagging and attendant grouping and aggregation using content filters. This meant that the application's population with content would eventuate in a thesaurus-like structure of content nodes of association. This enabled students to co-create content collections rhizomatically, according to their changing needs.

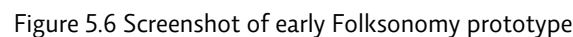
Ted Nelson's Xanadu Space and his interpretation of contemporary cultural theory (which is described in the preceding chapter) provided a model for reconceptualising the software architecture of the application. In some regards, it provided a blueprint for remodelling the design as an information structure that privileges interlinking and hypertextual association above nomological classification strategies in which content is strictly organised according to a single dimension (for example, alphabetically or chronologically).

The redesign also drew on the logic of Chris Marker's film *Sans Soleil*, also described in the previous chapter, in terms of its organising logic based on similitude. Despite the constraints of the cinematic form (which dictates sequential arrangement) the film is structured relationally as a type of thesaurus. In this way the film can be seen as a model for non-hierarchical organisational structures such as those underpinning the reconceptualised Folksonomy.

Developing the new prototype provided a vehicle to further refine the project in line with these theoretical and practice models. I began developing the new architecture, loosely conceptualised around Agnès Varda's reference to the role of the *gleaner*, that is, someone who gleanes value from scattered items (Varda, 2000). While the Folksonomy tool facilitated the production of new meanings through the assemblage of personalised inventories (reference collections) based on their specific conceptual needs.

In this case, while the functionality of the Heteroglossia and Constellations sites had enabled users to build such inventories through their role as content author, the revised version of the Folksonomy enabled students to collect and share their inventories of gleaned inspirational and influential designs through their selection and use of keyword tags. In addition, through the process of sharing, it enabled them to reflect on the relationships, inherent similarities, and affinities that their inventories had with those of their peers.

An iterative design and development process involved the production of several architectural prototypes in response to evaluation, feedback, and reflection. Figure 5.6 shows the first prototype. In it, the majority of the application interface is devoted to displaying keyword tags. I decided to highlight them in this way to make the site's ontology explicit to users so they could meaningfully situate themselves in relation to already published content.



In keeping with the emerging definition of folksonomies described above (Mathes, 2004), functionality was added to enable users to supplement the existing keyword tags assigned to individual posts. Doing so effectively meant that posts

would be redefined according to the new criteria. In effect, this had the potential to radically redefine the focus of the site. However, further development of this capacity would take considerable time investment at a technical level and, while it would serve the interests of defining the folksonomy, its value to the pedagogical interests of the research was less clear. It was therefore considered to be beyond the scope of my PhD. Therefore, while users could add keyword tags to posts, I stopped short of implementing the capacity to change or edit existing tags or modify the default concept filtering method.

I called this new iteration of the tool the Folksonomy because of its taxonomic nature. While earlier prototypes of the Constellations website were limited to a single top-down menu structure, the Folksonomy employs an associative logic designed to accommodate various students' research needs by enabling them to cluster content through the overarching concept filter.

I registered the domain name and created a brand mark (logo) to represent the overlapping and juxtaposed form of the folksonomic indexing system. In a playful homage to Adobe Photoshop clichés (the overuse of drop-shadows prevalent in digital design) I placed a white letter "F" of *Folksonomy* on a ground overlapped by its inversed copy. My aim was to invoke the Gestalt principle of repetition in which two separate elements are perceptually grouped so that they infer the concept of sequence; that is, where the upper letter "F" begins the sequence and where the lower is its (implied) continuation. My decisions to use the hexadecimal colour 6BCF6B and typeface FF Xscreen Straight (Sauerteig & Vermehr, 1998) were more whimsical. I borrowed the formal simplicity of the Swiss flag and made a colour selection (green) because of personal preference and a desire to avoid the overcrowded "corporate blue" ghetto of Michael Rock's corporate colour neighbourhood (Rock, 2003, p. 157).

5.4 STAYING ABREAST WITH TECHNOLOGICAL DEVELOPMENTS

As I have noted in previous chapters, during the life of this project we have seen enormous developments in the fields of social media and the digital technologies that enable them. To stay abreast with technical advances that were occurring in parallel with the conceptual and theoretical development process of the PhD, in 2007 I

created an online tool to assist in the continual survey of developments in social software design.³² I used it to collate data on social software design and this enabled me to recognise patterns that were occurring across a range of tools. This helped to reveal common design considerations and software architecture trends. It also helped me to stay abreast of technical advances, which I adopted as appropriate.

Through an inductive process of analysis of the evolving collection, I formed tentative hypotheses about the emergent field of social software design, technology and its affordances, and the implementations and uses of what would come to be called Web 2.0 applications. That is, the survey tool helped to produce an evolving contextual review, which provided an opportunity to observe trends and to recognise their significance to the conceptual advances that were occurring in my design process.

An example of the benefit of this observation and analysis process is that it enabled me to recognise the broad adoption of page-rendering techniques using AJAX (Asynchronous JavaScript) and XML (Extensible Mark-up Language)) and keyword tagging, which have since become standard in online aggregation, and search and recommender applications. I was readily able to adopt them as soon as they emerged and to incorporate them into my application during its ongoing iterative development process. This enabled a shift in the process of web page display. Instead of being triggered by explicit choices made by users (through the selection of Next and Previous links, for example), it would become a responsive loading based on broad browsing choices (as occurs in Google's image search results display for example). While web content was previously organised by my application according to named categories and hierarchically structured lists (tree structures), it would come to be organised by user-generated ad hoc naming systems (keyword tagging) to facilitate collaborative naming techniques, and to enable an integrative organisational structure.

³² A functional version of this website is available here: <http://socialsoftware.folksonomy.org.uk/>

Another example involves the conscious decision I made to develop the software architecture using LAMP (Linux, Apache, MySQL, and PHP) technologies (due to my familiarity with them from previous projects). I became aware of the Object Oriented Programming (OOP) methodology for programming, and incorporated it because of the flexibility it offered. This meant that I created a series of Object classes, which could be combined to enable application functionality, and recombined when functionality changed. While this approach significantly increased the complexity of the project, the resulting flexibility meant that I have been able to constantly extend and tweak the application by integrating new and existing classes as the need arises.

The impact of my continual evaluation of emerging technologies is also evident in the realisation of the application's software engineering. At first I considered designing the application as an open architecture based on XML (a commonly used open format) along with RSS syndication (because of my awareness of the innovative wiki-like content management system, Rhizome, created by Adam Souzis) (2005). I intended to construct my architecture as a cluster of bespoke, open-source, and public domain elements. This would involve integrating content through XML streams by passing content as structured data between system components and external dynamic sources. However, after evaluating the potential risks involved in using this relatively untested method, and because of the limited relevance of software engineering to the research questions of the project, I instead decided to create an integrated application using bespoke PHP server-side scripting. This enabled the creation of integrated functional (software programmed) elements to enforce the business logic of the application, a MySQL database to provide content storage and application state maintenance, and HTML/CSS pages to render and format screen content.

I also included a content management system (CMS) for organising the access and display of published content, as well as user application settings. This was implemented through a technique that combines server-side session cookies and client-side cookies. This technique meant that users had two levels of access: a client-side (frontend) cookie that allowed them to publish or edit posts, and a CMS

(backend) for controlling lower-level or general options such as interface colour scheme, user account details, and so on.

The Folksonomy employed a JavaScript *bookmarklet* technique to streamline aspects of the content collection process so that users could edit and add more content before publishing their posts. The bookmarklet was designed to collect and pass basic page attributes from a source page to an HTML form. The bookmarklet retrieved and parsed the following HTML tag information: Title, URI, keyword Meta elements. The process of using bookmarklets enabled content to be automatically parsed to extract URIs from body copy. This meant that users need only submit Internet addresses for files or resources to be associated with their posts. YouTube clips were also parsed so they could be published in a uniform way, such as being resized uniformly with their default bevelled window frames removed. Integrating the content publishing process with file upload and linking processes in this way was designed to limit the users' need to engage with lower-level application functionality.

In addition, each bookmarklet stored a reference to the current user, which was used to prompt them to identify themselves (through the authentication process). It meant that they simply needed to focus on the subject of their body copy and their choice of relevant resources to publish content. Posts would be automatically formatted with body copy appearing at the top of each post with associated resource links underneath; that is, standard icons for PDF, Doc, Mov files, and so on. Unfortunately, however, the non-standard nature of this functionality meant that few users were able to take advantage of my considerable design and implementation investment.

In these ways, the Folksonomy 1.0 tool was developed through the considered use of contemporary information technology techniques and methods. Developing a bespoke application in this way produced what Terry Flew describes as a *cultural technology*, in which the relationship between enabling technologies and creative output are intertwined and interdependent (Flew, 2008). When I completed developing the first version of Folksonomy (shown in Figure 5.7) I published it as a fully functional prototype online at: <http://prototype.folksonomy.org.uk/> on 1 October 2008.

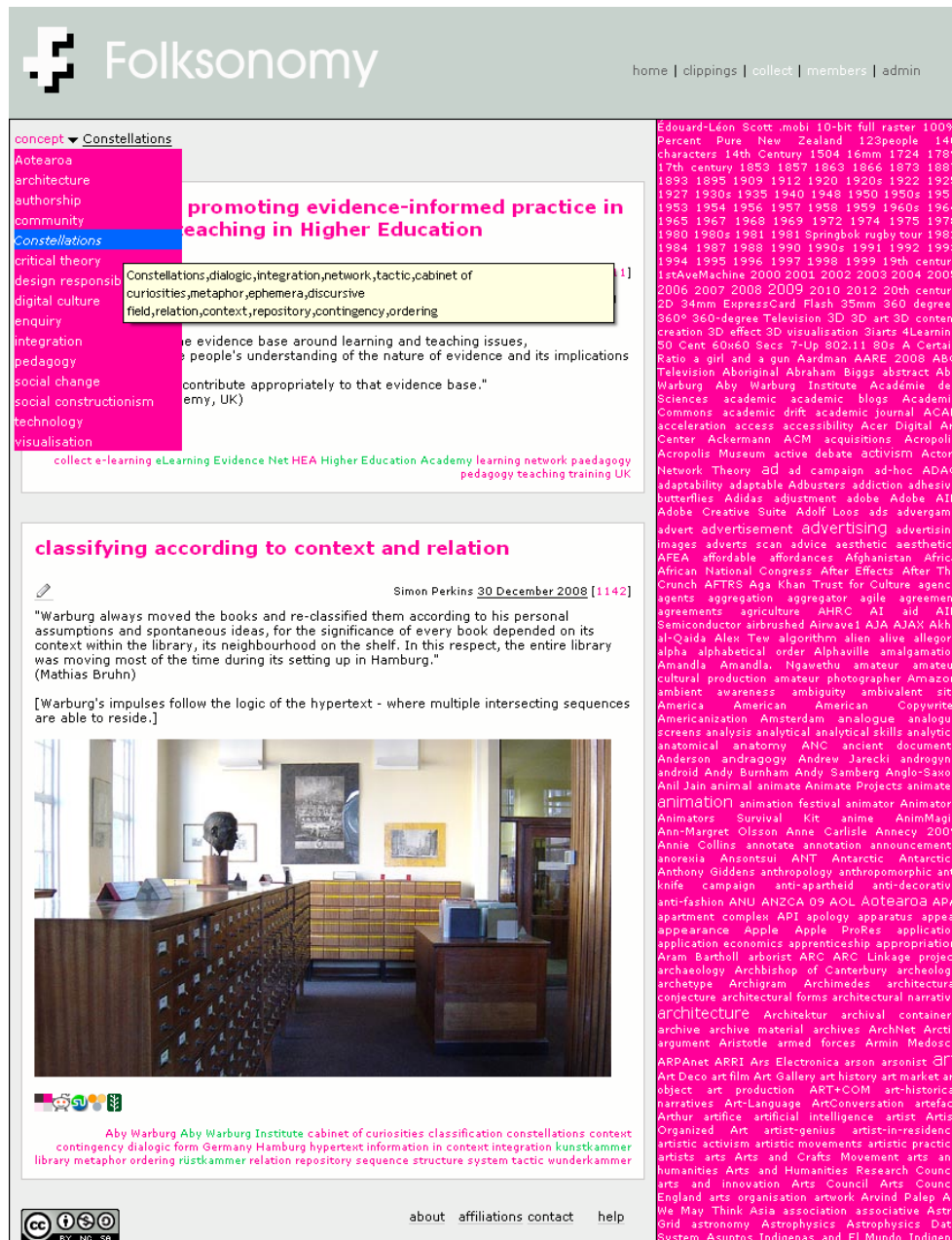


Figure 5.7 Screenshot of the Folksonomy 1.0 interface

5.5 FOLKSONOMY 2.0

While the initial version of the Folksonomy was a significant improvement on the Constellations website, it still used a traditional interaction model. It assumed hierarchically and statically defined user roles as content author and content consumer, and it maintained a separation between application backend and frontend. This would be addressed in a new iteration.

At the same time that I was deploying the Folksonomy in the classroom, I also set up a parallel project, which I called the Reflective Journal. In it, NTU Multimedia staff used an online list to aggregate student weblogs. The (approximately 230) weblogs were each managed by individual students and were made publicly available at: <http://reflectivejournal.co.uk/>.³³ This approach was aligned with the University of Mary Washington's A Domain of One's Own project, which is discussed in the previous chapter. By sharing their work through the Reflective Journal, students were able to share (publish) their practice and, at the same time, develop critical capacity. This involvement made me aware that students must be able to rehearse their professional identities by situating themselves and their work in relation to that of others – in their own voice and through engagement with each other in dialogue. In this way, their role was not simply to be ascribed as a consumer or producer of content, but as co-producers of meaning through dialogic exchange.

This conferred a new level of agency to students, which I was to replicate in a new iteration of the Folksonomy. I started developing a second (and final) revision of the Folksonomy on 25 July 2009. While this version, which I dubbed Folksonomy 2.0, incorporated most of the features of the first version prototype, I refined its features to become more intuitive for users, but my main focus was on revising the interaction model and content collection methods to enable dialogic exchange.

In terms of usability, while the CMS facility in the Folksonomy Version 1.0 was useful for the initiated, its operation was not particularly intuitive for novice users and this was attended to. And, while posts could be edited subsequent to publication, they could not be previewed at the initial publishing stage and this design limitation was addressed. I included AJAX in the design of the prototype because AJAX had become a central feature of contemporary social software design. (For example, Facebook uses it in numerous ways, most notably to enable users to reposition and dynamically load content.)

³³ It should be noted that because of my relocation from NTU to Bournemouth University (BU) the <http://reflectivejournal.co.uk/> site now lists blogs used by BU Digital Media Design students. Despite the change, however, the site's purpose closely mirrors that originally outlined in regard to NTU Multimedia students.

To improve usability, the interaction model of the site was further revised through redesigning the content publishing process. This was done by deemphasising distinctions between content author and content browser. Whereas the earlier Constellations website (and to a lesser extent the Folksonomy 1.0) were modelled on the more traditional approach involving a strict separation of user roles, this requirement was removed for the subsequent Folksonomy 2.0 version. Whereas, previously, users were required to submit posts for administrator approval, the revised version allows members to publish content as they see fit. Doing so affords them greater agency to control their content.

To improve the look and feel of the Folksonomy 2.0, I worked in collaboration with interface designer Shu-Min Heng. While I designed the architecture and built the functionality, Heng designed the interface elements. I made the decision to collaborate with Heng because of my more limited web interface design abilities. It is the conceptual framework, interaction design, and structural (information architecture) aspects that are at the core of the new knowledge contributed by the project, so outsourcing the less critical, interface design aspects of the final prototype enabled me to focus on the more fundamental aspects of the project as they related to my PhD enquiry, while ensuring an attractive look and feel.

We worked on the project remotely, as Heng was living in Japan at the time, while I was in the UK. While we had some common design ground (Heng was one of my students when I was lecturing in Communication Design at QUT) and were able to talk quite candidly with each other about the project, working remotely required me to write considerably more on the project's rationale, aims, and objectives than I would normally do working face-to-face with a collaborator, or working alone. And, of course, his responses also had to be more fulsome. This had the advantage of forcing both of us to be much more explicit about our ideas.

I created a series of diagrams to map out the requirements of the project. I created page templates (Figure 5.8) to determine the functional relationships between pages and a site map (Figure 5.9) and to describe the relationships between content pages, with page links identified through underlined text. The resulting site map distinguishes publicly accessible pages from members-only pages through green

and black colour coding. The pages that are grouped together in the green box in Figure 5.8 indicate pages that display content in reverse-chronological order; that is, weblogs. The pages grouped in the brown box are those that display content in the form of member profiles; that is, profile photo with text. The pages grouped in the blue box are form pages used for collecting and publishing content, such as making a post. The pages grouped in the grey box are those that display content that is static (such as user information pages like the About page). I created the site map and page templates to help me understand the needs of the project and to help me communicate these needs to Heng, as the project's interface designer.

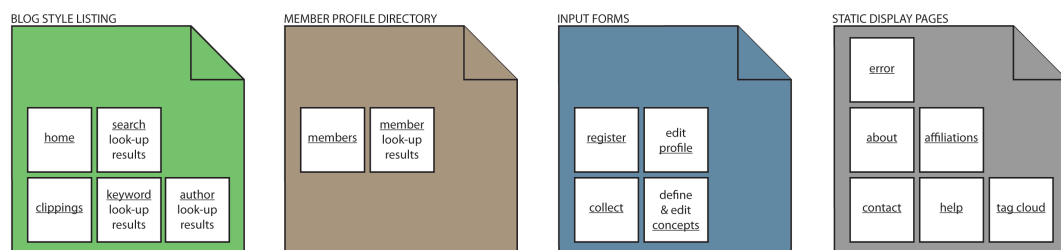


Figure 5.8 Planning page templates

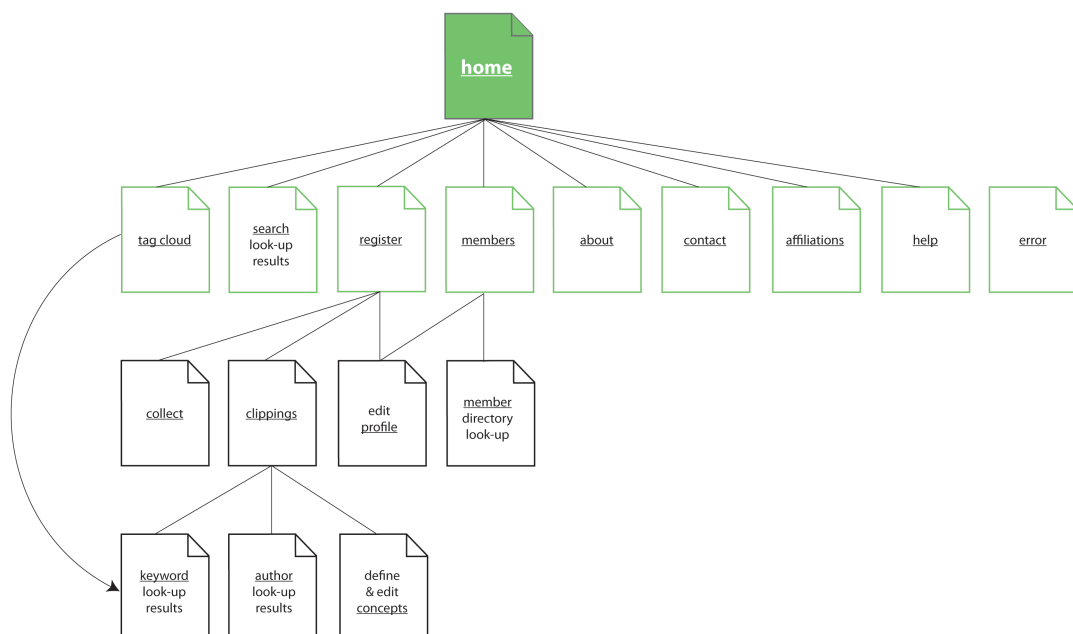



Figure 5.9 Folksonomy site map

I published Folksonomy 2.0 online at <http://folksonomy.org.uk/> on 2 November 2009 and relocated it to <http://folksonomy.co/> on 31 October 2010. The following series of screenshots (Figure 5.10 to Figure 5.13) show the completed Folksonomy 2.0 site, which was created from the above page templates.


folksonomy

Signed in as Simon Perkins | [Edit Folksonomy Profile](#) | [Sign-Out](#)

[HOME](#)
[ABOUT](#)
[MEMBERS](#)
[EXPLORE TAGS](#)

Select and review.

