

**SEEDFEED: THE INTERACTIVE MARKETING AND DESIGN OF A
DIGITAL VIDEO ECOSYSTEM**

by

Joel Anthony Flynn
Master of Applied Science, Simon Fraser University, 2006
Bachelor of Commerce, University of British Columbia, 1996

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF BUSINESS ADMINISTRATION

In the Management of Technology Program
of the
Faculty
of
Business Administration

© Joel Anthony Flynn
SIMON FRASER UNIVERSITY
Fall 2010

All rights reserved. However, in accordance with the *Copyright Act of Canada*, this work may be reproduced, without authorization, under the conditions for *Fair Dealing*. Therefore, limited reproduction of this work for the purposes of private study, research, criticism, review and news reporting is likely to be in accordance with the law, particularly if cited appropriately.

Approval

Name: Joel Anthony Flynn

Degree: Master of Business Administration

Title of Project: SEEDFEED: THE INTERACTIVE MARKETING
AND DESIGN OF A DIGITAL VIDEO
ECOSYSTEM

Supervisory Committee:

Title and Name

Senior Supervisor

Correct Title – Consult your Program Assistant

Title and Name

Second Reader

Correct Title – Consult your Program Assistant

Date Approved:

Abstract

seedfeed[™] is an interdisciplinary work that explores the business and strategic use of emerging interaction design (IxD) methodologies for understanding the interactive production, use and value of archives of digital media – i.e. digital ecosystems. It attempts to apply non-traditional IxD methods to a developing prototype of digital, non-professional concert video content, a mix of Standard Definition and High Definition content captured with consumer-level equipment. Through the project's sponsor, Burnaby's Teradici Corporation and its PCoIP[™] remote video protocol, this archive of recorded live music events will be opened up as an interactive online ecosystem for use in an industry co-op program for digital video production. The project's goals are to investigate emerging IxD methods as ways to better understand the complex and interactive dynamics of digital ecosystems, particularly their sustainability and the role of disruptive innovations in evaluating PCoIP[™]'s market potential and marketing strategies for higher education and the entertainment industry.

Keywords: collaborative computing, computer-supported cooperative work, design management, strategic information systems planning, systems analysis, design theory, market segmentation, consumer behavior, digital ecosystem, interaction design, prototyping, co-op education, concert films

Executive Summary

PROBLEM: A marketing opportunity has emerged in the interaction of higher education and the entertainment industry through digital media and networked communications. Analysis of these overlapping domains reveals that digital video recording, editing, and distribution activities (and their related archives of digital media content) already play a significant role across academic institutions in the day-to-day processes of teaching, learning, and research. These creative activities imply different “jobs-to-be-done” than for students who are simply consuming digital video passively. These activities form part of a larger ecosystem of digital video consumption and production, use and re-use.

OPPORTUNITY: Video capture technologies and equipment continue to improve, even at the under-\$1000 consumer-level, and lead to better sources of digital video that need to be managed across hard drives and networks. Academic institutions are already challenged by the growth of digital video use by faculty and students across their IT infrastructures. As a result, an opportunity exists for needed approaches, processes, interfaces, and technology platforms in managing this growth of high-quality digital video content. Teradici’s remote video PColP™ technology plays a key role in the **seedfeed**™ digital ecosystem as a “building block” for addressing these opportunities.

MARKET: The market in higher education for digital video technologies – including the PColP™ remote video protocol – is not just for film students, or even more generally for multimedia students. High quality, non-professional, digital video recording gear and inexpensive editing applications are now accessible (if not already standard) across student communities around the world. Digital video already forms a significant part of entertainment consumption patterns of YouTube® generation students. However, the market potential for digital video use in research and learning activities must also be considered as a natural complement to these entertainment uses. Opportunities for applied post-secondary research and learning in entertainment contexts have already been identified and planned for as part of a Vancouver-based **seedfeed**™ prototype.

ABOUT THIS APPLIED PROJECT This document completes a part-time Management of Technology MBA degree at SFU’s Segal Graduate School of Business. While its language and content is often theoretical and academic, it aims to provide the Teradici Corporation with methods and insights into the market potential for PColP™ in higher education. It is informed by developments taking place in entertainment and new media sectors, which are already part of Teradici’s market space. However, this applied project does not present the conventional industry and competitive analyses of most MBA projects, nor does it offer traditional strategic recommendations for capitalizing on market opportunity through pricing or product differentiation models. Instead, the project developed a new method (S/E/E/D).

POST-TRADITIONAL APPROACH: The **seedfeed**™ project is a “post-traditional” interdisciplinary attempt at using emerging design disciplines and methods, such as interaction design (IxD), and expertise from the notable design firm IDEO in identifying a market opportunity and strategy for Teradici. Rather than only considering traditional views of markets and consumers, this approach is grounded in innovation theory, particularly relating to sustainability, disruption, and the interactive dynamics of users, producers, and other participants of **seedfeed**™’s digital video ecosystem. In its digital form, this document will also attempt to integrate key digital video examples from this ecosystem.

Dedication

To:

a bird on a wire,

a cat on a lap(top),

a mother in rainbows,

and an old man in fiddler's green...



Acknowledgements

It is important at this time to acknowledge Teradici's role in getting this applied work moving again, and especially thank Geoff Bruce, Sam Davision, and Dan Cordingley for their support at the company. Additionally, Professor Ian Hand at SFU needs to be acknowledged for arranging Dan's guest speaker session during one of our MBA classes, then reconnecting me with Teradici the following year, while providing feedback along the way. Without the company's support, and the remote capabilities and cost efficiencies their PCoIP™ technology offer as a new way of looking at old problems, the idea of an industry co-op program based on collaborative video editing projects would have been a non-starter at the university from the get go. Thanks to my student support staff and secret society of camera operators, who shall remain nameless (since I don't name names, except when I do). Thank you to Byron and Dave and others who helped out with the Commodore exploits, as well as Malcolm in the middle ground of promoting the bands I love to see in Vancouver and being okay with having cameras in the picture. Special thanks to Dawn, Heather, Brandon, and all the Brothers National for keeping me inspired musically with their work, for taking an interest in mine (or at least feigning interest!), and for being so ridiculously easy-going, laid back, and cool-tempered even when I'd show up last minute and unannounced to watch or film a show (guest lists and Heather's deadpan temper notwithstanding). Finally, thanks to the MITACS Accelerate internship program and my SFU Business readers/supervisors in Jan Kietzmann and Rick Colbourne, who diligently and necessarily pushed me and my sleep-deprived metaphorical mind through the various stages of this changing and challenging project (ya think?). Oh yeah, Geoff Brown of ACS deserves a HUGE thanks to close this out. If not for his musical sensibilities, the Grim Reimager may not have spared a few of my video projects that may have clogged an occasional lab computer from time to time.

Table of Contents

Approval	ii
Abstract	iii
Executive Summary	iv
Dedication.....	v
Acknowledgements	vi
Table of Contents	vii
List of Figures	ix
List of Tables	xi
1: INTRODUCTION & QUESTION.....	12
2: BACKGROUND & PROBLEM SPACE.....	16
2.1 The YouTube® generation	17
2.2 About Teradici	22
2.3 The IxD of digital ecosystems and live music archives.....	28
2.4 Technological Xroads: education meets entertainment.....	35
2.5 The Commodore Co-op: the original seedfeed™	37
2.6 Dealing with disruption.....	42
3: THEORY	43
3.1 Disruptive innovation.....	44
3.1.1 RPV Theory: Resources, processes, and values.....	47
3.1.2 Overshooting the market.....	47
3.1.3 Targeting “nonconsumers” and harnessing disruption.....	49
3.2 The role of user/consumer behaviour in IxD.....	52
3.2.1 Jobs-to-Be-Done theory and the motivation/ability framework.....	53
3.2.2 Sustainability of technology adoption	57
3.2.3 Interoperability and adoption.....	60
3.2.4 Flipping the adoption direction.....	63
3.2.5 The adoption reversal and its relevance.....	64
3.2.6 Technology adoption in education	67
3.3 Patterns of mediation and coordinated lenses	70
3.3.1 Perspectives and meditational models	71
3.3.2 Affordances and constraints	73
3.3.3 Coordinated lenses.....	75
3.4 The complex ecosystem of learning and design	78
3.4.1 Steps towards ecology and sustainability	80
3.4.2 Back down the ladder of complexity, into the digital world	84
3.4.3 Hierarchy of complexity versus levels of learning	87
4: METHOD	95
4.1 The S/E/E/D prescription: model to method	96
4.2 Interdisciplinary Techniques.....	98
4.3 Importance of prototyping activities.....	100
4.4 Unit of Analysis: User-centered, socially-situated activity	102
4.5 Operationalizing the methodology	105

5: APPLICATION & RESULTS.....	108
5.1 Define the event and its activities.....	110
5.2 Consider historical development.....	111
5.3 Ideate and select an initial set of tags.....	112
5.4 Find other frameworks and tags	112
5.5 Choose an event(s) that feature the activity	114
5.5.1 Under Construction	116
5.5.2 Visiting and Revisiting The Last Waltz.....	117
5.5.3 A study of contrasts	117
5.6 Select a mode and/or tools for representation	119
5.7 Analyse and represent!.....	122
5.7.1 FIRST ITERATION: HyperRESEARCH and <i>The Last Waltz</i>	123
Evaluation:.....	126
5.7.2 SECOND ITERATION: HyperRESEARCH and <i>Under Construction</i>	127
Evaluation:.....	130
5.7.3 THIRD ITERATION: Dedoose as late-breaking game changer	131
Evaluation:.....	135
6: CONCLUSION.....	138
6.1 STUDY: Creating a method by studying it... and vice versa.	139
6.2 EXPLORE: Using the method to find your bearings while exploring	141
6.3 EVALUATE: Re-evaluating lenses, coordinating a breakthrough.....	143
6.4 DESIGN: Marketing a digital video ecosystem with jobs-to-be-done	147
7: BIBLIOGRAPHY.....	157
APPENDIX 1: Moggridge’s IxD method explained.....	162
STUDY THE PROBLEM.....	162
Constraints	163
Synthesis	164
Framing	165
EXPLORE THE POSSIBILITIES	167
Ideation.....	167
Envisioning	168
Visualization.....	169
Prototyping.....	169
EVALUATE THE ALTERNATIVES	171
Uncertainty	173
Selection.....	174
Evaluation.....	175
DESIGN An Outcome:	176
APPENDIX 2: Chronological event listing.....	178
APPENDIX 3: The National - Under Construction.....	184
APPENDIX 4: Analyzing The Last Waltz.....	191