13 NOVEMBER 2014

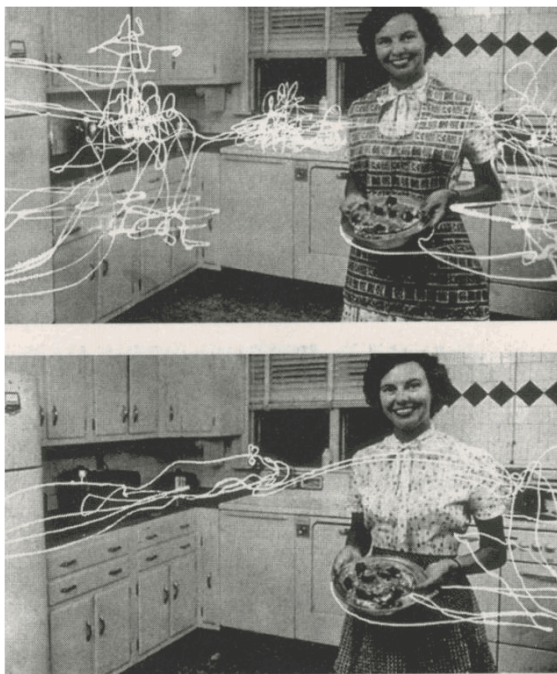
PERMALINK

Time and effort studies comparing the efficiency of pre-prepared meals with that of meals prepared from scratch

"Pre-cooked foods, made possible by new packaging development, are a major time-saver for housewives. Notice the difference in time and effort required in the preparation of a pre-cooked, pre-packaged goulash dinner and one fixed entirely from scratch. lights attached to the cook's wrists show how many more movements she had to make in the 90 minutes it took the long way, compared with the pre-cooked way which took only 12 minute."

(Elizabeth Diller, 1999, p.386)

Elizabeth Diller (1999). Bad Press. "Gender Space Architecture: An Interdisciplinary Introduction". editors: Iain Borden, Barbara Penner and Jane Rendell, Routledge.



Lights attached to a housewife's wrists demonstrate the difference in time and effort required in the preparation of a goulash dinner prepared entirely from scratch in ninety minutes and a pre-cooked, pre-packaged goulash dinner which took only twelve.

<http://m.friendfeed-media.com/6c75944c78b6aa9dfdc48b88ef2bc2ebba7bc7a>




TAGS

bodies in space • circulation • cooking in the kitchen • Diller • Scalfidio • dinner • efficiency • Elizabeth Diller • everyday movement • fast food preparation • George Toysnot • goulash • home cooked meal • housewife • human factors in design • human motion • kitchen • labour-saving • lights • Lillian Gilbreth • meal preparation • motion-tracking • movement analysis • movement efficiency • movement in space • patterns of movement • pre-cooked • pre-prepared meals • prepackaged food • prepackaged meal • preparing a meal • ready meal • ready-made meal • Ricardo Scalfidio • spatial information • spatial mapping • studying motion • The Kitchen Practical (1929) • time saving • time-motion studies • tracing • trajectory • understanding movement • wasted motion • wrist

CONTRIBUTOR


Simon Perkins

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folksonomy
Reflect. Collect. Select.



Tools

Clippings

- My Clippings
- Collect New Clipping

Concept Filter Browser

MY STORED CONCEPTS

- Constellations Metaphor (default)
- Critical Theory ×
- e-learning 2.0 ×
- Freezing Time ×
- Identity Construction ×
- Interdisciplinary Working ×
- Intertextuality ×
- Knowledge Integration ×
- Pedagogy ×
- Rehearsal Through Creative Practice ×
- Social Constructionism ×
- Speculative Design ×
- Sustainable Consumption ×

Stored concepts of all other members:

Member Concepts

Look-Up Concepts

Concept Filter Editor

☒ Edit Current
☐ Create New

Concept Label:

Constellations Metaphor

Concept Tags:

cabinet of curiosities
communities of interest
conceptual metaphor
constellations
constellations metaphor
contingency
cultural forms
cultural technology
design cultures
dialogic

☐ Set as my default concept filter


Preview

Store

Figure 5.10 The Folksonomy 2.0 Home page



Figure 5.11 The Folksonomy 2.0 About page



folksonomy

Signed in as Simon Perkins | [Edit Folksonomy Profile](#) | [Sign-Out](#)

[HOME](#)
[ABOUT](#)
[MEMBERS](#)
[EXPLORE TAGS](#)


Who uses Folksonomy? pg.1 of 5

All A B C D E F G H I J K L M N O P R S T U V W X Y Z


Talita Emmanuela Conde
<http://www.talydesign.co.uk/>
 I am an Interaction Designer from Brazil who lives in the lovely city of Nottingham in the UK.

CONCEPTS


- Agency [RSS](#)
- Formal Compositional Strategies [RSS](#)
- Interaction Design HCI [RSS](#)
- Sense Making [RSS](#)
- Figures In Space [RSS](#)
- Interaction Design [RSS](#)
- Ordering via Relation [RSS](#)
- Content Integration [RSS](#)
- Integration [RSS](#)
- Open Structures [RSS](#)
- Annotation [RSS](#)
- Information Design [RSS](#)
- Multiplicities [RSS](#)


Terry Shave
<http://www.terryshave.com/>
 Profress^r or Terry Shave is the Academic Team Leader for Visual Arts at Nottingham Trent University in the UK. His current practice and research stems from his interest in the way the activity of painting can be mutated and transformed using processes and methods that have been initiated and examined by other means, i.e. new technology, photography, film and video. He wants, through his work, to transcend a narrow doctrinaire approach to painting and engage in a practice that is negotiated as part of a pluralistic activity - not reinforcing a traditional position of painting but exposing problems of that tradition, posing questions about the physical and emotional activity of painting as well as what is painted.

The exploration of the materiality of painting is central to his work: how paint and other materials can be charged with significance and power by mere manipulation and placing, how these configurations of materials are read in relation to each other, to art history and to the 'real' but mediated world. It explores the relationship between painting and photography; painting and form; painting and physicality. The questions posed continually in the work refer to the notion of image/material as "fact", more particularly the idea that nothing can be categorical when it is continually mediated by other images, things, places and events. He is intrigued and stimulated by the process and materials of painting itself and the way painting is negotiated as a credible practice at the beginning of the twenty first century.


CONCEPTS

- Creative Economy [RSS](#)
- drawing [RSS](#)
- elift [RSS](#)
- visual arts [RSS](#)


Terry Middleditch
<http://www.linkedin.com/in/terrymiddleditch>


CONCEPTS

- Australasia [RSS](#)
- Mining [RSS](#)
- Ethics [RSS](#)
- South Island [RSS](#)
- Information Graphics [RSS](#)
- Visual Arts [RSS](#)
- Middle East [RSS](#)


Tessa Szwarnowska
<http://tessaszwarnowska.blogspot.co.uk/>
 Production Assistant at Foster + Partners, London.

CONCEPTS

- Audience Research [RSS](#)
- New Forms of Television [RSS](#)
- Future Media [RSS](#)
- Reflexive Modernity [RSS](#)
- Living Pictures [RSS](#)
- Research Associations and Journals [RSS](#)
- Neurocinematic Studies [RSS](#)


Thanassis Rentzis
<http://asia.academia.edu/ThanassisRentzis>
 Thanassis Rentzis is Film Director and Theorician of Audiovisual Media. The last ten years is teaching Aesthetics of Cinema and derivative media in the Athens School of Fine Arts.


CONCEPTS

- Filmmaking [RSS](#)
- Greece [RSS](#)
- Media Culture [RSS](#)
- Visual Communication [RSS](#)

[Post Navigation](#)
[Next](#)

[CONTACT](#)
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Tools

Clippings

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Concept Filter Browser

MY STORED CONCEPTS

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- Critical Theory
- e-learning 2.0
- Freezing Time
- Identity Construction
- Interdisciplinary Working
- Intertextuality
- Knowledge Integration
- Pedagogy
- Rehearsal Through Creative Practice
- Social Constructionism
- Speculative Design
- Sustainable Consumption

Stored concepts of all other members:
 Member Concepts

Concept Filter Editor

☒ Edit Current
 ☐ Create New

Concept Label:
 Constellations Metaphor

Concept Tags:
 cabinet of curiosities
 communities of interest
 conceptual metaphor
 constellations
 constellations metaphor
 contingency
 cultural forms
 cultural technology
 design cultures
 dialogic

☐ Set as my default concept filter

Figure 5.12 The Folksonomy 2.0 Members listing

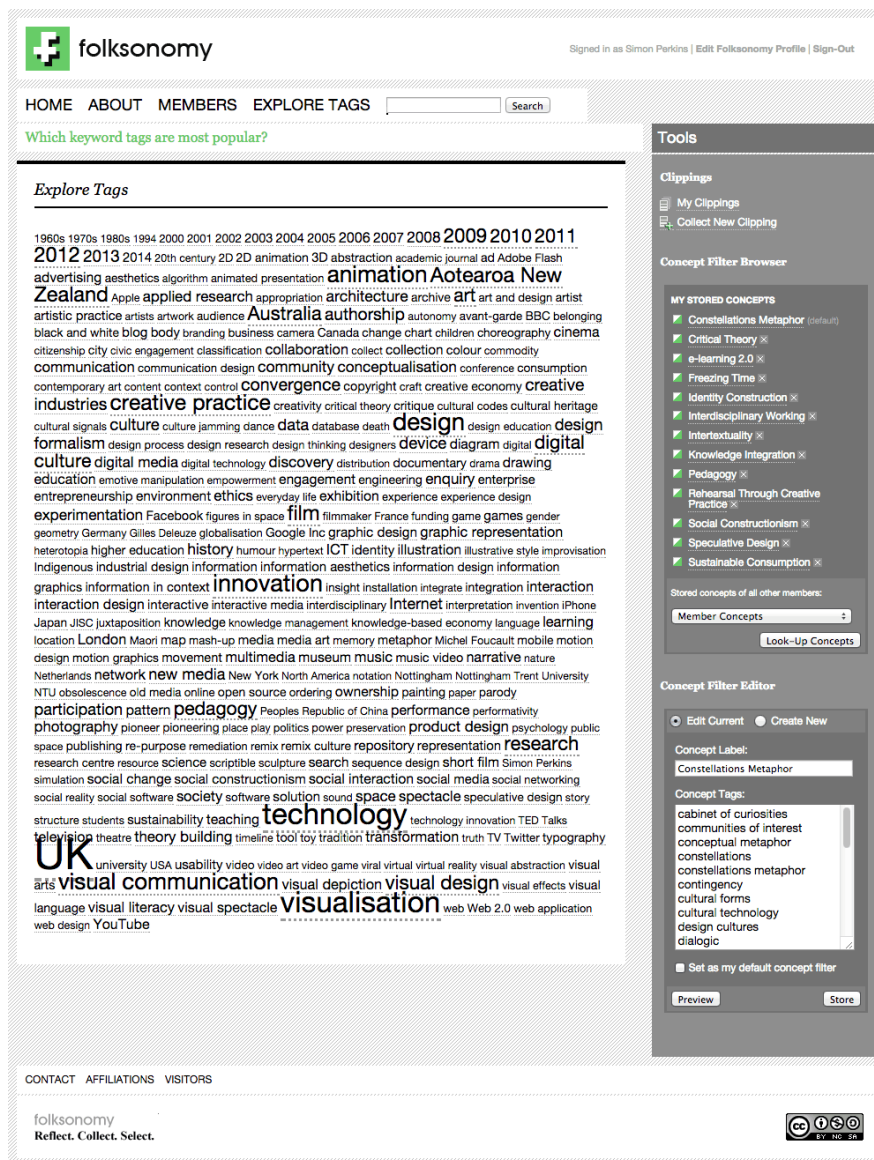


Figure 5.13 The Folksonomy 2.0 Tag Cloud page

5.6 CONCEPTUAL ASSOCIATIONS

As it evolved, my design of the tool drew insights from Benjamin's Arcades Project, Warburg's Mnemosyne-Atlas and Marker's film *Sans Soleil*, as well as Adorno's constellation metaphor and Ted Nelson's concept of intertwingularity. The architecture of the tool now embodies the multi-taxonomic strategy described by Mathes' folksonomy (2004), in which content can simultaneously belong to multiple and potentially contradictory categories. It addresses the limitations of more traditional structures of LMSs based on directory tree structures, where files are organised according to a singular, linear, centralised, and hierarchical logic. That is,

Folksonomies facilitate a type of similitude that echoes the polysemous nature of language and provides a means to individualise interests and interpretations without the requirement to conform to a universal or singular ontology. It generates search results that span multiple domains and is particularly useful for generating collections of thematically related interdisciplinary posts, which, in Martin Jay's terms, resist reduction to a "common denominator, essential core, or generative first principle" (Jay, 1984).

As an e-learning tool that aims to complement existing solutions, for communication design and multimedia courses, Folksonomy 2.0 functions as a design higher education content node. Socio-constructivist learning theory is enacted through the unique situation of students' ideas and concepts in relation to those of each other and the broader (interdisciplinary) field. In participating in situating their ideas, aggregating and clustering associating content, and annotating and reflecting on meaning-making, I consciously employed a strategy that Jean Lave and Etienne Wenger refer to as Legitimate Peripheral Participation (LPP). That is, students, as fledgling designers, participate peripherally "as a way of learning – of both absorbing and being absorbed in – the 'culture of [discursive] practice'" (Lave & Wenger, 1991, p.95).

The Folksonomy also applies aspects of Ted Nelson's concept of intertwinerity, where meaning is derived through the contingent relationships between intersecting constituent ideas. It does so by explicitly identifying content sources through hypertext linking (extracted using the site's bookmarklet widget), as well as through keyword tagging, where posts are interlinked according to multiple semantic indices (and which are discoverable through various search and linking methods). Through such interlinking, the Folksonomy serves to foreground contingencies, which define and deeply situate meaning.

5.7 ADDRESSING THE KEY PRINCIPLES OF E-LEARNING ENVIRONMENTS FOR EMERGING, INTERDISCIPLINARY COURSES

Although the design of the Folksonomy 2.0 publishing tool was quite novel and innovative in terms of its technological aggregation and functionality, at the time of

its production, it is its organising capacity that is most significant in relation to this project, because of the principles it enacts.

The Folksonomy 2.0 addresses the first principle (Design Principle 1) that I established for e-learning environments for interdisciplinary courses (that is, an e-learning environment must enable students to establish their own, (inter)disciplinary location and priorities, and to organise content, topics, and fields into unique configurations according to a self-identified specialisation) as well as the second key principle (that is, it must support students to amass personal collections of references. It enables students to collect and organise content according to their specific (ontologically defined) criteria, through the use of concept filters. They can *cut clippings* from online sources through the site's bookmarklet widget. Once relevant sources are located, students use the widget to make text sections as well to extract implicit attributes such as the page URL and keyword metadata. Through concept filters, students are prompted to explicitly define and name their interests as discrete subjects. In doing so they qualify their interests through the creation of sets of keyword tags, grouped according to their conceptual needs, ontological position, and identification with specialist domains. In effect, this enables them to relate their location and interests within the broader field, but also to relate their location to that of their peers as the tool produces conceptual networks between specialist domains.

Students can also establish and belong to multiple peer interest networks through the Folksonomy groups widget prototype. In doing so they are situated and represented in the system according to their conceptual interests (which are aggregated and displayed by their concept filters). And they are located within the network according to their shared and complementary perspectives, which form a constellation of fields around them. In this way, Folksonomy 2.0 supports students to develop their conceptual focus (through the collection of named sets of keyword tags in the form of concept filters), as well as to develop an awareness of their (inter)disciplinary proximity to the specialist domains of their peers' interests.

By enabling students to syndicate and subscribe to concept filter RSS feeds, the Folksonomy addresses Design Principle 3 (that is, the learning environment should be flexible and reconfigurable, allowing students to remodel the relationships between

content nodes, building and connections between content, learning nodes, and broader cultural circumstances according to their [changing] personal learning needs). By subscribing to posts using publishing tools such as weblogs configured in a *hub and spoke* arrangement, students are able to locate themselves at the centre of their online learning experience and, by (changing) keyword tags, they draw in new content from various sources, which is aggregated according to current relevance and need. In this way, students have the agency to frame their evolving disciplinary, conceptual, and creative location by modelling and remodelling relationships between content nodes. In a technical sense, the Folksonomy supports this by enabling students to create RSS content sources. By defining concept filters, two parallel streams are produced – one that is HTML formatted (to be viewed within the Folksonomy interface) and one that is RSS formatted (intended to be accessed remotely via an RSS reader). Once created, students can subscribe to theirs or their peers' feeds using RSS readers (commonly available within weblogs).

The Folksonomy addresses Design Principle 4, as I have defined it, by enabling students and academics to write into the online (pedagogical) space of the tool. The ability to publish posts is a fundamental feature of the tool and takes the form of weblogs. Users are also able to embellish their clippings or posts by adding supplementary information such as videos, photographs, and hyperlinks to them. And, before publishing, they can cross-reference their clippings by adding relevant keyword tags. In doing so, the process of clipping and republishing source content allows students and academics to contribute as content authors to a shared pedagogical knowledge space. The RSS feed model I have described above is also significant because it enables students to locate themselves at the centre of their learning experience, as both content consumers (through RSS subscription) and producers (through RSS syndication).

Design Principle 5 (that is, to support a socio-constructivist approach to learning, digital frameworks, tools, and environments must enable the development of communities of practice, specialist associations, and relationships with peers for the purpose of achieving a collective goal, sharing resources, or developing specialist expertise), is addressed in a number of ways. Through students' creation of concept filters, their (ontologically defined) conceptual interests are not only represented to

them, but also to their peers. Through the Folksonomy groups widget prototype they can then create ad hoc peer interest networks. The process of defining concept filters promotes a socio-constructivist approach to learning, because by first defining individualised conceptual categories students must evaluate, synthesise, and assimilate a range of conceptual interests. Then, through their use of the groups widget, students are able to belong to multiple interest networks, which enables them to establish common ground with their peers as well as to receive collegial support and feedback, which is necessary for developing specialist expertise.

Being able to contribute as a named author to the creation of a shared knowledge repository addresses Design Principle 6 (that is, all student users of a system must have the capacity to view each other's contributions to enable shared knowledge spaces – both individually and as a collection – and contributions must be attributed to their content authors to ensure acknowledgement, responsibility, and recognition). Member IDs, which are assigned during the site member registration process, discretely identify all Folksonomy contributors. Because of this, all posts contributed to the collective repository have author attribution, which ensures acknowledgement, responsibility, and recognition of contributors. This also means that readers are able to contextualise posts (through reference to their author). Authors can isolate their posts (referred to in the context of the Folksonomy metaphor as *clippings*). So can casual browsers, who can identify all posts by a particular contributor from the entire collection by viewing it as a discrete content stream, listed in reverse-chronological order.

Table 5.1 A number of changes have made to the Folksonomy since version 2.0 was completed and subsequently launched in October 2009. Despite this, the majority of these have been simple tweaks or software fixes, which have had very little overall impact on the tools' day-to-day use. For example: the site's hosting has been changed multiple times; the site was taken down by a virus; and measures have had to be put in place to limit the impact of spamming. The following outlines the major changes, which have been made since being published.

Table 5.1

Updates made to the Folksonomy platform since 2009

2009	Version 2.0 of the Folksonomy was published to the: http://folksonomy.org.uk/ URL.
2010	A password recovery feature available at: http://folksonomy.co/?p=recover was added to allow users to independently reset their lost passwords without my involvement.
2011	<p>The site was relocated from the: http://folksonomy.org.uk/ domain to the: http://folksonomy.co domain on 31 October 2010. This change was made to allow the site to be more easily accessed/discovered.</p> <p>The ability for user-profile information to be published in XML format was added. For example it is possible to access both the HTML and XML version of the following member i.e. HTML: http://folksonomy.co/group/?members=1364 and XML: http://folksonomy.co/?xml=1364 Publishing the dual streams allows external applications to integrate with the tool – such as the ad hoc grouping widget, which parses multiple user profiles – as in the case where the numbers: 1364,1366,1370,1372,1373 are the member IDs of Folksonomy members: http://folksonomy.co/group/?members=1364,1366,1370,1372,1373</p> <p>A prototype feature making it possible to create chronological lists of Folksonomy posts was added. However in doing so, this feature was not completed because it was outside of the scope of the PhD. This is an example of one list: http://www.folksonomy.co/?constellation=1</p> <p>A number of changes were made to address issues raised by the seminar panel (after made my final seminar presentation at QUT at the end of October 2011). Central to this was the redesign of the site search feature to improve the relevance of search results.</p>

	<p>This was achieved through changing the search comparison method from an approach where search strings were matched against a full-text index of all site content to a method where search strings are matched against keywords associated with published content. The change meant that posts are now only returned where there is an explicit correlation between searched keyword phrases and tagged content. Automatic keyword/phrase prompting using AJAX was added to the search form to support this. Alphabetical listing of site members was also added to compensate for the increased number of site members and the limitations of requiring users to cycle sequentially through a large number profile pages in order to discover a given profile.</p>
2012	No updates were made to the site.
2013	<p>The hosting for the Folksonomy was changed again in June 2013. This was due to a number of software issues (including a rogue database query, which I was only partly able to resolve). While this wasn't evident for site users – the on-going technical issues were quite demanding on my time.</p> <p>A facility to block spammers was added in response to the dramatic increase in bogus registrations. The facility has been designed so that it bounces all false registrations, capturing their details (for all subsequent attempts) to a text file located at: http://www.folksonomy.co/perkinss/spammerblacklist.txt This file is periodically backed-up and refreshed.</p>
2014	<p>I added functionality to the updated version of my: http://reflectivejournal.co.uk site so that XML streams associated with students who are listed here and who have a Folksonomy account automatically have their Folksonomy 'concept filters' listed with their blog URLs e.g. http://reflectivejournal.co.uk/?member=98 I made the change as a way of reinforcing to Bournemouth University Digital Media</p>

	Design students the conceptual significance of their critical reflection.
2015	Submitted exegesis for examination in February 2015

5.8 CONCLUSION

Through reflection and an iterative process, as my PhD progressed, I reconceptualised the design and architecture of my original Constellations website application both technically and conceptually. Through an evolutionary process, which was continually informed by technological developments, deepening conceptual understanding, and feedback and reflection, it gradually shifted from being a knowledge repository to a knowledge-creation and sharing tool. Finally, in the form of the Folksonomy, its information architecture was elaborated to become a broker for knowledge exchange. In this way the application progressively came to embody the principles I have established for designing applications to facilitate e-learning in emergent, interdisciplinary, and socio-constructivist learning contexts. Publishing to the Folksonomy enables students to amass personal collections of references, locate themselves in the field, publish, and, through the post attribution process, be acknowledged for their contribution. It enables them to situate themselves in relation to, make connections with, and respond to their peers. All of these attributes differentiate the Folksonomy application from the classification and broadcast models of commonly used LMSs, such as Blackboard, and align it with Web 2.0 attributes. More importantly, they contribute to enabling students in interdisciplinary and emergent courses to traverse disciplinary boundaries, situate their learning, connect with their peers, contribute to the discourses of the field, and be agile in the face of evolving technologies and discipline foci.

Chapter 6: Implementing and Evaluating the Folksonomy in a Learning and Teaching Context

6.1 INTRODUCTION

In Chapter 4: Priorities, Principles, and New Models for the Design of E-learning Tools to Support the Needs of Emergent Interdisciplinary Fields, I described a set of priorities for designing online learning tools to support students and academics working in emergent, interdisciplinary fields. These priorities – and the principles that arose from them – functioned in this research project as a proposal to address the issues raised in Chapter 2: Literature and Contextual Review, around the suitability of e-learning 1.0 for these learning contexts, and the issues associated with adapting Web 2.0 applications for them. The principles were underpinned and refined through a conceptual framework derived from ideas and theories outlined in Chapter 5: The Iterative Design and Development of the Project's Creative Outcomes. The design of a new application, based on these principles and conceptual frameworks, along with its evolution through various developmental stages, was also described in detail in this chapter. The resulting Folksonomy (versions 1 and 2) as functional prototypes – the principal outcomes of the creative work – was described there in terms of its evolving form and function.

Building upon this foundational and productive work, this chapter goes on to discuss the implementation of the Folksonomy in practice and in context, and discusses its qualitative evaluation in learning settings.

6.2 THE CONTEXT OF DEPLOYMENT: THE SECOND PHASE OF A CASE STUDY APPROACH

In Chapter 3: Research Methodology, I explained the case study approach of this research project, in which two qualitative studies were undertaken to gain insights into the learning needs of students in communication design and multimedia projects.

Here, I return to the NTU Multimedia Research Project module context, which was chosen as a case study for the project because of its direct relevance to the focus of the PhD as an interdisciplinary research-driven subject, with applied, project-based assessment.

In NTU's Multimedia Research Project module, third-year students are required to demonstrate their capacity to undertake research, construct conceptual models, and apply design knowledge and technical skills (see Appendix A for an example of the Research Project unit assignment brief). As discussed in Chapter 3: Research Methodology, the Folksonomy application was implemented in this module at NTU in the years 2008 (Version 1.0) and 2009 (Version 2.0) for the purpose of supporting the early discovery stages of students' enquiry. In this phase of their unit, they establish a research topic and locate it in relation to its historical context and cultural theory.

Students first nominate a relevant research topic to pursue. Although not an explicit course requirement, they tend to nominate topics that are related to their second-year Multimedia sub-disciplinary specialisations. This means they have already developed considerable awareness of current practices in their chosen specialist field throughout the previous year, along with some knowledge of internal and external factors that are currently affecting it.

They are encouraged to select topics in which a cultural phenomenon is being (or has recently been) transformed by multimedia or, alternatively, to develop topics that involve specific applications and qualities of their Multimedia sub-disciplinary specialisation. While both approaches enable students to develop depth of understanding, the first does so by raising students' awareness of changes and contingencies of their field, while the second leads them to consider the potential impact of their research topic on broader cultural and economic circumstances. This approach to assessment is a strategic course decision, which loosely draws on the research "impact agenda" set out by the Higher Education Funding Council for England's Research Excellence Framework (2009). In the case of the Research Project module, the intention is to raise students' awareness of the perceived and real value of their sub-discipline to society. Pedagogically, this helps to offset some of the

anxiety and (change-related) issues of working in an emergent field that I have outlined in the Chapter 1: Background to the Research.

6.3 EXAMPLE STUDENT PROJECTS

The following individual cases illustrate the types of projects that students adopt in this open-ended interdisciplinary context. They are described here to provide insights into the learning strategies that must be served by the Folksonomy (Version 2.0). Three student projects (Students 1–3) from the NTU third-year Research Project module, which were undertaken during the 2010–11 academic year provide useful examples. Each student focused their enquiry by defining a research question, which they sought to answer by situating their project in the field and the development of critical arguments.

Student 1 (S1) chose to ask the question, “How is the evolution of publishing modes providing new visual communication opportunities within online and mobile environments?” to focus his research. As a result, he became interested in Clayton Christensen’s concept of radical innovation, in which the market or business apparatus of technological development disrupts the status quo, so creating new opportunities for enterprise (2003). Through this focus, S1’s project looked at the evolution of publishing from print to computer screen to mobile devices, as well as the reinterpretation of Modernist typographic design principles exemplified by the Swiss Style (Müller-Brockmann, 1996). The project’s theoretical aspect involved understanding the dramatic changes that have redefined publishing. In terms of creative practice, the project provided S1 with an opportunity to experiment with new web design techniques such as HTML5 (Kesteren & Pieters, 2011) and responsive design (Marcotte, 2010). This combination required S1 to become conversant with knowledge from a range of disciplines, including business studies, graphic design, and software engineering, and it is thus an apt demonstration of the regionalisation of knowledge that characterises the Multimedia course.

Student 2 (S2) asked the question, “Could the use of Quick Response Codes and Augmented Reality improve the way we share information and communicate with each other?” An open-ended exploration of the convergence technology Quick

Response (QR) codes, the project provided S2 with an opportunity to develop his understanding of Augmented Reality techniques (popularised by *Esquire* magazine's 2009 "Best and Brightest" article (Granger, 2009) on a live-action VR feature involving actors Robert Downey Jr and Gillian Jacobs). In selecting this topic, S2 created an opportunity to explore contemporary approaches to visual and interactive communication. This enabled him to test his knowledge and demonstrate his design and conceptual versatility. This project also serves as a salient example of cross-disciplinary practice, as it required engagement with issues spanning visual communication (both print and film conventions) and interaction design (interactive design for mobile and augmented reality).

Student 3 (S3) asked the question, "How is social software able to promote the development of shared meaning systems that are both engaging and meaningful to their members?" This project provided an opportunity for S3 to take a sociological angle, and to apply his multimedia design knowledge to a social interaction and communication problem. In doing so, he limited his enquiry to contemporary cultural practices in popular social software tools Facebook, MySpace, and Twitter. He chose to situate his project theoretically through reference to Danah Boyd's study of teenagers using MySpace (Boyd, 2006), Manuel Castells' concept of media space (Castells, 2000), and Erving Goffman's concept of impression management and identity performance (Goffman, 1971, 1981). S3 decided to focus the project using speculative design, as a technique for reimagining social media interventions. (As Carl DiSalvo explains, "speculative design is a practice of creating imaginative projections of alternate presents and possible futures using design representations and objects" (2012)). In this way S3 created a speculative proposal for a Facebook app, which framed social media in terms of contemporary cultural theory (rather than a more predictable association with engineering and innovation). He drew qualitative findings from user interviews and the analysis of quantitative usage data. The project provided an opportunity for S3 to personalise his study programme, and situate his field of interest at the intersection of sociology, cultural theory, and interaction design.

These project descriptions demonstrate the considerable freedom that students in this Multimedia course have to develop their projects. Their complexities also

reveal something of the requirements of academic staff in such a course to span a diverse range of technical, discipline, and theoretical interests, and the challenges they face in supporting such wide-ranging projects at the cutting edge of many new fields. They provide insights into the diverse and changing knowledge relationships operating within what Bernstein describes as the “regionalised discourses” of interdisciplinary learning contexts.

In terms of their approach to the assessment task, students begin the module by engaging in an initial discovery phase, and then progress their research investigations into the production of an individual dissertation or research document. This theoretical and conceptual framework provides a foundation for the subsequent research phase of the module, which involves design practice. Here they develop a series of experimental designs that are both an exploration and elaboration of their theoretical positions. Throughout this process, students engage in peer critique and reflection, which involves them regularly presenting their artefacts to their tutorial groups for feedback (peer critique) as part of an iterative development process. That is, they adopt a regimen of research analysis, exploration, discovery, and reflection.

In presenting their outcomes in peer critiques, students are encouraged to frame their theoretical research in relation to the evolving narrative of their unfolding research practice. That is, they are urged to move beyond simple deductive testing of hypotheses (an inductive regimen) to the synthesis and production of nascent theories within and through their practice. They complete the year through a final formal viva voce, which they present to a small staff panel for feedback and assessment.

6.4 THE FOLKSONOMY’S APPLICATION IN LEARNING

The Folksonomy provides a range of software and interaction features that support students in their learning and research – through its experience design. Its form and function, in relation to the experiences and outcomes it helps to create, is perhaps best described and understood through the way in which it is adapted to varied, individualised interdisciplinary approaches and outcomes such as those described above.

6.4.1 Formulating and situating topics and gathering content through browsing, keyword linking, and searching

The Folksonomy assists individual students in the first phase of their project to formulate a topic and to contextualise their research in relation to their individual Multimedia specialisation and field. It does so by helping them to establish a theoretical and conceptual framework for their project through searches for relevant content (ideas in relevant surrounding fields), and this helps them to identify relevant topics and questions within their field as they explore the broader interdisciplinary fields in which their project is located.

Students can investigate their broad field of enquiry in two ways: through *open browsing* – that is, scanning posts to discover patterns of relatedness – or through *direct searching* – locating a specific piece of information through keywords, which in turn may become a starting point for further open browsing.

One approach to open browsing is through recent posts. Students (both site members and casual users) who access the site from the home page would see the five most recent posts published to the site listed (in reverse-chronological order) as shown in Figure 6.1. They can scroll down, scanning to see if any of the posts are relevant to their needs. If not, they can select the Next link at the bottom of the page to continue browsing. If they discover a useful post, they might decide to follow its title link to check its sources and any bibliographic references in the post. Alternatively if they find the post useful, they might decide to review the keywords that contextualise it, and follow their hypertext links to discover related posts.

For example, if the post entitled “In cognitive linguistics metaphors are not simply stylistic devices but processes which enable understanding through the mapping of source domains onto target domains” was selected, a student could review its keyword tags, as shown in Figure 6.2, and then might decide to follow the keyword tag entitled “analogue correspondence”, which would lead them to a subset of all Folksonomy posts, grouped according their shared keyword index (Figure 6.3)

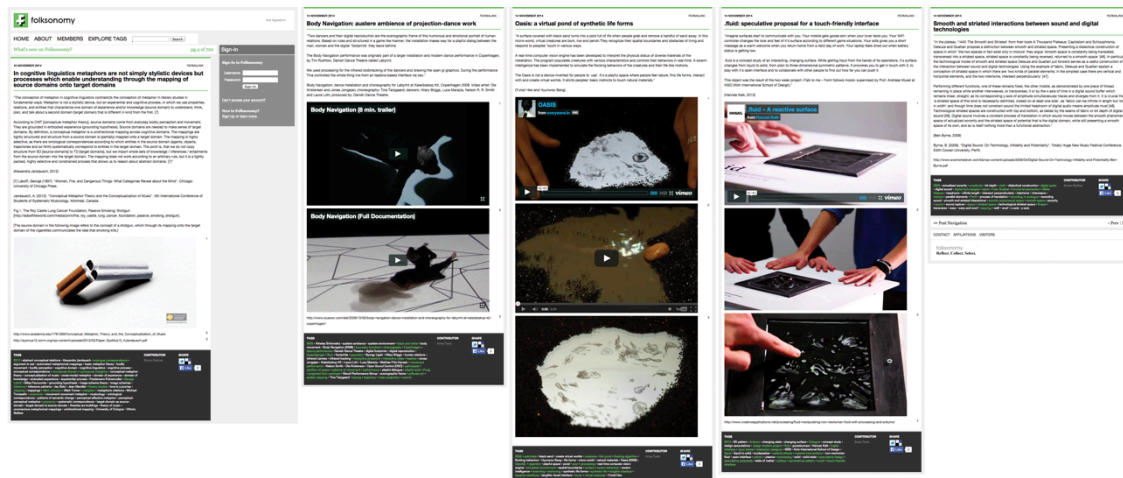


Figure 6.1 Reverse-chronological listing of recent Folksonomy posts

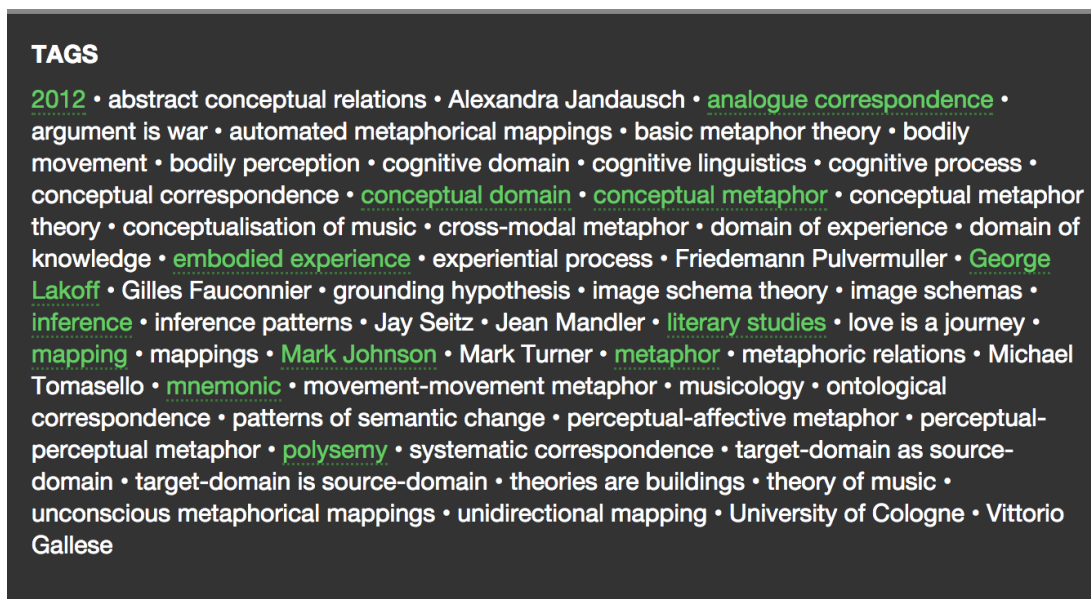


Figure 6.2 Keyword tags associated with the "cognitive linguistics" post

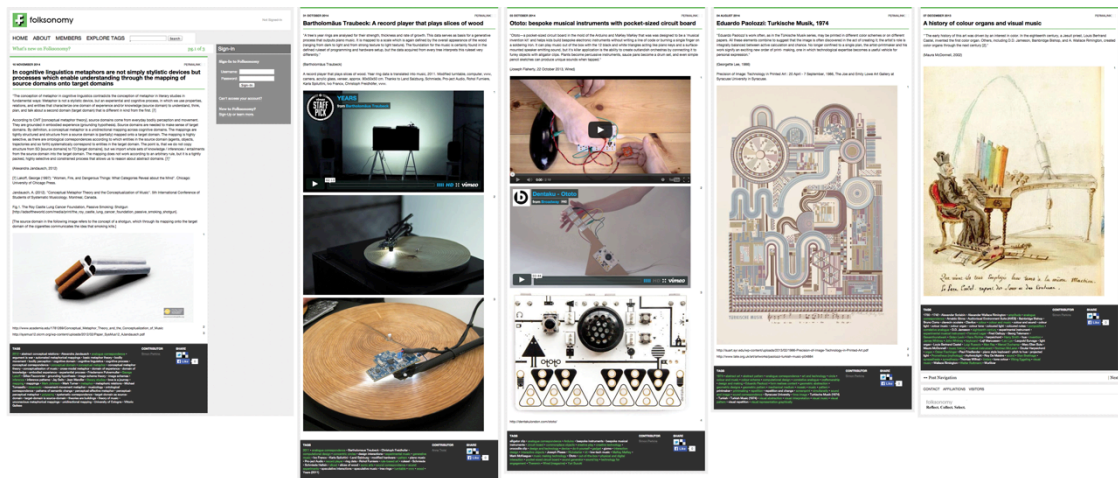


Figure 6.3 Posts associated with the “analogue correspondence” keyword tag

At this point they might choose to review all posts related to this keyword tag by using the Next link at the bottom of the page, until they discovered a post(s) useful to them.