List of Figures

Figure 1 Fly fishing illustration from The Diaries of Roderick Haig-Brown	15
Figure 2 Do-It-Yourself (DIY) approach to digital video broadcast, using YouTube	21
Figure 3 PColP™ basic systems diagram	23
Figure 4 PC-over-IP technology's transparent USB bridging benefits	24
Figure 5 Teradici's PColP system applied to entertainment industry collaboration	26
Figure 6 Co-OPoIP digital ecosystem concept, MITACS presentation, June 2010	30
Figure 7 Fan-captured video from Leonard Cohen's Vancouver show (screenshot)	32
Figure 8 Apple's "digital ecosystem", photo from New York Times, December 5, 2009	34
Figure 9 U23D editing environment at Burbank's 3ality using Assimilate's SCRATCH	36
Figure 10 The Commodore Ballroom network of connected recording venues	39
Figure 11 Floor plan for proposed "Commodore Co-op" internship program, circa 2008	40
Figure 12 Upstream/Downstream perspective of Co-OPoIP digital ecosystem	41
Figure 13 Motivation/Ability Framework, from Seeing What's Next (2004, p. 289)	56
Figure 14 Technology adoption "mashup": Rogers (1962), Gladwell (2000), Moore (2002)	58
Figure 15 Liddle's adoption model vs. Horowitz' reverse model	59
Figure 16 A coordination of Liddle and Horowitz's models, expanded and altered.	65
Figure 17 Vygotsky's mediational model and basic activity system	73
Figure 18 Framework for coordinating theoretical lenses around remix culture	76
Figure 19 Moggridge's IxD methodology in Designing Interactions (2007)	79
Figure 20 Hierarchy of complexity (Moggridge 2007, p. 652)	82
Figure 21 Christensen's RPV theory integrated with meditational frameworks	85
Figure 22 Refining Moggridge's hierarchy of complexity	89
Figure 23 Coordinating IxD and the "hierarchy of complexity" with three-level systems	91
Figure 24 Moggridge's IxD methodology, with Study/Explore/Evaluate categories added	93
Figure 25 Two activity systems with partially shared object as a minimum unit of analysis	103
Figure 26 Avant-garde silent film Man with a Movie Camera (1929) as activity systems	105
Figure 27 Leonard Cohen, December 2010, Vancouver BC, three-song encore	114
Figure 28 HyperRESEARCH's video analytics tool, showing two events to be compared	119
Figure 29 Free web-based "tag cloud" mapping sample from TagCrowd.com	120
Figure 30 Screenshots from the Atlas.ti qualitative analysis tool	121
Figure 31 Dedoose logo and project interface	122
Figure 32 HyperRESEARCH video interface screenshot, code list, and annotation box.	125
Figure 33 HyperRESEARCH trial version interface text-based data analysis	128
Figure 34 HyperRESEARCH mapping tool (left), and image placement feature (right)	129
Figure 35 Dedoose cloud-based mixed-data analysis application, demo project	132

Figure 36 Dedoose text-based tagging interface featuring Revisiting the Last Waltz	133
Figure 37 Dedoose “descriptor” sets featuring seedfeed™ project chronology	135
Figure 38 Getting one’s bearings after radically reframing a design process	142
Figure 39 Reframing coordinated lenses in the Vygotsky Positioning System (VPS)	146
Figure 40 Potential partners for a current seedfeed™ digital ecosystem	148
Figure 41 Elements of “EXPLORE”: ideation, envisioning, visualization, prototyping	167
Figure 42 Elements of “EVALUATE”: uncertainty, selection, evaluation	172
Figure 43 Screenshots from The National - Under Construction at the Commodore	189
Figure 44 Poster and screenshots from Martin Scorsese’s “The Last Waltz” (1978).	192

List of Tables

Table 1 Sample matrix-style representation of tags	107
Table 2: Key 2007 events for SEED analysis	179
Table 3: Key 2008 events for analysis	179
Table 4: Key 2010 events for analysis, with [tags] column added	181
Table 5: Key 2010 events for analysis, with <link> column added for online media	181

1: INTRODUCTION & QUESTION

I still don't know why I fish or why other men fish, except that we like it and it makes us think and feel.¹

The aim of the **seedfeed**™ project is to use an extensive archive of concert-related digital video as part of a prototype for an online student-driven learning environment and remote video collaboration space. The technological challenge for the project – or opportunity, as the case may be – is in applying Teradici's PCoIP™ remote video protocol as a potentially disruptive innovation to the way that archives of video content are currently managed (to varying degrees of success). While this research is based largely on theoretical and methodological aspects of digital media, there is potential for Teradici's technological innovation in “radically reframing”² the way things get done, not just in the world on concerts and live entertainment, but also in educational settings. Foreshadowing later innovations in this project, radical reframing will help identify new opportunities for marketing PCoIP™ in these educational settings. Since **seedfeed**™ is based on the idea of developing and using networked archives of digital video and other media, questions need to be asked as to how digital media objects are currently managed, and how they might be managed in the future with technologies such as PCoIP™. Such questions include:

IxD as Business Strategy: *“How can interaction design methods be used to create a business case for Teradici's PCoIP as a disruptive innovation in higher education, specifically, through the development of sustainable digital video ecosystems for high tech learning?”*

¹ Roderick Haig-Brown, *A river never sleeps* (New York NY: Skyhorse Pub., 2010).

² John Seely Brown, “User-centered design,” in *New thinking in design: conversations on theory and practice*, by C. Thomas Mitchell (New York: J. Wiley, 1996), 104.

From such questions, a research problem emerges relating to the “jobs-to-done”³ in the design of digital ecosystems. In design disciplines, and in reference to Donald Schön’s concept of “the reflective practitioner,”⁴ the kind of questioning which has led to the research problem can be seen as a metaphorical “conversation” with the problem in order to understand it better. The idea is to allow the problem to reveal its dimensions naturally, rather than forcing an external solution onto it. This brings in complex topics relating to adaptive, self-producing, autopoietic systems and levels of cognitions⁵ that I’ve applied in previous graduate work on cultural systems and digitization.⁶ In this project, while I’ve somehow managed to sidestep the topic of autopoiesis directly, complexity still runs through it, and is even fundamental to the interaction design (IxD) method that will be applied in later sections.

Because of this underlying complexity, several metaphors will be drawn from order to discuss ecological perspectives of dynamic systems of digital media. Metaphor, with its special role in cultural systems and design, underpins much of my applied research and practice, past and present. To this end, I may at times even invoke the unusual metaphor of *fly fishing* in order to communicate my role in creating the concert video objects that comprise the robust archive of digital media data intended for future use and analysis. As part of an upcoming prototype for testing Teradici’s PColP™ platform with digital video content, I’ve had to reflect extensively on how this archive came about through my own research, design and art practices, but also on its role in shaping current applied research in innovation and technology management.

³ Clayton Christensen, “Foreword: Reflections on disruption,” in *The innovator's guide to growth: putting disruptive innovation to work*, by Scott Anthony et al. (Boston Mass.: Harvard Business Press, 2008), 1-8.

⁴ Donald A. Schön, *The Reflective Practitioner: how professionals think in action* (New York: Basic Books, 1983), 78-79.

⁵ Humberto R. Maturana and Francisco J. Varela, *Autopoiesis and cognition: the realization of the living* (Dordrecht, Holland; Boston: D. Reidel Publishing, 1980).

⁶ Joel, A. Flynn, “Travels in Intertextuality: the autopoietic identity of remix culture” (Project, Surrey, British Columbia, Canada: Simon Fraser University, 2006), <http://www.siat.sfu.ca/grad/theses/jflynn/>.

Indeed, the fishing metaphor was well-established in my previous thesis project⁷, and even became an organizing perspective in an earlier version of this MBA project. It has become a perspective that is so natural to me – a *second nature* that is completely in keeping with the idea of a digital *ecosystem* – that I sometimes forget when I’m using it, let alone going overboard with it. While many of these references have since be removed, one in particular still remains: adding contextual “tags” to pools of data for analysis, specifically, by invoking the activity of tagging “fish” in a process of catch and release, then cast and reel again. Interestingly, as this project neared its conclusion, my instinct to use the term “tags”, versus the traditional academic research term of “codes”, would payoff in a slight but satisfactory way, specifically, its use in a qualitative research tool that now presents a real opportunity for **seedfeed**™ and PCoIP™

Similarly, this MBA project builds on my previous thesis project, and to some degree is an extension of it. The work reflects my background in areas of education, business, entertainment, and technology, which will be all be touched on throughout. In doing so, and especially given the evolving **seedfeed**™ digital media archive and prototype I’m building for Teradici, this work necessarily draws from my creative pursuits in film, music, and dare I say, writing. The approach has allowed me to see some overlapping concerns emerging from the rapid growth of digital video, both inside and outside the classroom, as well as, metaphorically, spotting opportunities to cast a line.

In this regard, there is a significant opportunity here for the Burnaby, BC-based Teradici Corporation, specifically, an opportunity to redefine how digital video is approached and managed in higher education with its PCoIP™ remote video protocol. By framing this research and design problem as also being a potential marketing opportunity and example of applied innovation strategy, I’ll point to an object of study that lies at the confluence of two dynamic *ecosystems* of digital media: higher education and the entertainment industry.

⁷ Ibid.

Where these two rivers meet – and “if a fisherman has eyes to see”⁸ – you’ll notice the ongoing, innovative, back and forth of sustainability and disruption.



Figure 1 Fly fishing illustration from The Diaries of Roderick Haig-Brown⁹

Fishing illustrations by Richard Bunse, 1992

⁸ Roderick Haig-Brown, Robert Nichol, and Peter Jones, *Fisherman's fall*, 1967, [http://www.nfb.ca/trouverunfilm/fichefilm.php?id=11398&v=h&lg=en&exp=.](http://www.nfb.ca/trouverunfilm/fichefilm.php?id=11398&v=h&lg=en&exp=)

⁹ Roderick Haig-Brown and Beaverdam Press., *Excerpts from the diaries of Roderick Haig-Brown, 1927-1929 & 1932-1933* (Salem Or.: Beaverdam Press, 1992).

2: BACKGROUND & PROBLEM SPACE

The **seedfeed**™ project and its upcoming prototype are based on the realization that student audiences in colleges and universities have both the interest and need for developing digital video authoring skills, not only for their own education, but for their own entertainment as well. Since both learning and entertainment are socially situated activities, these digital media skills are in effect becoming the social skills needed for increasingly mediated technology environments. When working on projects for building these technology and media skills, it's as much about educating and entertaining others as it is with keeping oneself engaged in the learning activity. This overlapping area of interest represents an unprecedented opportunity for innovation in higher education, as well as for the entertainment industry.

The opportunity currently exists for identifying and developing innovative and effective approaches for integrating and managing technology demands into curriculum design. This rather action-packed statement needs to address the skills that will be in demand for using these new and emerging technologies. This requires looking at what people are already doing in the world, and how what they're doing can be transformed into *learning-by-doing*.¹⁰ Often, as my experience in the classroom can attest, students are looking to be entertained, and if the entertainment is not coming from the classroom, they'll have other means of getting this job done through laptops, cellphones, and smartphones.

On the one hand this is a problem for the instructor, but it's also an opportunity to explore the problem space where education and entertainment overlap, particularly, through the mediating role of technology. It requires evaluating approaches that can be beneficial for the human needs to learn and grow – to *think* and *feel* – and the related needs to both entertain and be entertained.

¹⁰ Mary Bateson, *Peripheral visions: learning along the way* (New York: HarperCollins Publishers, 1994), 152.

2.1 The YouTube® generation

As YouTube usage on campuses continues to increase¹¹, the weight of digital video content on school IT infrastructure has reached the point where alternative approaches must be explored in order to manage this rising network traffic. YouTube, as one of the largest examples of a social media website, is continually in the process of optimizing its servers of video content for streaming to end viewer/users (i.e. where content is simply being *viewed* by end users). For example, YouTube automatically adapts to a user's available bandwidth to provide the best resolution for the situation at hand, or, it can allow users to specify and lock in these display settings on their own. Yet there is a much bigger problem for school network administrators, one that goes beyond simply *viewing* online video content, but moves into *the creative side*.

Many students, who are also part of this YouTube generation, go beyond passive engagement with video content and are well adept at creating and uploading digital video content of their own, whether to YouTube or other similar social media sites. This kind of creative consumption and communication has reached the point where it has become a common language of sorts¹². There are students who can be considered more than just users, but as creators who are eager to produce digital video works of their own, or simply upload raw camera footage to their personal video web pages and cloud-based storage spaces. Increasingly, there are instructors who see these kinds of interests and abilities in students and tailor their curriculum and assignments to make use of this same in-house talent. This makes compelling pedagogical sense where appropriate, i.e. getting the most out of limited resources and student contact time by focusing attention to a well-produced video clip, rather than (or in addition to) a traditional paper deliverable. This kind of approach encourages team-based projects for video production, developing cutting edge

¹¹ Michael Zink et al., "Characteristics of YouTube network traffic at a campus network-Measurements, models, and implications," *Computer Networks* 53, no. 4 (2009): 501-514.