Alternatively, instead of browsing in such a way, students can discover content through direct searching against a subject or topic within the extensive Folksonomy database. That is, they might find specific posts or groups of posts through the site’s built-in search facility (it employs standard browser functionality). They would do so by entering phrases or partial phrases that are matched, responsively by the system, against keywords associated with Folksonomy posts by earlier contributors (as shown in Figure 6.4).

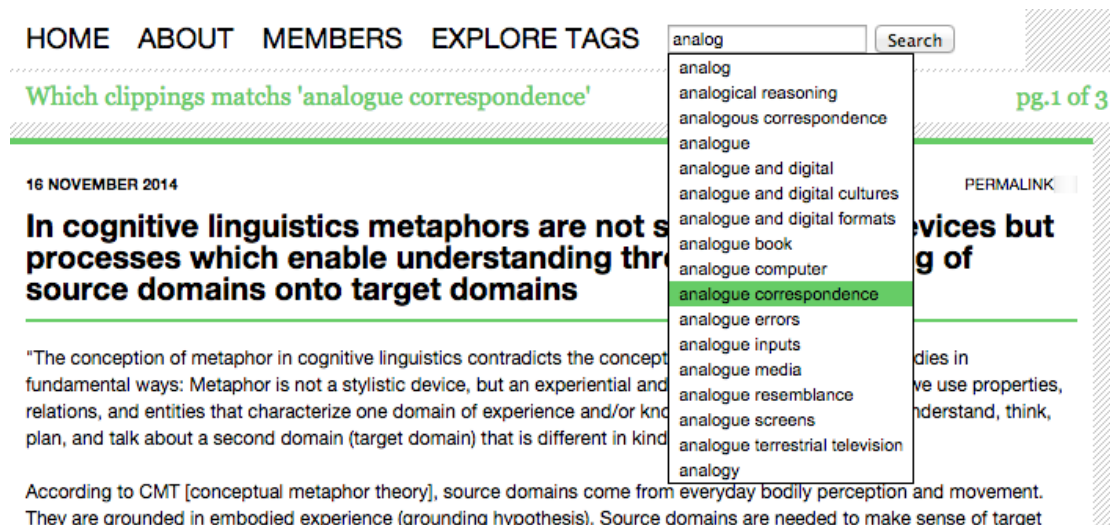


Figure 6.4 Responsive keyword matching search functionality

This is possible because each post has a unique *permalink* address, and all have keyword tags with URL equivalences. Therefore, open browsing enables students to discover patterns in the process of reviewing posts, when they begin to encounter posts with in-common keyword tags.

It is important to note that, unlike many other similar search tools, the Folksonomy 2.0's search feature does not perform searches by matching words contained within the body of each post; that is, against any word or phrase that occurs within a post (however insignificant). Although this functionality was enabled in the previous (Folksonomy 1.0) version (where searches were matched against a full-text index of all database content), this functionality was revised after receiving criticism about the lack of specificity of such search results. It was possible, for example, to search for *stop words* such as *the*, *is*, *at*, *which*, as well as words that were only incidentally related to the overall meaning of a post. The ability to do this was therefore removed in Folksonomy Version 2.0. Now, instead, searches can only be matched against keyword tags that have been explicitly assigned to posts.

In summary, while students who have a clear idea of what they are searching for might discover content using the keywords for searching directly, an alternative purposeful browsing process provides support for students who do not. It helps them to develop concepts by enabling them to recognise similarities between the content they find and the keyword tags that commonly arise from them.

6.4.2 Amassing personal and integrated reference collections

Once searches have been performed and relevant information identified, the results are grouped together. This occurs in the same way that searches are returned using keyword tags. A unique permalink address associates keyword tags and their URL equivalences, which can be saved (in the browser) for future reference. In this way, making URLs explicit (so they can be saved in the browser) enables students to reflect on their search journeys. Through the process of reviewing the range of posts they have traversed, students can discover patterns that arise through in-common keyword tags. In this way, along with traditional search methods, students can use the Folksonomy to amass collections of references to support their coursework.

As students gather relevant content, they effectively use the Folksonomy as a form of weblog, through which they create personal content nodes. They amass collections of references through personalised clipping threads, or lists of all of their captured posts (as shown in Figure 6.6). These are sequenced in reverse-chronological order (according to date stamp), which echoes the format of personal weblogs. Links for accessing concept filters are located in the Tools panel for authenticated users, as well as through their public profile (as shown in Figure 6.5).

The screenshot shows the Folksonomy 2.0 user profile page for Simon Perkins. The page layout includes a header with the Folksonomy logo and navigation links (HOME, ABOUT, MEMBERS, EXPLORE TAGS). A search bar is located in the top right. The main content area features a user profile for Simon Perkins, including a profile picture, name, and a bio. Below the bio, there is a section titled 'CONCEPTS' with two columns of tags, each preceded by a green checkmark and followed by 'RSS'. The tags include '2D Animation', 'Critical Theory', 'Knowledge Integration', 'Spaces Between', 'Architectural Conjecture', 'e-learning 2.0', 'Pedagogy', 'Speculative Design', 'Capturing Place', 'Interdisciplinary Working', 'Rehearsal Through Creative Practice', 'Sustainable Consumption', 'Constellations Metaphor', 'Intertextuality', and 'Social Constructionism'. On the right side, there is a 'Sign-In' panel with fields for Username and Password, a 'Sign-In' button, and links for 'Can't access your account?' and 'New to Folksonomy? Sign-Up or learn more.'.

Figure 6.5 Publicly available Folksonomy 2.0 user profile page

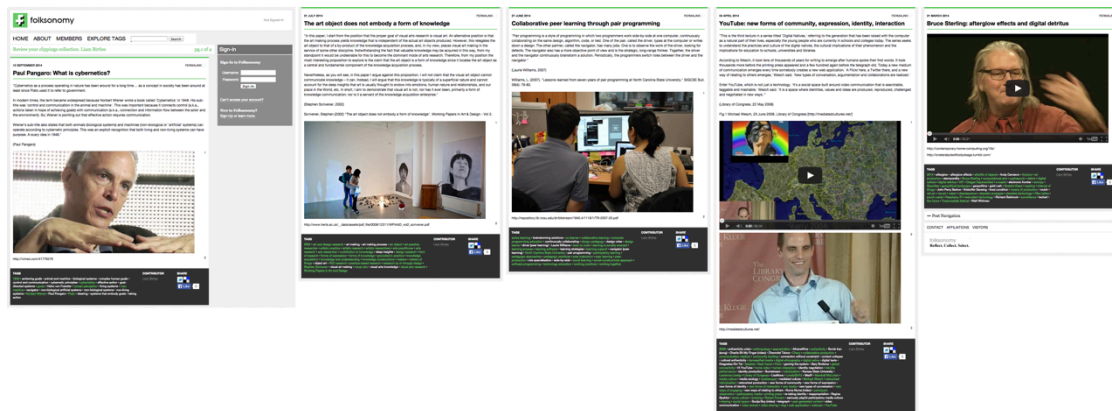


Figure 6.6 Example clipping thread of posts added by a specific user

It should be noted that, while ordinary personal weblogs are generally designed to be discrete, clipping threads within the Folksonomy are integrative through their keyword identifiers. Through their keyword tags, they intersect with the collections of others. This is significant because it enables students to discover connections they have made that relate to those made by others in the class, which can lead them to discuss ideas that they are mutually familiar with, as well as those that they are not.

6.4.3 Producing personal ontologies and content collections through concept filters

Students are able to establish, refine, and evolve personal ontologies and content collections by defining and naming sets of keywords, which are referred to as *concept filters*. Concept filters comprise sets of keywords that are grouped according to a student's individual interests. They can be built up iteratively by defining and redefining sets of keywords as the student reflects on the suitability of available filters and the search results they produce. This also enables them to situate and resituate their specialisation and their practice in the specific and broader field.

This is significant because it addresses Priorities 1 and 2, outlined in Chapter 4. That is, effective learning applications should be designed to enable students to build customised collections of learning materials that are suitable to their individual self-identified specialisations and to organise them according to their own specific current needs, as well as their changing and evolving needs.

The process is enabled by the Folksonomy in a manner that is similar to that described above to look up keyword tags and search terms. However, in this case,

results are produced as aggregates based on matching concept filter keywords (CAKE) with post keyword tags (PKT). This can be explained in relation to the mathematical logic of set theory, where concept filters return results as a union of CFK and PKT. As shown in Figure 6.7, for example, CFK1 has a union with PKT1, PKT2, PKT4, and PKT5 but not PKT3 and PKT6.

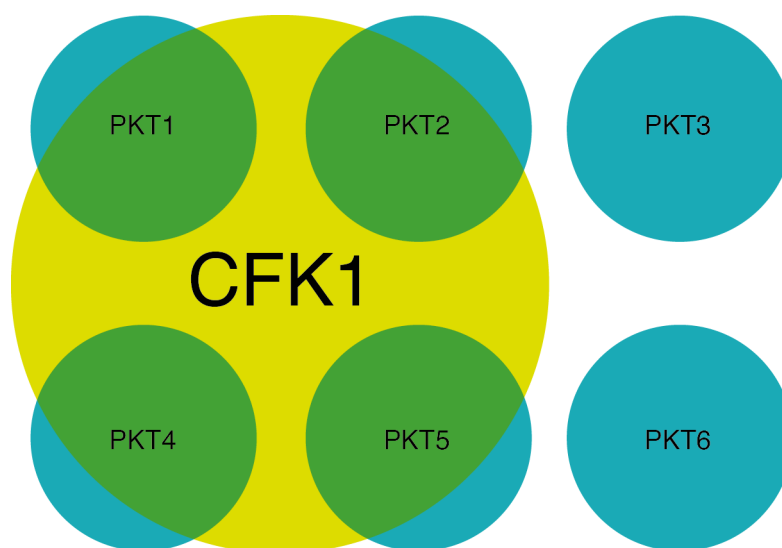


Figure 6.7 The union of concept filter keywords (CFK) with post keyword tags (PKT)

It is possible, by selecting a drop-down list box included within the publishing tool, to retrieve keyword tags, which are part of the user's personal ontology or concept filter list. Doing so not only makes it possible to extend the existing manually assigned keyword tag list but also helps to ensure the relevance of the post to the student's evolving clipping thread.

While concept filters can be used to discover topics and aggregate content related to project work, from another perspective – that of conceptualising students' work through integrative practices (as described in Chapter 2: Literature and Contextual Review) – they might choose to define and then publish posts indexed against their personal ontologies. That is, concept filters and the ontologies they create are useful for enabling both the consumption and presentation of content.

6.4.4 Extracting, editing, tagging, and publishing content posts

To publish posts to the Folksonomy, students use the site's bookmarklet widget, which simplifies the process of extracting content from online sources. The tool allows users to select blocks of text from a source site, which it passes to the Folksonomy so that the content can be saved, edited, commented upon, tagged, and republished for future reference. It indexes using a combination of keywords derived from the student's concept filters. The following series of screenshots shows the steps involved.

The first stage of selectively copying content from an online source to the Folksonomy is shown in Figure 6.8. In this case it includes the source URL and HTML page meta keyword tags that are captured implicitly using JavaScript, and some of its description as a quote (selected manually by the user), as well as associated media, which are collected manually through copying file addresses and transferred across to the Folksonomy publishing form, as shown in Figure 6.9. Words and phrases from the description have been added manually as keyword tags, as well as generic tags (shown in Figure 6.10) supplementing those, which are initially extracted using JavaScript.

MIGUEL JIRON

ABOUT NEWS // BLOG

STORYBOARDS Following (6)

LA-GAR-TO

Animation

Sensory Overload: Interacting with Autism

ANIMATION

Paint Showers

ANIMATION

Next

Paint Showers

"...Pays homage to the cameraless painted films of experimental legends like Stan Brakhage and Oskar Fischinger... the striking nature of the visuals alone engenders a unique emotional resonance." -- [Film International](#)

Swirling cosmos of paint give way to a storm of color and drips. An experimental animation that is a mix of paint on glass and stop motion, Paint Showers is the anticipation, fury, and release of a colorful storm.

Starz Denver Film Festival 2012

FILM + DESIGN Film Festival 2012

Prima Anima 2012

Fantasia Fest 2012

Extremely Short Shorts Film Festival 2012

Wallabout Film Festival 2012

Cinetoro Film Festival 2012

Toronto International Film Festival 2012

South by Southwest 2012

New York International Children's Film Festival 2012

Ottawa International Animation Film Festival 2011

Los Angeles 3-D Film Festival 2011

Figure 6.8 Selecting content to be copied from an online source to the Folksonomy

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folksonomy

Signed in as Simon Perkins | [Edit Folksonomy Profile](#) | [Sign-Out](#)

[HOME](#)
[ABOUT](#)
[MEMBERS](#)
[EXPLORE TAGS](#)

Gather content for your new clipping.

Collect, assemble and include...

Quote or author a new clipping with its accompanying images and/or media

* Title:

Source Address:

Quote:

*...Pays homage to the cameraless painted films of experimental legends like Stan Brakhage and Oskar Fischinger... the striking nature of the visuals alone engenders a unique emotional resonance.' -- Film International

Swirling cosmos of paint give way to a storm of color and drips. An experimental animation that is a mix of paint on glass and stop motion, Paint Showers is the anticipation, fury, and release of a colorful storm."

(Miguel Jiron)

Linked media:

Note: you can publish images and videos by including their URLs here. Multiple files can be published by separating their addresses with a space.

Concept List:

* Keyword Tags:

Miguel Jiron
Oskar Fischinger
Stan Brakhage
animated short film
cameraless film
colour
experimental animation
paint drips
painting
painting on glass
stop motion animation

* Required fields

Tools

Clippings

My Clippings
Collect New Clipping

Concept Filter Browser

MY STORED CONCEPTS

2D Animation
Architectural Conjecture
Capturing Place
Constellations Metaphor (default)
Critical Theory
e-learning 2.0
Interdisciplinary Working
Intertextuality
Knowledge Integration
Pedagogy
Rehearsal Through Creative Practice
Social Constructionism
Spaces Between
Speculative Design
Sustainable Consumption

Stored concepts of all other members:

Member Concepts
Look-Up Concepts

Concept Filter Editor

Edit Current
Create New

Concept Label:

Concept Tags:

cabinet of curiosities
communities of interest
conceptual metaphor
constellations
constellations metaphor
contingency
cultural forms
cultural technology
design cultures
dialogic

☐ Set as my default concept filter

Figure 6.9 External website content copied to the Folksonomy publishing form

Concept List:

* Keyword Tags:

2D animation
2D space
Miguel Jiron
Oskar Fischinger
Stan Brakhage
animated short film
cameraless film
colour
experimental animation
paint drips
painting
painting on glass
sequential art
stop motion animation

Figure 6.10 Additional keyword tags added to supplement the existing set

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Posts can be checked by reviewing changes, which have resulted from applying correct text formatting, content linking, and on-screen media rendering (as shown in Figure 6.11). Posts that are deemed incomplete can be edited further by selecting the Revise button. Completed posts can be published to the site's database by selecting the Publish button, whereupon they are assigned a unique permalink reference, enabling them to be shared and bookmarked in the process described above.

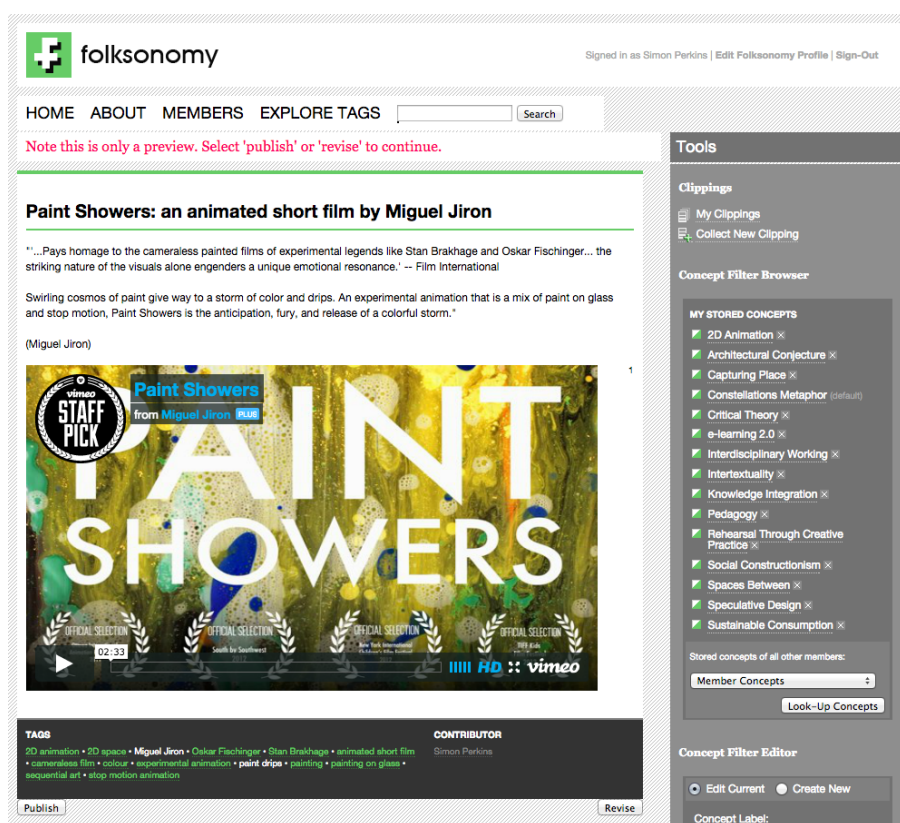


Figure 6.11 Reviewing a post before it is published

6.4.5 Sharing ontologies and making connections with peers

Once defined, concept filters can be saved for later use, and they can be shared. Indeed, students might collectively aim to create a suite of filters (as shown in the highlighted section in Figure 6.12), which collectively represents the conceptual interests of a group.