¹² Lawrence Lessig and Paul, D. Miller, "Know Your Digital Rights" (Panel discussion presented at the Vimeo Festival and Awards, New York, NY, October 8, 2010).

skills through engaging multimedia projects, and development of other non-traditional skills for academia and future job prospects.

However, recent changes to YouTube policies have significantly increased the file size limits of uncompressed movie clips that can be uploaded to the company's (Google's) servers for compression.¹³ These file sizes are significantly larger than they've ever been, especially in now offering the ability to upload files of up to 20 GB in size. Furthermore, if considering scenarios where students are required in their courses to create multimedia works for class projects – or in simply *wanting* to create more engaging content without being required to so – the bandwidth and storage space on campuses will need to adapt accordingly. By considering this increasing usage in either or both cases, and what is basically an unconstrained 20GB size limit, YouTube users therefore no longer need to be overly concerned with compression settings on their own end. They can now effectively upload a single high quality file to be compressed remotely. For students, the only constraint now is whether they can stay on a school computer long enough for the files to upload.

To put this in perspective, this 20GB in file size is *the same amount of storage space* as the computer lab hard drives on workstations while I was a new media design student at BCIT from 1999-2000, i.e. Macintosh G3 computers with 20 GBs hard drives (15GBs of which were available to the user). Having worked with digital video content consistently since then, and until recently only having to manage Standard Definition (SD) video across multiple networked computers, I shudder to think of what current students are doing with high the definition (HD) content that has become standard. I also wonder how a university's technology infrastructure is able (or unable) to handle this increase in video file sizes. For YouTube users, the 20GB size limit is more than enough to get high-definition quality video content by uploading for remote video compression processing. Alternately, the user could do the compression on his

¹³ YouTube LLC, "How to upload: Getting Started," Corporate website, *YouTube Help*, December 30, 2010, <http://www.google.com/support/youtube/bin/answer.py?hl=en&answer=57924>.

or her own and achieve as good of quality at a smaller file sizes before uploading. However, for the end user/creator, it may appear just as easy to upload the highest quality HD version and let YouTube's compressors do the rest. Even if it takes longer to do so, the amount of time student spend in campus computer labs may make this less of an issue. There will be a trade-off in compression time locally versus upload time to YouTube, but the idea of not having to experiment with getting the compression settings right may be enough for students on university computers to simply upload the larger file to YouTube. Again, the only constraint for the student now is finding a school computer they can stay on long enough, that is, if they aren't using their own laptop through the school's networks.

From my experience working in various computer labs while editing and producing instructional and research-related video projects, there were many instances where I'd wonder if the content I left on the machine(s) that night would still be there by the time I showed up the next day. While in most cases these video projects were backed up and could be put back together if needed, the processes involved recompiling video projects are tedious and time consuming enough that it was easier just to leave the files on a machine until that machined needed reimaging. By then, hopefully the project and its content would no longer be needed and could be erased. If it was needed, I usually had the raw footage and project sequences and resources in my archive of content to be able to put it back together (though I didn't necessarily have the time to do so, especially if the expected output was of marginal value).

As an instructor, I've assigned video projects to students and to groups of students where there was always at least one ambitious individual or team who'd push the limits of the network's resources (which, admittedly, I may also have done from time to time myself). I've also witnessed library camera equipment shift from tape-based SD media to hard-drive based HD media only to wonder how students are now managing the extremely large video files sitting on cameras that ultimately need to be returned to the library by a fixed

time. While it's possible to edit down much of the footage on the camera before moving it to a computer, in practice it's just as easy to put the entire clip on the computer first and then edit it down in size before backing up. In either case, significant "heavy" content has to be moved off of the camera and put somewhere (or else deleted outright). Asking where this content goes – in the short and long term - fundamentally raises the question of the *archive*.

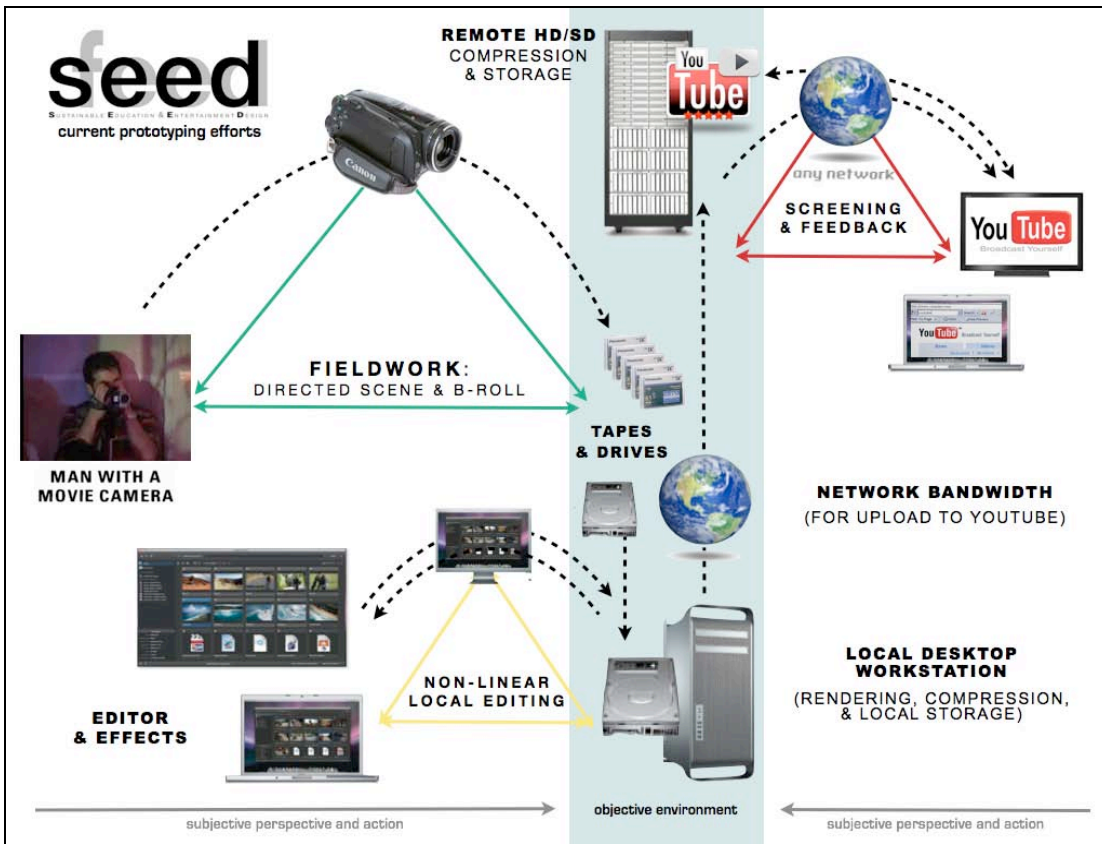
In the past, all that had to be done to archive video content at its most basic was to do was eject the tape and store it safely, while of course realizing that even the tape medium isn't permanent. In my case, this archivization even consisted of storing tapes in a shoeboxes until I had a chance to get back to the content. Again, reengaging the content was both a matter of available time and available hard drive space on my computer to handle the raw video. Even with improvements in lossless compression for video files and expanded hard drives, the source video taken from any HD camera can quickly fill up a hard drive on a home computer, or on workstations in school computer labs.