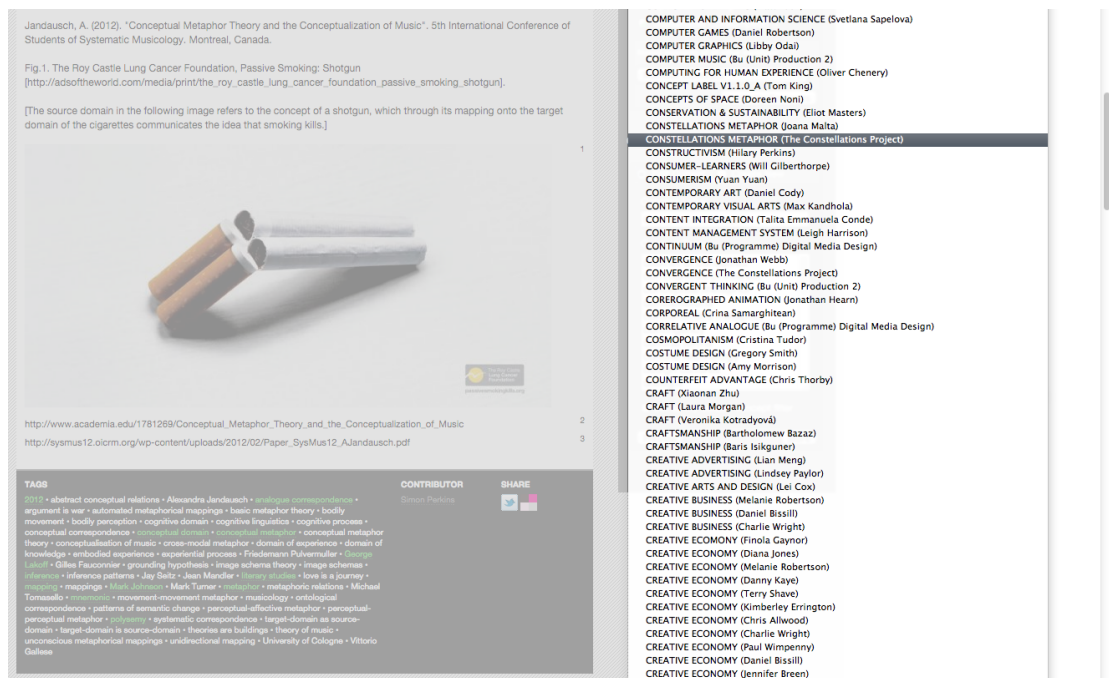


Figure 6.13 Concept filters created by all Folksonomy members

In addition, because each concept filter has an associated RSS feed (structured using a standardised RSS format, as shown in Figure 6.14), students are able to selectively import the Folksonomy content streams of others into their own individual (RSS enabled) content nodes using RSS syndication.

This represents a departure from the traditional one-to-many hierarchical relationship underpinning the design of e-learning 1.0 tools, which I have discussed in Chapter 2: Literature and Contextual Review. Integrating content in this way offers students greater autonomy to construct their own learning networks, according to their specific learning needs but also in concert with a group of peers.

Streams can be incorporated within or external to the Folksonomy. In the case of a student using a weblog such as Blogger or Word press (both of which have built-in RSS readers), students might choose to follow a Folksonomy filter, say one called Capturing Place: <http://folksonomy.co/?concept=4994> by subscribing to its companion RSS feed: <http://folksonomy.co/?rss=4994>. In so doing the *vanilla* (unformatted) RSS version of the Folksonomy feed will be accessed and displayed within Blogger or Wordpress according to the student's own specific considerations and requirements.

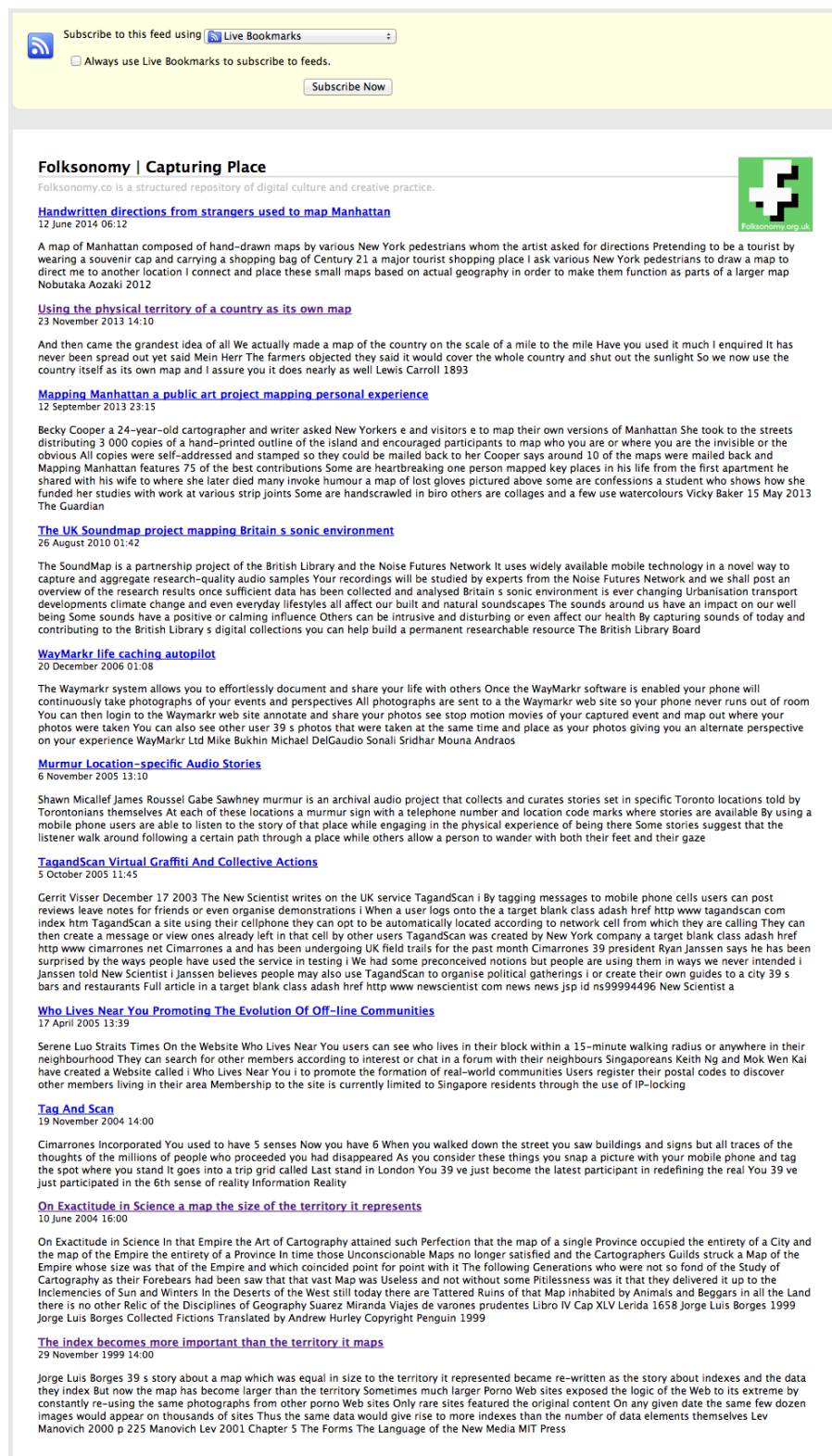


Figure 6.14 RSS feed for the Capturing Place concept filter

As I have described in Chapter 4, Priority 5, being able to share interests and resources, and being able to receive feedback from peers (on evolving concept filters in this instance), is an important requisite of a socio-constructivist approach to learning as it foster the development of communities of practices within cohorts.

6.5 COMMUNITIES OF PRACTICE AND AD HOC GROUPS

Students using the Folksonomy are able to create ad hoc groups through one of the tool's experimental features. At one level, students might decide to interlink their content feeds through an external integration tool such as a weblog by subscribing to Folksonomy RSS feeds (which are automatically generated by the site in parallel with its HTML rendered pages).

At another level they might also seek to establish common ground with other members of a project or tutorial group using the Folksonomy's ad hoc grouping widget. By creating URLs that include comma-separated sets of Folksonomy member IDs, it is possible to create an ad hoc virtual group. Members might seek to build on existing real-world associations – as illustrated in Figure 6.15, where Multimedia students (in semester one of the 2012–13 academic year) used this tool to recognise their shared interests as they worked towards defining their individual research topics. It might also be used to established collaborative projects, or to establish commonalities between students in a class.

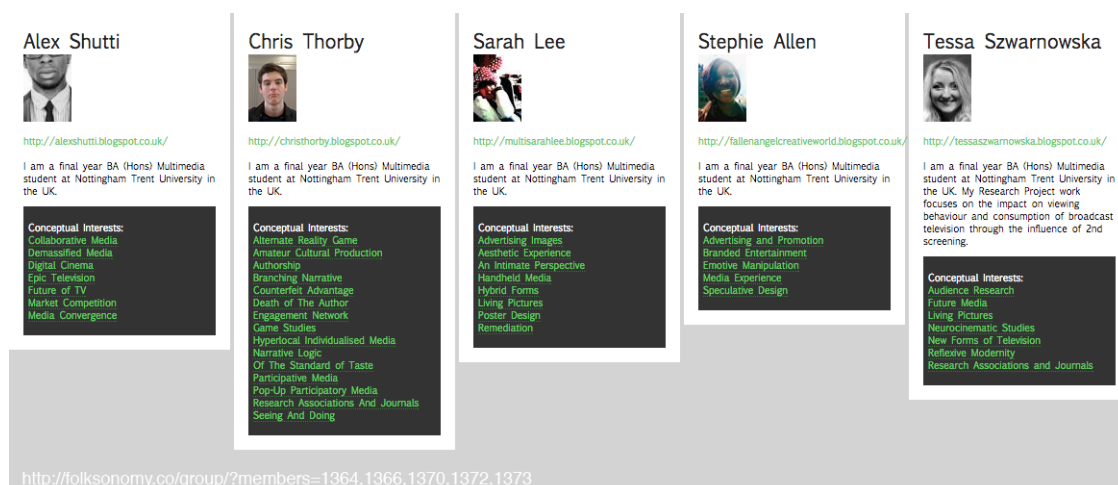


Figure 6.15 Virtual student group created using the ad hoc grouping widget

In these ways, the Folksonomy provides significant flexibility for students to access, gather, and integrate relevant content and to develop content nodes for establishing individual identities, but they also assist in establishing the shared contexts of a group.

Being able to develop shared knowledge spaces is central to Priority 6, which I outlined in Chapter 4. That is, it enables students to develop an awareness of their own special interests in relation to those of their peers. And it is relevant to Priority 5, namely, learning applications should provide opportunities for students to adopt a socio-constructivist approach to learning through their active sharing of interests with peers.

6.6 AN EXAMPLE IN USE

It is also useful here, for the purposes of description, to illustrate the use of the Folksonomy Version 2.0 from the perspective of an individual student. The example I will draw on is Research Project Student 4 (S4), who expressed an interest in research relating to filmmaking through the use of digital single-lens reflex (DSLR) cameras. His interest was a response to a phenomenon that was emerging in 2011, when many independent filmmakers had started to use still photography cameras to shoot high-definition (1080p) video. Brought about by the availability of increased screen resolution and high-quality lenses, it was a trend that was promising to radically transform the nature of video production. Despite the potential impact of such changes for creative practitioners, without further development the topic provided limited opportunity for final-year honours research. Such enquiry needed to be located within a clearly identifiable conceptual field, as well as demonstrating potential in terms of creative exploration. While his topic was contemporary, it lacked a clear context and established field of enquiry. In the absence of this, such proposals inevitably provide little more than opportunities for reviewing device features and usage techniques. The topic therefore needed to be significantly revised to ensure that it was situated in relation to named discourses and practices.

By working together on Folksonomy searches, S4 was able to create a Folksonomy concept filter to help him further conceptualise his project. I initiated the process by recommending a range of works and essays for him to review. They included Robbie Cooper's *Immersion Project* (2010), Gillian Wearing's *Sixty Minutes Silence* (1996), John Berger's *Ways of Seeing* (1990), and the video game *L.A. Noire* (Team Bondi, 2011). On reviewing these works, S4 was able to reflect on the keyword tags assigned to each post, and he chose to select individual tags when further clarification was needed. On my advice, he then made a note of relevant tags, which he used to create a concept filter labelled Intimate Image, to perform an aggregated concept filter search. At this point he reviewed the references that were returned in order to narrow both the scope and the context of his enquiry (by noting which references were outside his research focus), as well as deepen it by selectively choosing references that were relevant to his topic.

The process of reviewing the references provided a means for S4 to conceptualise and articulate his project requirements. In the case of the Folksonomy post about the computer game *L.A. Noire*, for example, S4 saw associations between his topic and the increased capabilities of game engines to render action and advances in camera technology. As such, while game designers might have asked themselves the question, "What can we do with photorealistic rendering that we couldn't do before?" the question might similarly apply to S4's interest in advances in camera technology. Using the selection and review process therefore helped S4 to refine his research topic to focus on the relationship between advances in camera technology and their increased ability to capture precise and intimate detail; that is, his question became, "What can filmmakers do with DSLR videography that they couldn't do before?" This led to the focused hypothesis, "DSLRs allow filmmakers to observe intimate moments in ways that haven't been possible using conventional video cameras and, as the equipment is now much cheaper, filmmakers are able to observe everyday phenomena to reveal detail that would otherwise have been invisible."

S4 was then in a position to draw out a research direction that centred on the hybrid nature of a new cinematic or photographic visual language. He began this process by performing nuanced observations on Cooper's *Immersion Project* and

Wearing's *Sixty Minutes Silence* to evidence the potential of such research in creative practice. Cooper's work was readily available to S4, as the Folksonomy included a short video of it, and this allowed S4 to examine Cooper's in detail. After watching this, S4 noticed the post's keyword tag, which was labelled Living Pictures,³⁴ which he decided to explore. It revealed to him Andy Warhol's *Screen Tests of Edie Sedgwick* (1964), the waitresses scene from the influential feature film *Koyaanisqatsi* (Reggio, 1982), and KaFai Choy's DSLR revision of Chris Marker's masterpiece *La Jetée* (1962) – *La Jetee Redux* (2010). It became apparent through his review of these works that a hybrid form existed that borrowed equally from filmmaking and photographic portraiture or editorial photography. This realisation was immensely important for S4, as it provided a much-needed bridge between his emerging research interests and that of established film or photography practices. In this it demonstrated the potential of the area for Honours exploration.

While the Folksonomy played an important role in focusing S4's research direction, once this had been achieved further research was conducted through conventional means to consolidate this position. S4 followed up with conventional library searches. He did so to discover examples of photographers and filmmakers interested in similar issues. He began by reviewing the work of influential photographers Irving Penn,³⁵ Steve McCurry,³⁶ and Réhahn Croquevielle³⁷ because of the implied intimacy in their work between photographer and subject. He also chose to review the influential film *Stalker* (1979) by Andrei Tarkovsky, *4 Months, 3 Weeks and 2 Days* (2007) by Cristian Mungiuand, and *Sebbe* (2010) by Babak Najafi because of their *mise en scène* approach, including their use of selective focus³⁸ and

³⁴ The Living Pictures keyword tag is available through this link: <http://folksonomy.co/?keyword=15236>

³⁵ Penn is a fashion and portrait photographer known for the directness of his subjects and visual simplicity of his compositions.

³⁶ McCurry is best known for his 1985 *National Geographic* cover photo of Afghan refugee Sharbat Gula entitled "Afghan Girl".

³⁷ Croquevielle is a French photographer famous for his portraits of Vietnamese people.

³⁸ Selective focus is a technique used by cinematographers to focus an audience's attention on particular elements within the frame through the use of reduced or shallow depth of field.

long takes³⁹ (as apposed to the more conventional continuity-editing or montage approach of shorter shots cut together in quick succession).

Using the Folksonomy provided S4 with valuable initial insights. It enabled him to find leads and, ultimately, direction in his individual study as he strived to integrate creative practice and research enquiry within an interdisciplinary and emergent field. For students such as S4, the Folksonomy is particularly useful for resituating undergraduate design practice and enquiry according to the requirements of final-year practice-led Honours research. With academic support, the tool provides a means for identifying relevant fields of enquiry useful for locating research topics. Through the use of concept filters, students such as S4 are able to discover references to help them locate their enquiry according to identifiable conceptual fields and creative works. Being exposed to Cooper's and Team Bondi's work, for example, provided a way for S4 to develop greater sensitivity to the features of his enquiry, which in turn enabled him to name these features as a definable research topic. From this he was able to use the Folksonomy to develop a firmer basis for his enquiry, by enabling him to locate further references and exemplars of creative work such as Warhol's *Screen Tests*, Reggio's *Koyaanisqatsi*, and Choy's *La Jetee* revision.

In this way, the Folksonomy provides support for students to situate and contextualise their work. It provides a means for conceptualising project requirements and for potentially focusing and refining research directions. This leads to greater capacity to locate their design research interests according to the requirements of Honours exploration. And through associations with broader conceptual interests, it deepens their conceptual capacity as they embark on their practice-led research.

³⁹ The technique of using long takes is a stylistic device used by filmmakers in which they hold the camera on a particular scene for a longer than usual duration.