As school semesters move into later weeks and more and more video projects get underway, hard drive space on lab computers begins to shrink dramatically. Network administrators are left to warn student users that the lab machines can be reimaged and erased at any time, so if files weren't backed up at that point, it was the student's problem, not the school's. While students can purchase increasingly cheap hard drives to back up this content before the drives are reimaged, or sign out hard drives a short term basis, these external drives can and do fail badly. This actually happened very recently to me while in the process of backing up video content on a brand new drive I purchase for this very reason. In my case, while many of the files were recoverable, the time lost in trying to recover the files and put them back in place was not.

It can be argued that the resources required to properly manage digital video needs for today's students and faculty – even simply in terms of storage and bandwidth, let alone collaborations and other team-based work – are becoming

increasingly unsustainable. The diagram in Figure 2 depicts the current model, which can function adequately to a degree, but is prone to bottlenecks in set up time, especially when large files need to be moved around locally or remotely.

Figure 2 Do-It-Yourself (DIY) approach to digital video broadcast, using YouTube



Since colleges and universities must find ways to differentiate their programs from other schools in the competitive space of higher education, access to high tech equipment, cutting edge courses, and available space in school computer labs become areas of differentiation – if not competitive advantage. These technological resources and capabilities can motivate a student to commit to a particular school, stay enrolled at that school, or switch to a new school altogether. New approaches for the development and delivery of curriculum – including an increasing role for projects using online video – either become

important parts of institutional strategies for engaging and recruiting future students, or are recommended for addressing the coming “crisis” at college and university campuses.¹⁴ Even if these strategies are, cynically, only for institutions to present themselves as leaders and innovators in higher education, a school’s technological capability becomes as much of a sales pitch to recruit and retain students as it is a requirement for enabling students to maximize the value of their time in school. In this historically developing context, there will be significant problems in addressing and trying to overcome the growth of high definition video content storage and data transferred, whether archived locally on school servers, or, streamed across school networks in some way.

While this is a significant and growing problem, it also presents an opportunity for applied industry-sponsored learning to take place. Such a strategy will not only help academic institutions save time and costs, but can also help introduce students to industry best practices for managing the problematic issues of high definition video content. As well, it may even open up otherwise dormant archives of digital content to teams of networked users for collaborating on projects, perhaps even teams or remote mentors and students. The PCoIP™ remote video protocol offers just such a potential solution to these emerging issues and will be discussed next, along with some background on the company that created it.