6.7 EVALUATION OF THE FOLKSONOMY IN USE: FOCUS GROUPS AND INTERVIEWS

A focus group of three final-year students was convened to ascertain their perceptions about a late prototype of Folksonomy Version 1.0. As preparation, the students were given a tour of the features and functions of the tool and an explanation of its basic operation. This provided them with sufficient context and information for them to evaluate the operation of the tool in relation to their particular learning needs. They employed the Folksonomy prototype during their initial exploration phase to locate relevant references. This involved various information discovery techniques, including search (locating posts based on search criteria); keyword associations (retrieving posts that match a common keyword); and grouped keyword matching concept filters. The students used keywords that they discovered through the searching process as criteria to define named custom concept filters. These were saved and linked to each of the students' Folksonomy profiles, allowing them to refer back to these posts (and any further posts matching this criteria) according to their learning needs as they undertook the Research Project module.

First, during their use of the Folksonomy (Version 1.0), the students were observed interacting with the tool to ascertain any barriers in terms of software affordances, the operational purpose, and general user model of the tool. Think aloud protocols (where subjects are asked to vocalise their thoughts and actions, as detailed in Chapter 3: Research Methodology) were implemented to enable a clear understanding of the nature of any confusion or impediments to use, and any workarounds that were adopted by the students. These observations occurred over three days.

While the observations helped to confirm many of the design decisions, they also revealed some usability issues, and misunderstandings about some of the more experimental features. For example, the purpose of authenticating (logging in) was designed to eliminate the need for users to explicitly link posts to their sources (through an automatic method of matching links within the body text of their web posts), but this purpose was not clearly understood by them and caused some

frustration when they wanted to explicitly identify their sources through a manual process.

It also became evident from observing the students that the ability to edit posts (once they had been published) had an unintentional affordance – it inadvertently encouraged students to revise and hone their posts unnecessarily, using the tool as a publishing platform; that is, an online portfolio or magazine rather than as intended, as a digital scrapbook. Some students also commented that the process of associating content through using keywords was cumbersome, and that a more intuitive technique should be possible, such as drag-and-drop. These findings contributed to the subsequent (Version 2.0) refinement of the tools (as part of the agile and iterative process). For example: a more standard authentication method was implemented (removing the ability for users to publish content without being logged in); automatic URL extraction was removed and replaced with an HTML form to enable users to explicitly list their sources; and the ability to edit published posts was removed. Despite some criticism about the linking process being overly text-centric, this functionality was not revised because it would have required significant new experimentation that was beyond the scope of this PhD.

They were also asked about its ability to serve their learning needs as they undertook the final-year Research Project module. The insights gained provided a foundation for subsequent focus group discussions, which occurred towards the end of the 2008–09 Northern Hemisphere university academic year (29 May 2009). This timing was chosen because it was a natural review point (both in terms of the progress of the academic year and the progress of the Folksonomy). It involved three Multimedia students, who are referred to here as Respondents 1–3. They were selected because each had a clear identification with one of the three Multimedia sub-disciplines; that is, interactive media (web application design), virtual environments (3D character animation), and moving image (short-filmmaking). Discussions drilled down into the ease of use of the prototype as well as reflection on its benefits for the completion of the Research Project module.

By the start of the following academic year, a number of changes based on the observations and focus group feedback were implemented and the tool had

transitioned into its next iteration: Folksonomy Version 2.0. Seven open-ended interviews were conducted with students in the new cohort (Respondents 4–10) to evaluate its efficacy for their research needs. The interviews took place during the initial stages of defining their research topics, during the research and investigation phase, and during writing drafts of their research documents (dissertations). Interviewing the students at these points helped to reveal an even greater awareness of the specific needs of individual students, provided further insights into the processes of enquiry in this learning context, and identified the potential benefits of the Folksonomy for interdisciplinary research-driven learning.

The perspectives provided by the focus group and interview subjects proved valuable in both providing a specific case or instance of the research problem as it relates directly to representative students in interdisciplinary courses, and in providing insights into the application's efficacy in helping to solve the problems they face. They yielded qualitative evaluation data on the efficacy of the research project's tangible outcomes; that is, whether and how the tool makes the research process easier, more efficient, sensible, expansive, and rigorous.

6.8 QUALITATIVE RESPONSES TO THE USE OF THE FOLKSONOMY IN CONTEXT AND IN USE

Considerable insight into the use of the Folksonomy by students was captured during the focus groups and interview sessions. In what follows, representative responses have been selected and arranged according to their relevance to the priorities and principles of online learning tools, which I identified in Chapter 4: Priorities, Principles, and New Models for the Design of E-learning Tools to Support the Needs of Emergent Interdisciplinary Fields.

In response to Principle 1 (the learning environment must be user centred), students recognised the potential of the Folksonomy to enable them to gather content according to their own very specific needs, but without drawing in wide-ranging, peripheral, and tangential materials as one might do in a general web search. Representative comments include those of Respondent 4 (R4), who explained that she was especially interested in discovering posts related to her information design

research topic, which she did by creating and reviewing posts that were returned based on her design of custom concept filters. She talked through the process of doing this:

That's interesting; I can see that the posts match the tags that I added to the (concept) filter ... so I can change what I'm looking for through the tags – that's really useful. I find most sites don't use tags properly – they keep changing what they mean ... often if you follow links what you get isn't relevant to where you started ... sometimes sites use the same word but forget that the first one has an "s" [making the word plural] and the next doesn't [changing the meaning and how they are associated] I like the idea of using concept filters – because you can combine tags so that you don't have to worry about tags not matching [because you can combine all related meanings as a single filter].

That is, R4's experimentation with the built-in concept filter facility enabled her to discover and collect posts that were most directly related to her information design research topic.

Because learning systems are often conceived as standalone tools, they often make few concessions to students whose learning process depends on having a high level of agency. In relation to Principle 3 (the learning environment should be reconfigurable), the agency provided by the Folksonomy was the subject of much interest to the students. For example, Respondent 6 (R6) explained that he found the Folksonomy very useful as a complement to his online journal (course blog) to facilitate his learning engagement. Rather than relying on a single tool to centralise information, R6 instead interconnected a number of tools as a web of content or publishing nodes. He had done so because of the particular advantages of each tool for supporting his learning. He was therefore keen to explore the potential of connecting the Folksonomy to his journal by aggregating RSS feeds derived from his custom concept filters. He explained:

I use my journal to keep everything together. It can be really frustrating – when you've worked on something ... [then] you go to get it you realise it's gone. I did that recently with an assignment from second year ... we'd used Facebook so it was impossible to find where it was. I now make sure that I

add everything into my journal first. I also try to use it to aggregate my [RSS] feeds – subscribing to blogs I like. The Folksonomy could be really useful this way – I could pre-filter content using my [concept] filters. Instead of having to spend lots of time checking feeds [for relevance] because the site will only send me stuff that I've already tagged.

R6 found it particularly useful to be able to remodel his learning environment through the Folksonomy, something that he realised was possible by integrating Folksonomy content streams with the content streams with his online journal or course weblog.

In relation to Principle 4 (students and academics must be given the agency and capacity to write into the pedagogical space), R6 also found it particularly valuable to be able to link to specific posts using Folksonomy permalinks. He explained that doing so enabled him to develop his understanding of particular ideas by writing critical commentaries. R6 discussed this in relation to the course requirements of the Multimedia final-year Research Project module, where students produce a research document or dissertation in the following comment:

I find the best way to understand ideas is to try to review them on my site – linking to the original post but adding my own thoughts. Now that I'm putting everything together for my research document I've realised I can use some of these for my bibliography – instead of having to find them all again ... I've [also] been able to use some of my comments in the "research argument" section [of the research document], which has been a big help.

The ability for R6 to reflect on ideas he was exposed to, such as those made available to him through the Folksonomy, provided a valuable opportunity to assimilate pedagogical codes. By commenting on specific Folksonomy posts (linked directly through discrete permalink URLs), R6 was able to rehearse critical arguments and perspectives, which he then published to his online journal.

Respondent 1 (R1), Respondent 5 (R5), Respondent 7 (R7), and Respondent 9 (R9) all made comments in relation to Principle 2 (the learning environment should support students to contextualise and synthesise new ideas and associations). R1 explained his use of the Folksonomy to refine his research topic as follows:

It's difficult sometimes when you're looking for a concept or reference to use in your Research Project, when you have an idea in your head but just can't pin it down. I think the Folksonomy is really useful then – it can help you bring everything together... I find that you need to be quite specific when you search using Google because, if you're not [specific], it can obscure what you're looking for, just because of the sheer number of results it returns. Grouping results thematically [as the Folksonomy does] is really useful here as the associations between results can help prompt you to come up with new ideas.

That is, R1 found the Folksonomy helped him focus and narrow his search, and to locate references that were relevant to his coursework. In doing so, the process provided support for him to create a relevant collection of references.

For R5 it was the ability to discover content related to her research topic using the Folksonomy concept filters that was most useful. She began by carefully selecting and assigning keywords to her filter, which she labelled "Flexibility of Employees" (as she felt that this best represented the conceptual focus of her research). She used the filter to perform a search and reviewed the returned results, reflecting on their appropriateness to her research topic and the relevance her keyword selection and assignment. After doing so she commented that:

I'm just seeing which keywords are bringing up results ... which ones seem to be having the most influence on the search ... All the matches seems to be related to the "innovation" keyword, which I think is interesting – it's not what I expected.

As the session continued it became evident that, by assigning keywords and reviewing search results, R5 was engaged in a dual naming process, which required her to develop a concept that was logically related to her topic and was aligned to the expectations of her sub-disciplinary practice. The combination of her explicit editing decisions and the feedback received from the keyword associations in the system appeared to be functioning dialogically and helped her to formulate and synthesise her ideas.

R9's interview followed a similar pattern to R5's. He began by defining a concept filter, which he assigned keyword tags to, based on his Multimedia sub-

disciplinary expertise. He selected the label “Environment Design”, which he defined through a collection of 3D modelling and animation terms. He then performed a search and reviewed the matches that were returned, paying special attention to a Folksonomy post entitled “The Construction of Ludic Space”. He scanned the body of the article and, pointing at the screen, he explained:

That seems like a useful link for my project ... I’m trying to find information that talks about how people react to different spaces; it’s kind of about the psychology of spatial design ... and how characters are affected by their surroundings, so the idea of ludic space could be useful.

He then went on to elaborate, describing the potential usefulness of the Folksonomy for helping him discover other ideas that he wasn’t aware of:

I probably wouldn’t have found that idea of ludic space through searching – using my own keywords ... whereas with this I’m using keywords which are related to someone else’s tags – so you kind of get someone else’s input as well.

In this way, the Folksonomy provided an opportunity to strengthen his research through exposure to associative ideas, which would eventually find their way into his thesis.

Similarly, R7’s interview focused less on the requirements of his specific research project than on his discovery process, which he felt was facilitated by the Folksonomy by way of associating content. He explained:

I tend to follow ideas which interest me, and I’m finding the Folksonomy useful because it makes connections between ideas that I know and ones which are new [to me]. I can follow links to see where they lead; I’m hoping that this one gives me more to go on with my project.

For these students, the Folksonomy realised its potential to help them position research ideas within a broader conceptual frame. Moreover, because the content and associations of the Folksonomy are produced through a collective, ongoing participatory process, the currency of the accumulating content ensures that students locate their research within a contemporary context. This is important as it helps to guarantee the relevance and potential impact of their work. This is especially useful

considering the delayed timeframe for print publishing and the rapidly changing nature of multimedia innovation.

Indexing content using keyword tags is useful as it produces search results, which include both practice and theory. Such returns enable students to access ideas that they might not otherwise have discovered and that allow them to consider the broader implications of their enquiry. This is especially significant in contexts that are undergoing radical transformation. In the instances outlined above, the students were able to situate their research through awareness of letterpress publishing (Cooke & Higgins, 2012), debates about electronic literature (Memmott & Prater, 2011), and augmented reality used in *Esquire* magazine's 2009 "Best and Brightest" issue (Curcurito, 2009).

In relation to Principle 5 (it should be possible for students to create ad hoc peer groups and associations), while the focus group sessions did not cover the functionality of groups explicitly, R10 discussed her thoughts about the value of supporting and promoting collaborative working practices. She did so in context of the Folksonomy's Members section, which she compared with her use of the Members facility built into Blogger. As she explored functionality, she commented:

So each user has a profile page ... does that mean that you can link your page with other members – for example if you were making a film together and wanted to share YouTube clips? It would be great if you could automatically share your posts so that you don't need to keep sending links backwards and forwards or posting them on Facebook – which I personally don't like because it can get a bit messy. In first year we used Blogger groups for our Narratives [course module] film – which was really useful; however, it would be great to have something which allowed you to work together more – and not just for managing the project – something more creative, where you can share stuff and comment on each others' posts.

Indeed, this is all possible through the Folksonomy. R10 not only points to the value of creating groups for supporting teamwork projects, but also demonstrates an awareness of their potential for generating new ideas through the closer communication and working practices that the Folksonomy enables.

In relation to Principle 6 (contributions made by students to shared knowledge spaces must be identifiable and students must be attributed as content authors), both R4 and R10 found it useful to be able to distinguish between posts published by specific users (using the clippings link in the Folksonomy). For R4, being able to do so reassured her that her contributions wouldn't get lost, something she had experienced using Facebook for teamwork previously. R10 also thought that it was useful to selectively view user clippings, and suggested that enabling groups of users to amalgamate their posts to create a combined knowledge base would help collaboration. R10 explained her perspective as follows:

I like the idea of being able to separate your posts from other users – that way it [the Folksonomy] is kind of like an online journal [blog] – except that you create it collectively with others ... It would be really good if it worked like a digital moodboard so that I could collect and share ideas with the rest of my team ... a bit like my journal except that we [our production team] could use it to collaborate ... so we could all share our ideas and inspirations in the same place.

Although R10 found it very useful to be able to identify and select the posts of individual users, she was particularly enthusiastic about the potential of being able to interlink users to form temporary shared knowledge and work spaces (something that isn't yet enabled but provides an opportunity for further revision of Folksonomy in the future).

6.9 CONCLUSION

The observations of the Folksonomy in use, and interviews with students who were trialling it, provided insights into the importance of supporting integrative scholarship and ways in which this can be achieved through the use of the Folksonomy in the context of the final-year Multimedia Research Project module. From student responses, it became clear that the Folksonomy can support interdisciplinary students – especially those engaged in research and discovery practices. Students showed that they are able to discover existing posts directly related to their design research topic from a number of surrounding fields. They demonstrated that they were able to develop further interest in a topic or focus it more specifically as the conceptualised

and named relevant theory (indeed, for some, it positively altered the trajectory of development by introducing new ideas or clarifying ideas that had previously been unnamed). They reported that they could selectively integrate Folksonomy content into their personal content nodes and create their own bespoke collection of learning materials according to the particular needs of their work. And they appreciated that it enabled them respond to specific Folksonomy posts through critical commentary and to contextualise their discoveries in relation to broader cultural understandings. Moreover, they valued its capacity to help them to: connect with peers by sharing concept filters, posts, and streams; share their perspectives; and create ad hoc team groups composed of multiple individual streams.

Chapter 7: Project Outcomes and Conclusion

As an academic in the field of communication design, I was acutely aware that e-learning 1.0 environments such as Blackboard – despite their the large-scale and ubiquitous adoption over the past two decades – fail to provide adequate support for students working within rapidly evolving interdisciplinary fields. This problem arises because of a phenomenon described by Bernstein as *weak classification*, where the clearly defined boundaries that have been established by means of traditional knowledge domains are absent, so students are unable to assimilate deep specialist knowledge in conventional ways. The issue of weak classification in the field of design is pervasive in both education and professional contexts, due to the field's evolving spheres (visual communication, interaction design, IT, animation, and film, to name just a few) and rapidly advancing technologies. However, it is the circumstances of students that are most problematic, for they must learn to be both specialists and agile collaborators who are fluent in the adjoining specialist fields of their peers.

Academics teaching in such fast-changing, interdisciplinary courses, must be particularly wide ranging in their expertise and adept at embracing new discourses and technologies, as they endeavour to support students whose interests span diverse sub-specialisations at the cutting edge of an emergent field. E-learning 1.0 tools are inadequate for contributing to such a task as they are designed to shore up discipline boundaries into discrete and stable blocks of knowledge.

This practice-led PhD has set out to investigate how the pedagogical needs of students engaged in undergraduate interdisciplinary projects in emergent fields such as communication design and multimedia might be effectively supported by new online learning environments. More specifically, it responded to the question:

How might we design online learning environments that are appropriate to, and effectively support, students' learning requirements in rapidly changing interdisciplinary courses of study, such as communication design and multimedia?

This question provided the impetus for a review of relevant literature and theoretical models, which led to a discussion on e-learning 1.0 and 2.0 design archetypes and conceptual models. This discussion established the reasons for the limitations of e-learning 1.0 and considered the affordances of Web 2.0 technologies and their capacity to support students to:

- assimilate new knowledge and practices as they reconcile contradictory and changing contexts caused by weakened classification
- situate themselves in an expanded field
- engage in socio-constructivist interaction and engagement
- connect intersecting knowledge domains
- become responsive co-authors and content creators rather than passive consumers of a unidirectional information flow.

While I concluded that, despite their popularity and ubiquitous uptake, no Web 2.0 technologies address all of these learning needs because they were produced for other purposes. At best they provide the possibility of a suite of tools (a concoction) that can support learning, if adapted for learning contexts. However, their attributes offer new ways of thinking about what learning experiences might be.

Alongside this secondary research, it was important to recognise that, in developing design proposals for pedagogical innovation, primary research is needed to ensure that the audience, context, and purpose of a specific instance of the research problem is considered and that the study is grounded empirically. Two case studies were used to focus the enquiry and to establish a needs analysis. Both related to teaching contexts that I was directly involved in during the course of the study: the QUT Communication Design BCI and double-degree Information Technology and Communication Design BFA courses in which I was a lecturer, and the NTU BA (Honours) Multimedia degree, in which I was programme leader.

The triangulation of the preliminary literature review, the contextual analysis of available online learning environments and applicable attributes of Web 2.0 technologies, and data collected from the case study contexts, led to the identification of a set of core priorities for designing new, online tools for supporting interdisciplinary work and, from this, a set of working principles was established.

These principles provided a foundation on which I have designed and developed a bespoke web application, called the Folksonomy. However, the principles themselves are an important outcome of this research. They are generalised and so can be adapted and applied to multiple design solutions – potentially across interdisciplinary and emergent fields. The Folksonomy might be described as an instantiation of these principles. It has provided a means to test and refine them through an iterative process, in context and in use. It has also provided a means to evaluate them to test their efficacy. However, as generalised principles, they are a contribution to new knowledge, in and of themselves, as they can be applied to other design solutions for interdisciplinary learning contexts.

As a tangible outcome, the research has led to the development a bespoke e-learning 2.0 application – the Folksonomy – to provide greater support for students studying in the interdisciplinary QUT and NTU courses. As a design tool it has been implemented, refined, and tested for its efficacy. It is an important outcome of the research in its own right, and its potential benefits and impact is not just applicable to the students who have trialled it and those who regularly use it. As an open-structure application, or as an extensible repository, it can be taken up in other design schools as well as other fields of study that are interdisciplinary in nature.

7.1 LIMITATIONS OF THE RESEARCH

Aspects of the priorities and design principles were challenged during the seven open-ended interviews I conducted at the beginning of the 2009-10 academic year. The interviews revealed that assumptions had been made about the level of support required by students as well as their level of engagement with general pedagogical practices. For example, while students commonly use collections of online tools to support their learning, it was noted that the final year NTU Multimedia students rarely did so in the coordinated way that was initially outlined in Priority 1. Instead of strategically choosing to construct heterogeneous networks of learning nodes they tended instead to select (and ultimately discard) tools based on their changing learning needs. Also, while the students commonly constructed reference collections they rarely sought to maintain the collections upon completion of course units. These

insights were useful for my reflection upon outcomes and their scope of use amongst other emergent tools.

Folksonomy technology limitations were also discovered, which prevented students from editing, selecting and co-presenting their ideas to the degree initially indicated in Priority 2. While students were able to synthesise knowledge through creating concept filters, further support would need to be provided for them to curate their filters through grouping, archiving and reinstating any previously archived filters. Also the ad hoc grouping tool, which was designed to attend to Priority 5 was seen to be quite limited and so would need to be significantly revised in subsequent software revisions. In summary, comments made by students during their open-ended interviews, challenged some of my assumptions made about the Folksonomy Version 2.0, which were taken into account as the tool continued to develop.

The Folksonomy now has a life of its own, regularly receiving visitors from across the globe. Beyond the context of the classroom, its impact might be measured more peripherally through its popular use as an online resource. The site has an international audience who regularly visit it and a membership of 440, which is significant given the scale and niche focus of the project. The Folksonomy visitor patterns are shown in the following graph (Figure 7.1), which is generated from data automatically collected through the ClustrMaps web service. It evidences regular access by a global audience and a healthy constituency of users.

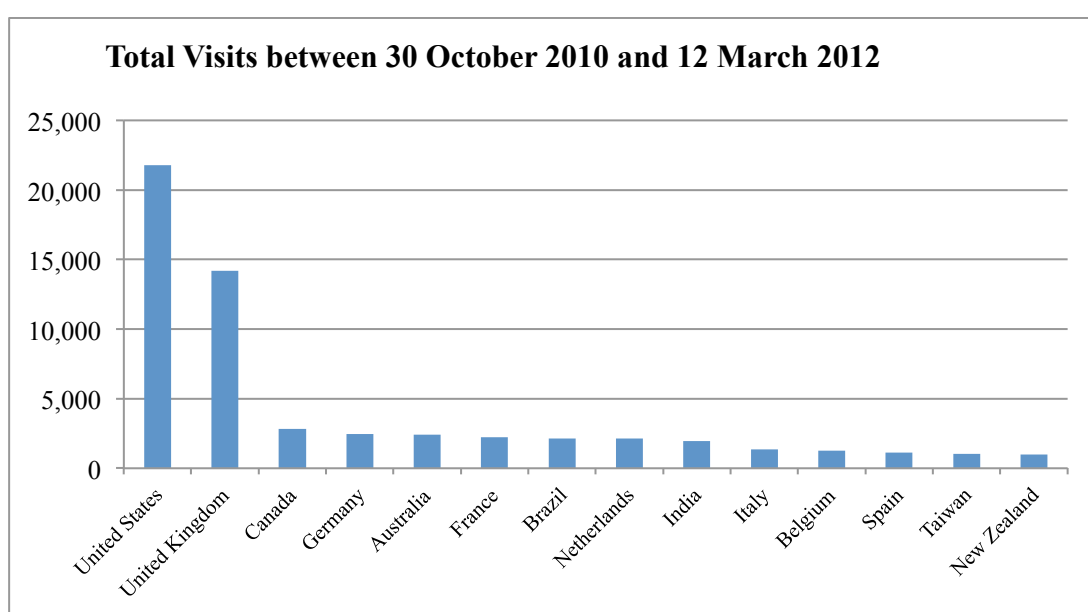


Figure 7.1 Folksonomy global access

Figure 7.1 provides a tally of visitors accessing the Folksonomy between 30 October 2010 and 12 March 2012 (note that only countries where the total number of visits exceeded 1000 are shown). The tally ranges between 21,778 visitors in North America to 1004 visitors from Aotearoa New Zealand.

The global spread of visitors accessing the site can be seen on the following locative media graphic (Figure 7.2). Note that while there are clear concentrations in Europe, North America, the Indian subcontinent, and South-east Asia, the ClustrMaps service registers visitors from 182 countries, including smaller concentrations in Australasia, South America and Southern Africa.



Figure 7.2 ClustrMaps chart showing global Folksonomy site access

An understanding of the impact of the Folksonomy can also be extrapolated from a review of backlinks and inbound links (IBL) to the site; that is, instances of users on the Internet linking to the Folksonomy from external sites. Examples range from prominent sites such as TheGuardian.com and WIRED.co.uk through to personal websites and design blogs. Perhaps the most significant of these is Justin McGuirk's Guardian article, "Design Research Unit: the firm that branded Britain" (2010), which includes a direct link to a Folksonomy post within the body of the article. This is significant because it provides an indicator of the Folksonomy's credibility, not only in the context of attribution by one of Britain's leading media outlets but through the article's subject of British design history. The WIRED.co.uk article is on data visualisation.

Numerous articles across a range of disciplines cite the Folksonomy in their inline references, including Katie Scott's "Vienna Method of Picture Statistics" (2012), Sanjoy Roy's discussion on avant-garde choreographer and performer Saburo Teshigawara (2011), an essay discussing the history of virtual museums (Marmo, 2012), a Malay journal article on the symbolic structure of sadness portrayed in Michael Dudok de Wit's animated short film *Father and Daughter* (2000), and a review of occupational health guidelines published in French in the interdisciplinary journal *Perspectives interdisciplinaires sur le travail et la santé* (PISTES) (Lortie et al., 2013). The Folksonomy has also become a popular reference source for discussions on Carmen Hermsillo's landmark 1994 essay on the commodification of human interaction and identity online, such as a *Networking Knowledge* journal article about queer social justice on Tumblr (L. Bell, 2013).

It features on prominent reading lists, such as the Northwestern University Digital Humanities Laboratory reading list (Kramer, 2014), and Stanford University PhD syllabus (Turner & Lee, 2013), and State University of New York at Geneseo Contemporary Biology unit (Simon, 2012). And it is linked on numerous blogs and forums, perhaps as a result of Wikipedia editor Mikhail Lewis citing the Folksonomy as a source for the "Hermsillo" Wikipedia article (2011) and an anonymous author citing the Folksonomy as a source for the Wikipedia page on Adam Curtis' *All Watched Over by Machines of Loving Grace* television programme (2011). They include, for example, influential art and design blogs, The Fox Is Black (Dent, 2011) and Madame Pickwick Art Blog (Bouchard, 2011, 2012).

While this widespread uptake of the Folksonomy as a resource validates its usability and usefulness as a repository, it is an unintended outcome of the project. Its primary purpose and its benefits are as an educational tool to support the pedagogical needs of students.

The observations, focus groups, and interviews, which focused on the affordances of the Folksonomy in instances of use revealed the value of the Folksonomy for supporting practice-led discovery and research training in design courses. For the student subjects involved in the evaluation of the tool, it provided a useful way to support their needs as individual learners, even when each was

differently situated from their peers. It offered support for developing their research focus and defining the topic and direction of their projects. It enabled them to develop greater awareness of the context of their field of practice, to find examples and exemplars for situating their practice within a named discourse, and to discover evidence for supporting their critical arguments. By creating personalised collections of content nodes, they could place themselves at the centre of a constellation of fields, practice, and theoretical frames. And they could adapt the configuration of their content clusters (through concept filters) to serve different needs over the course of a project, a degree, and a career. By writing into the pedagogical space, they could rehearse their conceptual understanding within the context of digital culture and creative practice. Moreover, they could connect with their peers through shared content and in-common concept filters, as well as through responsive commentary and dialogue, and in working together towards common goals.

7.2 POST-PHD TECHNOLOGY DEVELOPMENT

The Folksonomy evolved out of particular circumstances within a context of student and academic needs amidst constant change and reinvention of social and learning technologies. While it has largely maintained pace with these changes, most obviously through its focus on integrative scholarship (and perhaps least through its keeping step with screen layout trends), its effort to provide a generalised platform for integrating a wide array of information and formats with a largely open conceptual focus now needs to be reconsidered. Over the course of its development (and for similar such sites which are still operating)⁴⁰ comparison sites have tended to either narrow their scope i.e. become niche or, in the case of well funded or well supported open source sites have significantly enhanced their technical capabilities and user-base. For the Folksonomy to continue being useful, it needs to be reconsidered according to the full set of contemporary circumstances. A choice needs to be made about its direction an repositioning as either a fully-functioning

⁴⁰ By comparison the following similar sites no longer operate: Ofamind.com, Researchrr.com and Retaggr.com.

generalised service such as Wordpress and Facebook or a much more targeted service such as the online reference manager RefWorks.⁴¹ For the project to be truly future-proofed, decisions need to be made about whether it serves a commercial purpose, perhaps even as a non-profit or a strategic research purpose i.e. that it has continued utility as a platform for academic research..

Central to this are decisions about its sustainability as a post doctoraal project. While my time designing, developing, using and maintaining the site can be justified within the context of a PhD creative project because of the pressures for academic professionals such as myself to produce research outputs of qualified significance and impact projects such as these are simply not sustainable without a clearly articulated economic or strategic purpose. For this reason discussions about technology future proofing must be considered in relation to an overall project sustainability. Despite the importance of such considerations, speculations about the future of the project at this stage are ostensibly beyond the scope of this exegesis (and will begin in earnest at the completion of the PhD).

From a technology perspective there are two logical directions for developing the site: 1). Maintaining the current direction through extending the site's capabilities as a self-contained and freestanding platform; 2). Redesigning the site's core functionality around a niche service, which integrates with other providers, extending their provision.

In the case of a continued self-contained and freestanding platform, it would be strategic for the site to adopt the 'mobile first' strategy to take advantage of the prevailing trend of online content being predominantly accessed via mobile rather than desktop devices. In this way, the display of site content would need to be redesigned around a baseline minimum for small screen i.e. mobile phones, which would be extended and enhanced for larger screen devices such as tablets, desktop computers and potentially smart televisions. In this way the site's interaction model and interface would need to be redesigned to take advantage of the technology

⁴¹ RefWorks is an online research management, writing and collaboration tool available: <http://www.refworks.com/>

affordances of such platforms, screen sizes and computing power. For web delivery, this would necessitate the site being redesigned through using a 'responsive layout' approach, resulting in site content reflowing according to available screen size. For mobile/smart app delivery e.g. using Apple iOS, Google Android (or relevant device Software Development Kit). The application and its interface would be redesigned to take advantage of specific device capabilities e.g. integration with inbuilt cameras and location-aware functionality such as maps and GPS etc.

Site controls related to content collection/re-blogging would also need to be revised to take better advantage of relevant device functionality/code libraries. In doing so, greater integration between the Folksonomy and the relevant enabling platform/technology would need to be explored. Doing so would allow the tool to be potentially used in quite different ways depending on the user's accessing device. For example in the case of mobile users the process of 'clipping' might be more akin to 'documentation' where, through using device cameras, users might record from their local surroundings instead of sampling content from online sources as has been anticipated for desktop users. In such a way the basic logic of the Folksonomy would be extended to be a tool for primary data collection as well as content integration.

As a niche service, integration aspects of the Folksonomy would need to be significantly enhanced; doing so would not only tie the platform's development to the technology decisions of other integrated providers but it would also require careful consideration of pre-existing licencing arrangements to avoid the threat of copyright claims. While there would certainly be some benefits of integrating the revised Folksonomy with popular social software platforms such as Facebook and Instagram etc., it would be educationally more logical at this point to integrate with reference managers such as EndNote, RefWorks and/or Zotero and, if possible, flipping the plagiarism detection functionality of the online service Turnitin so that it can support students in their process of substantiating academic arguments (rather than simply auditing them post hoc). At the same time, through integrating with popular VLE platforms, the Folksonomy might provide students with a means for negotiating their interactions with institutional online learning provisions. In these ways, providing a niche service centring on information integration and user/relationship brokering would be a logical and appropriate direction for a remodelled Folksonomy.

7.3 ATTENDING TO CHANGING LEARNING PARADIGMS POST-PHD

To assure that the Folksonomy best serves changing learning paradigms, the next iteration of the platform would need to be further developed to provide a number of pedagogically focused services. The following are important recommendations that the platform should attend to:

- Be more user-reconfigurable;
- Enable students to create personalised organisational relationships;
- Provide better support for students to identify disciplinary sub-specialisations;
- Enable users to annotate posts to foster critical analysis and debate;
- Better support for peer collaboration and project team organisation;
- Clearer guidance in regard to re-blogging and intellectual property rights;
- Better integration with existing e-learning services;
- Opening up the platform as an 'open source' project.

Version 2.0 of the Folksonomy enables users to publish and organise content using keyword tags (as described in Design principle 1 in Chapter 4). However,, the platform doesn't allow users to make choices about top-level functions or make choices about how content is displayed in the interface. The ability for users to customise their environments is commonly understood to be beneficial for promoting a sense of ownership. While the 1.0 version of the tool provided some basic customisation through allowing users to create and share interface colour choices, this optionality was removed from the 2.0 version. An extended version of the platform should allow users greater optionality through allowing them to customise software functionality and visual appearance (that is accessible on both Desktop and mobile devices). Such functionality might also include 'administrative privileges', where user-access is modelled on real-world roles e.g. lecturers, student project leaders, students. At one level the options for groups of users could be controlled according to a shared purpose e.g. student or project group, while at another level individual users could enable/disable a subset of these features according to their individual needs and preferences.

Allowing students to make ad hoc selections and content associations would help to promote integrative/synthetic thinking. Although version 2.0 of the platform supports the use of tagging and tag groups, doing so requires users to work in a more measured/strategic way, pre-emptively defining tag titles and group categories according to their anticipated needs. Extending the Folksonomy to provide better support for associating, organising and grouping content would be a real advantage for students working in a synthetic mode – allowing them to discover patterns and connections more laterally as they placed and assembled personal reference collections. This might be enabled functionally through users being able to interactively select and arrange content using commonplace techniques such as in-page absolute positing and ‘drag and drop’. The addition would mean that students would be able to build and grow collections through both ad hoc selection and tagging.

The ability for students to locate their interests according sub-disciplinary specialisations in a more explicit way would be huge advantage. While the process of creating and refining ‘concept filters’ is intended for this purpose, specialist knowledge is currently required to make clear interpretations. Through analysing Folksonomy user content tagging, grouping and associating patterns it might be possible to create a ‘smart’ prompting tool which provides similar functionality to that available through Ravensbourne College of Art & Design’s course finder.⁴² In this case however, instead of quite simply offering up a fixed set of outcomes based on a predetermined set of choices (as is the case with Ravensbourne’s tool) the Folksonomy tool would provide prompts based on the analysis of choices made by users as they worked to collect and organise content. In this way students would be prompted to consider sub-disciplinary specialisations based on the analysis of their on-going usage data i.e. their ‘actions’.

⁴² Course Finder for courses provided by the UK’s Ravensbourne College of Art & Design

<http://www.ravensbourne.ac.uk/courses/course-finder/>

Being able to comment on Folksonomy posts would be hugely beneficial for fostering critical analysis and debate. Such functionality is not possible in the current version. A subsequent version might conventionally do this through the addition of an in-built comment system or possibly through integration with social software platforms such as Facebook, Google+ and Twitter. Through annotating posts in this way, Folksonomy members would be able to discuss concepts and issues with peers as they relate to their interests and learning needs. Integrating comment facilities provided by established social media platforms would provide a familiar mechanism for many users while proving greater exposure of such discussions beyond the confines of the Folksonomy platform. In the case of Bruce Sterling's Wired article on 'design fiction' (2013) for example, comments which are displayed at the end of the article were initially contributed through a Facebook discussion rather than directly through an in-built Wired comment system. In doing so the discussion was exposed to the Facebook 'friends' of each of the commentators – for them to potentially contribute. Regardless of the approach used, the addition of a facility for Folksonomy users to annotate and comment on posts would inevitably provide benefit for student users.

The full integration of the ad hoc grouping widget would provide greater opportunities for students to interact and collaborate with each other, which is useful for establishing communities or practice and for facilitating the organisation of course project teams. As discussed in Design Principle 5 – the widget provides a basic mechanism for Folksonomy users to create project groups. In a more resolved platform, the widget might model some of the features common to online project management tools such as Basecamp⁴³ – where site members are able to assign tasks and coordinate shared activities. Currently, Folksonomy members are only able to create ad hoc groups, which enables them to view the concept filters of group member.

⁴³ This service can be accessed at: <http://basecamp.com/>

Clearer guidance needs to be provided in regard to re-blogging and intellectual property rights. While all content on the site is informally re-blogged according 'fair use' this process would need to be formalised in future Folksonomy versions. Support could be provided through the inclusion of online help information for users as well as publishing functionality that supports users correctly identifying appropriate licences. Such support would need to be provided to enable posters to correctly attribute authorship for all elements within a post i.e. cited text, digital images and video clips.

Greater consideration needs to be paid to integration opportunities with open courseware and massive open online course (MOOC) providers such as Coursera, edX, iTunes U, MIT OpenCourseWare, MITx, Pearson eCollege, Udacity. This would help to guarantee the on-going viability of the Folksonomy platform. While it is assumed that each case would need to be considered separately – broadly speaking, such integration would likely be best achieved through first technically integrating the Folksonomy with each of the separate technology infrastructures, then subsequently pursuing business opportunities based on this integration with each of the organisations.

Publically releasing the source code for the Folksonomy would be a logical progression for the platform. While it was important to assure proprietary ownership to serve PhD requirements, it would be appropriate to release the source code subsequent to this to the e-learning community. Releasing the code would be partly an ethical and partly a strategic decision. Ethically releasing source code acknowledges contributions provided by the development community in the form of free code examples and online advice, which such projects inevitably benefit from. Strategically publishing source code helps to grow interest in the project from other developers who are working in similar areas and who might see the benefit of extending the project to achieve their aims.

Although not exhaustive, this list of recommendations provides an indication of potential developments, which could be made to the Folksonomy platform to assure that it, is best able to attend to changing learning paradigms.

7.4 LIMITATIONS OF THE RESEARCH

The research presented here has a number of limitations, which can be broadly described in terms of the following three issues: scope, technology challenges and the use of empirical data collecting tools.

The problem of scope is threefold: the narrow focus of the case studies limits the potential for extrapolating and generalising the findings more broadly; the insatiable demand for new and updated Folksonomy content limits the utility of the resource for research subjects; and the expansiveness of interdisciplinary creative practice scholarship is difficult to reconcile within the scope of PhD research.