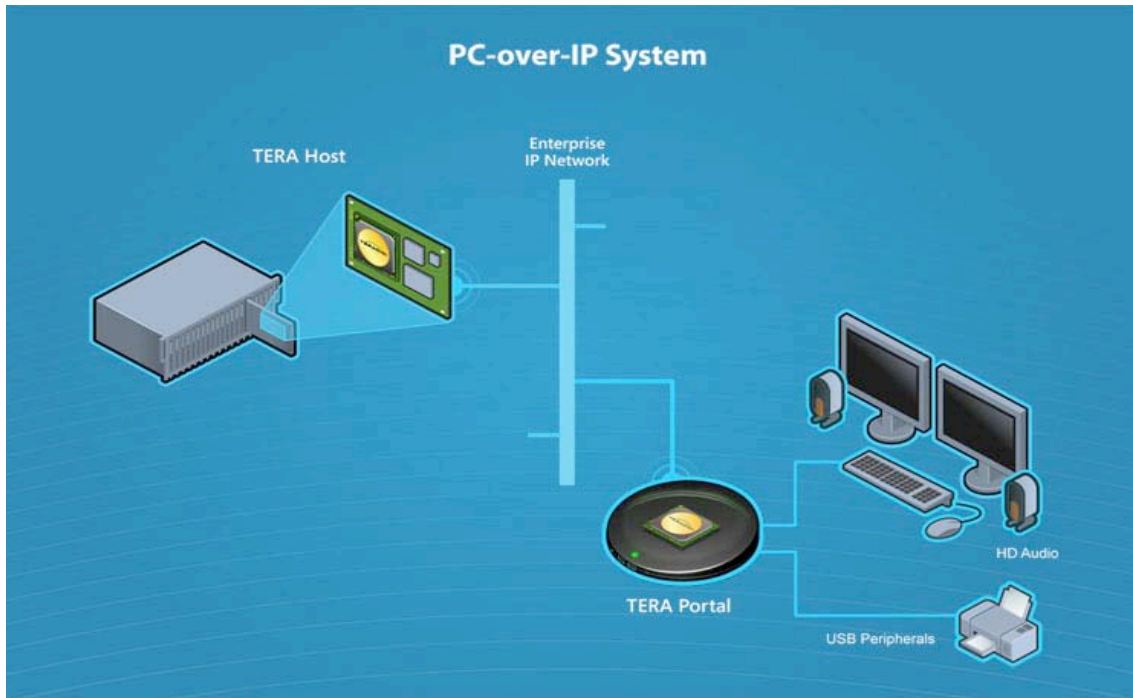
2.2 About Teradici

Teradici Corporation is a technology company located in Burnaby, British Columbia that was originally started in 2004 by Silicon Valley veterans Dan Cordingley, Ken Unger, Maher Fahmi. The founders went looking for “a really tough problem to solve - and hopefully one that was interesting enough start a new company around” while noticing that the desktop PC provided “fantastic

¹⁴ Mark Taylor, *Crisis on campus: a bold plan for reforming our colleges and universities*, 1st ed. (New York: Alfred A. Knopf, 2010).

user experience, with great graphics, video and multimedia.”¹⁵ However, from a larger networking perspective of interconnected devices, the Teradici founders saw the desktop PC as creating practical security issues that would consistently (and unnecessarily) require a great deal of resources to address.

Figure 3 PCoIP™ basic systems diagram



For Teradici, the answer was centralization (Figure 3). However, the problem was how to maintain the user experience that desktop PC users had come to expect, that is, how to create “a completely uncompromised user experience with the all of the benefits of complete centralization.”¹⁶ Their solution to this problem was to create a chip that made the IP network the interface between the user and the computer and would create a “true, uncompromised

¹⁵ Dan Cordingley, “About Teradici,” Corporate website, *PC-over-IP remote display technology: true zero client desktop virtualization*, December 30, 2010, <http://www.teradici.com/teradici/about-teradici.php>.

¹⁶ Ibid.

computing experience for the end-user”¹⁷, though delivered completely over a network. In this way the efficiency and security of having centralized control over software provisioning and data would still be possible, but the user would experience the desktop environment as though it were running the operating system and applications off of a local machine.

Figure 4 PC-over-IP technology’s transparent USB bridging benefits



The key difference in Teradici’s approach is that where other virtual machines create interfaces to remote data and applications that run “windows” within a desktop’s operating system, PC-over-IP runs everything remotely (Figure 4). The user is provided with a KVM (keyboard, video, mouse) setup that includes “integrated displays, desktop portals, and server plug-ins.”¹⁸ The interface is

¹⁷ Teradici Corporation, “PC-over-IP technology,” Corporate website, *PC-over-IP remote display technology: true zero client desktop virtualization*, December 31, 2010, <http://www.teradici.com/pcoip/pcoip-technology.php>.

¹⁸ Teradici Corporation, “PCoIP markets,” Corporate website, *PC-over-IP remote display technology: true zero client desktop virtualization*, 2009, <http://www.teradici.com/pcoip/pcoip-markets.php>.

centrally managed in a data center, but displayed over a Local Area Network or remotely over a Wide Area Network. However delivered, the system will provide what feels like a desktop environment including “high resolution, full frame rate 3D graphics and HD media, with full USB peripheral interoperability.”¹⁹ The user therefore isn’t constantly aware of being faced with the back and forth of moving between local and remote environments.

The advantages of this user experience from a design perspective is that the user is not put in a position of consciously or unconsciously comparing his or her mental models of the remote vs. local computing experience. For example, the user might associate a lag in mouse responsiveness to having to work remotely off a virtual machine, even if this lag is caused by a local plug-in issue rather than anything to do with the remote system. These kinds of gaps in mental models where the user makes assumptions about what is taking place “under the hood” are not uncommon in design²⁰. The key innovation for Teradici’s new conceptual model for virtualized computing, that is, the breakthrough that allowed the model to take effect, was the development of its PC-over-IP video protocol, or PCoIP™.