It was partly a strategic decision to restrict the research to QUT Communication Design and NTU Multimedia cases. Lecturing in these courses gave me the insights needed to problematize and focus the research. Despite the benefits however, localising the research also has the potential of limiting its relevance beyond its particular circumstances. While such insight might have direct relevance in order for it to be useful within a research context, it must have the capacity to be generalised as a theory. The decision to formulate the research in terms of a set of principles was made for this reason. Through their synthesis, the concepts behind the principles become divorced from their specific circumstances so that they may be redeployed in the production of new theories. The research principles articulated in the PhD are quite concrete and tied to their original contexts however. Further synthesis and generalisation is required to further the insights offered.

The capacity for the Folksonomy to support learning within a communication design and multimedia context is largely dependent on the currency and wealth of references which it contains. As a result, there was significant pressure to constantly refresh the site's content with new posts. This was further exacerbated by the extended timeframe of the research. Despite this effort, it is inevitable that such a resource is only able to provide partial support for student learning, as it operates as but one of many sources within a much larger constellation of repositories accessible to students. The resulting effect meant that some of the substance of the research was compromised by the inability for the resource to wholly service the learning needs of its student subjects.

By its nature interdisciplinary creative practice scholarship is demanding. Unlike singular disciplinary scholarship, interdisciplinary scholarship demands researchers to demonstrate their knowledge of a wide range of conceptual models, practices and data collection instruments. This is challenging, especially so for PhD students who must complete individual programmes of study. In the case of this PhD, aspects of the enquiry have been limited because of the necessity to incorporate broader concerns. For example, the depth of analysis of interview data is limited (especially in the context of social science research), the constellations metaphor conceptual framework lacks some of the nuance that would be expected in humanities research and the information design, user-interaction model and software engineering have only been resolved to a functional prototype stage, rather than production stage as would normally be expected for live software. Despite these limitations, the research successfully presents a clear thesis through the integration of multiple disciplinary domains.

The issue of 'technology challenges' is tied to epistemological differences between theory and practice, governing their approaches to knowledge construction. While the first data collection instruments are conceived of as being distinct from their context of use (and ultimately the theory with which they serve), for 'practice' they are inextricably linked. This difference produces significant challenges for the research in terms of designing and remodelling the Folksonomy software to meet the changing research demands. It has meant that instead of being able to quickly design and discard instruments as might be possible with more traditional research, the PhD often necessitated compromises being made in order to make best use of available opportunities. This meant that, to a larger extent, data collection opportunities were predicated on design and technology decisions (rather than the other way around). While these limitations were managed through relying more heavily on interview and observation methods, subsequent research might do so through greater use of available 'off the shelf' software to approximate the intended functions.

The research only made limited use of empirical data collecting software tools. Importantly it was not possible to use automatic means such as 'cohort analysis' (as discussed in Chapter 3 'Quantitative data collection') to monitor the specific usage patterns of individual student subjects. While it is now possible to do this through

using Google Analytics, this functionality was only added after the data collection period of the research (October to December 2008 and 2009). Being able to monitor users in this way would have made it possible to build up a detailed picture of research subjects as they interacted with the Folksonomy interface. In doing so, it would have allowed me to track their specific choices, which through correlating this with my observation data would have allowed me to further extrapolate insight about the value of the tool for supporting learning. Some empirical data was captured through software means however its use was limited in the context of the research.

7.5 NEW RESEARCH EMERGING FROM THIS RESEARCH

Research emerging from this PhD would logically focus on the potential for e-learning infrastructures to support students to assimilate pedagogic codes. In doing so it would seek to further elaborate the research underpinning Priorities 1 and 5, which centre on issues relating to the ability for students working within interdisciplinary contexts to establish professional identities and to develop personal autonomy. Such research would focus on the support needed for students to holistically frame and assimilate these perspectives.

The research would problematize issues around learner agency and its relationship to identity rehearsal and enactment. In doing so it would draw on sociological, pedagogical and counselling theoretical perspectives including: concepts of classification and framing described by Basil Bernstein (2000, p.7); the concept of backstage and front stage behaviour described by Erving Goffman (1959, p.78); theory underpinning ipsative feedback and assessment; as well as 'career narratives' described by Torben Christensen and Joseph Johnston (2003, p.149). The research would aim to use insight about pedagogical codes and ipsative feedback to provide support for students to engage with the learning process. It would seek to provide support for students to develop personalised career narratives through their critical reflection of their prior learning experiences, awareness of their professional goals and the nature of identity rehearsal and enactment.

The research would involve the use of the Folksonomy, both as a data collection instrument and as a means of manifesting the research results. Initial considerations

might include functionality to enable users to interactively 'locate' themselves in relation to their peers, to the sub-disciplinary discourses(s) and to a professional field(s). Logically, this might be represented using a network diagram – where each user is represented as a node interlinked with other related users. It might be desirable to visualise an individual's accumulated learning experiences as an evolving trajectory. This might include the use of predictive scenarios, which are automatically generated based on their user-choices. Both qualitative and quantitative data would be collected using the Folksonomy. Students would be observed using the tool and their user interactions would be collected automatically for subsequent analysis.

The study would provide further elaboration on the PhD theoretical position in relation to e-learning and interdisciplinary knowledge contexts. It would additionally provide further impetus for value of the Folksonomy learning tool. The research would also help extend the PhD scholarship through further insight about factors controlling learner agency and the establishment of personalised career narratives through identity rehearsal and enactment.

The project outcomes, which include both a set of generalised e-learning design principles and the Folksonomy tool advance a theory for knowledge construction based on new relationships between disciplines. In doing so, the outcomes further the case for learner-centred integrative pedagogical practices, and present a new model for online learning environments suited to supporting them. The findings are significant because they provide a means for students to develop much-needed agency within complex learning situations, such as those characterising interdisciplinary contexts. Because of its unique design, students are able to use the Folksonomy to establish and strategically locate their individual specialisations while at the same time drawing relationships between aligned fields and knowledge domains. This is in contrast with traditional e-learning environments, which, through their focus on mass 'content delivery', fail to provide the necessary tailored interdisciplinary support. Being able to integrate and assimilate multiple perspectives is a fundamental requirement for design students in their process of becoming industry professionals.

The e-learning design principles articulated in this PhD further extends the range of the findings. Although developed in response to the learning needs of students working within two specific case study contexts, through their generalisation they represent a model, which has the potential for application across interdisciplinary and emergent fields and as foundational research for future further study.

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Appendices

Appendix A Multimedia Programme Research Project unit guide

module guide
level THREE 2011-12

Module title: Research Project

Module code: MMPR30023

Module Leader: Simon Perkins

Number of credits: 50

All year–core module

The context

The research project is a design project developed by you through negotiation with tutors. It provides you with the opportunity to develop an in-depth understanding of a specific aspect of your nominated multimedia specialisation.

The module is designed to complement the learning outcomes of the Client Project module. It does so through requiring you to define a research proposition that you investigate through the production of a series of design artefacts.

You should aim to create a 'narrative' of your research which you evolve into a precise description by the end of the module. Doing so will help you to conceptualise your work as it evolves as well as communicate its significance⁴⁴ at the end of the module i.e. at your viva voce.

See Appendix 1 for details.

The brief

As an individual you will produce two pieces of coursework that examine your relevant multimedia

⁴⁴ Sensemaking: <http://folksonomy.co/?keyword=13757>

discipline and your place in it.

It is expected that each student will produce a journal. The journal should seek to help contextualize the work that you have produced this year. This journal will be presented and discussed during selected personal tutorials sessions. It is recommended that this journal take the form of an online journal or weblog (whose URL is published to the www.reflectivejournal.co.uk site).

Essential reading/viewing

Hilary Collins (2010). 'Creative Research: The Theory and Practice of Research for the Creative Industries' AVA Publishing.

Blaxter, Hughes & Tight (2006). 'How to research' Edition: 3rd. Location: Boots –ISBN: 0335217478

Research Methodology: A step by step guide for beginners. Kumar. Edition: 2nd 2005 Location: Boots – ISBN: 141291194X

Useful reading/viewing

References tagged in the Folksonomy

Note that these are recommended to help you contextualise and support your research. All posts are linked to their sources and many include references to academic papers. The collection prioritises digital culture and creative practice and includes many useful references targeting the Multimedia pathway areas.

Content tagged that generally relates to the module:

<http://folksonomy.co/?concept=2883>

(UK) National Endowment for Science, Technology and the Arts (NESTA):

<http://folksonomy.co/?keyword=5222>

Creative Industries Knowledge Transfer Network (CI KTN)

<http://folksonomy.co/?keyword=12522>

Arts and Humanities Research Council:

<http://www.ahrc.ac.uk/Pages/default.aspx>

References available in the library

Gray, C. and Mallins, J. (2004), *Visualizing Research: a guide to the Research process in art and design*, Hants: Ashgate

Rose, G. (2006). *Visual Methodologies, an Introduction to the Interpretation of Visual Materials*. Sage Publications

Visocky O'Grady, J and Visocky O'Grady, K. (2006), *A Designer's Research Manual*, Mass: Rockport

Schedule of module events

Refer to your online timetable

This programme contains a combination of traditional and online learning approaches, deemed as important as live, participatory taught sessions, and includes:

Essential information about the module including the module handbook, a reading and resource lists, news items, directed learning, details of assessment tasks and criteria and submission requirements;

A range of online learning activities, such as group discussion, learning tasks and assessment tools.

Deadlines

Signed research topic form
Week 13 (25/10/2011 WAV102)

Final Research Document
Week 19 (06/12/2011 NOW Dropbox)

Viva voce (presentation of artefacts, supporting material and written conclusions)
Week 40 (30/04/2012–04/05/2012)

How the work will be assessed

Learning Outcomes

Learning outcomes describe what you should know and be able to do by the end of the module and are the benchmarks against which your work is assessed.

Knowledge and understanding

After studying this module you should be able to:

- critically evaluate and analyse the contextual dimensions of your Multimedia practice as it is informed by social, cultural and technical issues;
- engage with a substantive area of current research in the multimedia field through a process of analysis critique;
- produce well structured and relevant arguments supported by visual, textual or other evidence as appropriate.

Skills, qualities and attributes

After studying this module you should be able to:

- demonstrate a sustained capacity to generate novel ideas through exploration and enquiry.

Feedback to you

Students will receive verbal formative assessment at the end of the research document stage. A final summative mark will be given at the end of the module.

Potential costs

You will be submitting your work in the relevant digital/electronic format i.e. DVD, online, etc. so there will be some expected financial outlay on your part to purchase this media/arrangement.

How to make comments/suggestions about the module

Your feedback is welcome at any time and we would encourage you to recognize the relevance and importance of the suggestions you may make and how it is invaluable to the future developments of the module and the programme. You will be asked for your feedback during the module via formal and

informal methods, and also at the end of the module via a module feedback form. Your thoughts and suggestions are incorporated into the Module Leaders Report Form at the end of each academic session and this helps inform future programme developments.

You can also make comments and suggestions via your student representatives who attend three Programme Committee Meetings per year on your behalf and you can also attend the Staff/Student Liaison Committees held each term.

If you have a problem

If you have any concerns with the module or the work, ask to see your personal tutor or Module Leader as soon as possible. They will be able to support you by offering help and advice; the sooner a problem is identified, the quicker it will be sorted out.

The School is aware that there may be times during your studies when you could experience difficulty in completing your work due to situations arising outside of your reasonable control which may have an impact on your ability to continue with your work or to demonstrate what you have learnt at an assessment point. It might be that the deadline for a module assessment cannot be met and results in you needing to request an extension, or in extreme circumstances may result in you not being able to complete the year. The procedures are as follows:

Extension requests—Your Programme Leader, if in agreement with the claim, can grant an extension of up to 2 weeks. An Extension Request Form is available from your Subject Administrator. Requests for extensions must normally be made 5 days prior to the official deadline date and must be supported by relevant documentary evidence.

Notification of Exceptional Circumstances (NEC) – This procedure forms part of the University's Academic Appeals regulations where if you believe your academic performance has been affected by circumstances beyond your control you can submit an NEC form for consideration. The deadline for submission of a NEC is within 5 working days of the submission deadline of the assessment you believe has been affected. The decision by an independent NEC panel as to whether your submission has been substantiated or not, based on the evidence you provide, is then forwarded to the Board of Examiners for consideration. You will only find out whether you have been successful with your submission after the Board of Examiners has met. Please use the following link to access all the information and relevant forms about the Academic Appeals procedures:

http://www.ntu.ac.uk/current_students/resources/student_handbook/appeals/index.html

Leave of Absence—If you are experiencing difficulties to a point that you feel may result in you having to take a break from your studies, then you need to firstly speak to your Programme Leader, prior to taking leave, about the intended dates for the leave of absence. Please note that requests for leave of absence are not granted retrospectively and each request is considered on a case-by-case basis.

If you have any problems with the module or the work, see your module tutor or the Module Leader (Simon Perkins) as soon as possible. They may be able to help, and the sooner a problem is identified, the easier it will be to sort out.

If you are ill or have other special circumstances that might affect your ability to meet an assignment deadline you may be entitled to an extension. Speak to your tutor as soon as you can—don't wait until the work is due.

To request a deadline extension you need to complete a 'Request for Extension' form or in exceptional cases a 'Special Situations' form that you submit with appropriate evidence, to the Programme Administrator ([Jan Binch](#)) for consideration by the Programme Leader (Simon Perkins).

See also your School handbook for further information and help. A copy of the School's 'Special Situations' policy is on the NOW. If you have any queries, see the Programme Administrator.

The School is aware that there may be times when you could experience difficulty in completing your work due to circumstances outside of your control which will affect your ability to learn during a module or to demonstrate what you have learnt in assessment. There may be situations where the deadline for a module assessment will not be met, or when assignments require an extension, or when a whole year or level cannot be completed, again all due to circumstances outside of your control. The School provides three procedures (claims) that you can follow when this happens:

- Extension request;
- Special Situations;
- Leave of Absence.

There are forms for each of these claims which you can obtain from your Subject Administration Office from the Multimedia Programme Administrator ([Jan Binch](#)).

These procedures form part of the School's Quality Assurance and overall the responsibility lies with the School Academic Standards and Quality Management Committee (SASQC).

Appendix 1

During this module you will develop a body of work, which reflects individual interests and demonstrates professional potential. You will research into the content and background of self initiated topics, including relevant technologies and theory.

You will achieve further independence and employability through effective time management, setting of personal goals and the consolidation of professional/interpersonal skills developed through the project brief.

The opportunities of the module are deliberately very wide ranging.

The structure of the research project module has two parts:

(Term 1) Research Document

(Term 2&3) Practice-Led Research

Research Document (Term 1)

A written research document of between 3000 and 4000 words to be handed in at the start of term 2.

The form of the document follows a generalised thesis structure, where the document aims to

communicate key aspects of your research enquiry. The document should be an elaboration of your proposal i.e. an elaboration on your topic described in your 'RP_Topic_Submission_Form'.

Your research document should include the following sections:

Title page
Abstract
Table of contents
List of Tables*
List of Illustrations*
Statement of original authorship
Acknowledgments
Introduction
Background to the research
Research Question
Survey of literature & works
Research Methodology
Description of proposed practice
Discussion
Conclusion
Bibliography and list of works
Appendices

*Note only include if cited within the body of the text.

Your 'Title page' should include the title of your research and your name as its author.

Your 'Abstract' should provide a concise description of your research in its entirety. It should include a concise list of keywords.

Your 'Table of contents' should list all sections with their respective page numbers. For details of how to automate this process in MS Word refer to:

<http://office.microsoft.com/training/training.aspx?AssetID=RC011356771033>

Your 'List of Tables' and 'List of Illustrations' (if these are relevant to your research document) should list all the tables of data used in your document. For details of how to automate this process in MS Word refer to:

<http://office.microsoft.com/en-gb/word/HP051892971033.aspx?pid=CH063563741033>

Your 'Statement of original authorship' should include a brief statement explaining that you are the primary author of your research document and that all sources have been appropriately referenced (and included in your bibliography).

Your 'Acknowledgments' should briefly acknowledge the guidance and support you have received in producing your research document.

Your 'Introduction' should introduce your research document through identifying its key issues and your approach to your research enquiry.

Your 'Background to the research' should provide the context of your enquiry as well as the rationale for its contemporary relevance.

Your 'Research Question' should be expressed very succinctly and should aim to encapsulate the objectives of your research enquiry. Note that your discussion should consistently refer back to this question.

Your 'Survey of literature & works' should be constructed as a list of review summaries. The summaries should be loosely interconnected so that they collectively describe the context of your enquiry and field of practice. Note that your survey should include a range of articles/works i.e. selected from multiple sources.

Your 'Research Methodology' should identify your research methods and provide a rationale for their selection.

Your 'Description of proposed practice' should outline your intentions for the 'Practice-Led' component of your enquiry. It should include a general description of the design practice that you plan to carry out. Note that this section should operate as a 'sketch' for understanding your plans not as a contract for carrying them out.

Your 'Discussion' should take the form of a logical argument that specifically relates your 'Research Question' to your research enquiry. It should justify its claims through evidence provided in your 'Survey of literature & works' that is further supported through your 'Research Methodology' and your 'Description of proposed practice'. The discussion should represent the substantial part of your research document.

Your 'Conclusion' should tie together and summarise the key issues described by your research enquiry i.e. it should 'book-end' your research document.

Your 'Bibliography and list of works' should list all references that you have cited in your research document. These should be listed according the Harvard Referencing System. Note do not include references that you have not referred to in your document (but may have reviewed in the course of your investigation).

Your 'Appendices' should include any relevant supporting documentation that you have generated as part of development of your research document. Note that the word-count of your appendices is not counted as part of the 3000-4000 word limit.

The document should be formatted according to the following:

top, bottom and right margins 2.54cm;

left margin 3.81cm;

all page (except for the Title page) should be numbered;

use a Serif typeface e.g. Times New Roman;

use a line spacing of 1.5;

use italics for emphasis (on first occurrence only);

a limited use of footnotes (essential ones only);

All sources of reference must be acknowledged in standard form. The Nottingham Trent University Library guide 'Citing References' gives good advice, particularly concerning the Harvard System (http://www.ntu.ac.uk/lr/document_uploads/66061.pdf)

Practice-Led Research (Term 2&3)

The 'Practice-Led Research' part after Christmas that is based on 'MA by Project' where the programme proposed is essentially practice centred. This should include a 'Reflective Analysis' of the work as a series of artefact analysis summaries.

Five or more artefacts must be produced, **it is the variety, originality, coherence and quality of ideas that is most important and not final polished product**. All of the artefacts must have strong reasoning and connection as to why they have been created and substantial quantities of material in the log/sketch book, journal etc. that documents their creation. Every two weeks when you see your research supervisor you will present a new artefact and a brief 300 word summary of its evaluation.

At the end of the 'Practice-Led Research' there will be a viva voce in the form of a presentation summarising your research enquiry. Your presentation should 'argue' a case for the substance and worth of your research enquiry. It should be supported through evidencing your artefacts and reflective practice. It should have a logical connection to your discussion outlined in your Research Document.

All of your work for this module should be submitted together on a DVD and should include:

Your Research Document;

all of your artefacts (all 5 copied to appropriately labelled sub-directories);

experiments and evaluations;

all log/sketch books;

digital reflective material (e.g. a copy of your online journal entries).