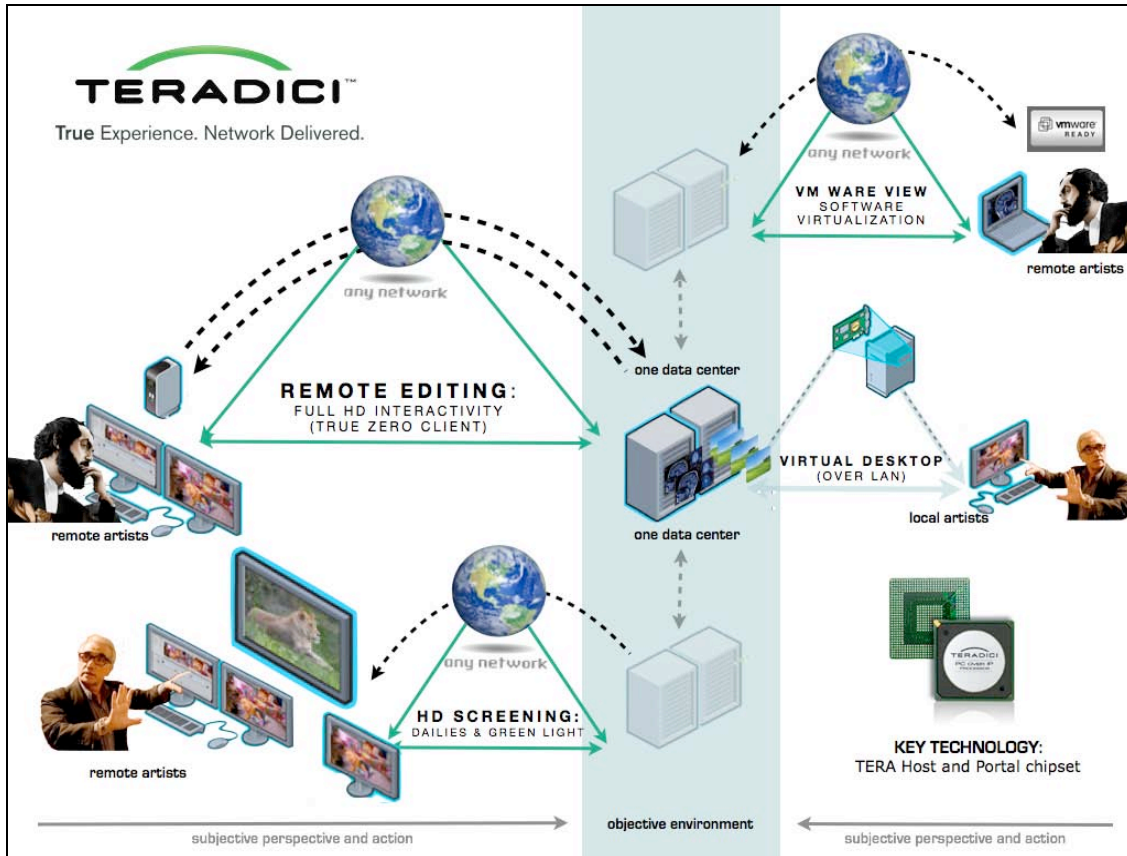
Working “under the hood” and outside the user’s point of view, PCoIP™ “compresses, encrypts and encodes the entire computing experience at the data center and transmits it 'pixels only' across a standard IP network to stateless PCoIP™-enabled desktop devices”²¹. To the user, the experience would seem as though data, files, the operating system, applications, and media were all being accessed from a local hard drive or even in a hybrid of local and remote systems. However, PCoIP™ allowed for *all* the computational operations to take place remotely, while the telling the local monitor what to display to the user (see Figure 5).

¹⁹ Teradici Corporation, “PC-over-IP technology.”

²⁰ Donald A. Norman, *The design of everyday things* (New York: Doubleday, 1990), 12-23.

²¹ Teradici Corporation, “PC-over-IP technology.”

Figure 5 Teradici's PCoIP system applied to entertainment industry collaboration



As advertised on the company's website²², Teradici's PCoIP™ technology is utilized in five key markets;

1. **Financial:** PCoIP™ enables secure multi-monitor computing that eliminates heat and noise in trading rooms, frees up space at the desk, enabling free seating to simplify grouping traders for collaboration based on dynamic market conditions. PCoIP™ keeps customer data secure, and simplifies regulatory compliance and business continuity.
2. **Design/manufacturing:** PCoIP™ protects large, valuable CAD data while also eliminating heat and noise, while freeing up desk space. It also allows

²² Teradici Corporation, "PCoIP markets."

design and manufacturing firms the ability to offload corporate networks by containing large dataset transfers exclusively within the data center.

3. **Government:** PColP™ secures sensitive information and valuable research and development data, and also provides user authentication and peripheral (USB) authorization management. Data can be consolidated in this way for cost effective and reliable use of computing and management resources.
4. **Healthcare:** PColP™ secures private patient data in the data center, and allows for flexible free “seating” capability for doctors, nurses, and patient use. Medical teams can therefore more easily get themselves to the patients instead of having to move patients around. PColP™ also maintains high resolution, lossless viewing capability for medical images that need to be coordinated within/ between hospitals. Healthcare professionals can therefore collaborate remotely on pre- and post-operative cases. They can also easily view echocardiograms, CT scans and other visual diagnostic studies, or connect with regional specialist centers. They can even provide international care in this way.
5. **Entertainment:** PColP™ allows large video and animation files to be kept in the server room and off the desktop, which frees up resources for more process-intensive rendering functions. Again, the system also enables free seating for creative collaboration, which is especially important in entertainment contexts. For film studios, PColP™ can protect against pre-release piracy by keeping the files secure in the data center, while the process of reviewing “dailies” can be done remotely in the native format of the video without arduous file uploads, compression, or expensive shipment of physical media. (see Figure 5)

A major benefit across all these markets is that PColP™ technology enables companies to consolidate all IT resources into a data center and eliminate the

need for desktop workstations²³. Of course, the questions that comes up, even though the concept sounds great in theory, relate to the practical concerns of transmitting data across networks in order to produce what Teradici calls “true experience”? That is, won’t the kind of high-definition video and multimedia that users now come to expect require significant bandwidth resources to transmit over an IP connection?

And perhaps more importantly than issue of bandwidth, how can this much data be securely transmitted in a way that users would still feel comfortable with the environment? Teradici’s answer is that it claims to offer more than just a “thin client” (to use cloud computing and virtual machine terms). Instead it offers a “zero client” user experience where *all* the computing is pushed to the server, but still feels like it’s taking place locally.

2.3 The IxD of digital ecosystems and live music archives

As can be seen with social media sites such as YouTube, and its main competitor in Vimeo, the easy integration of streaming video into social networking applications like Facebook has resulted in an increasing number of clips of from live concert performances posted to these sites for sharing. For the most part these are clips captured by audience members who are equipped with cameras that are increasingly getting better and better in terms of higher definition video capture and, to a lesser degree, built-in microphones that are more capable for adjusting for concert noise levels. The quality and availability of this digital media today would be impossible to consider as practical even ten years ago.

Watching a band play on stage in the year 2000, to consider the kind of digital ecosystem we see today – even if only in terms of live concert related media – was really a hypothetical “What If?” While pre-shutdown Napster provided bit of what “the cloud” might look like, the idea of an ecosystem of concert moments

²³ Teradici Corporation, “PC-over-IP technology.”

was still more “blue sky” than anything. In today’s contexts, however, these audience-perspectives become moments that are fairly easily recorded. The can then be archived for later access through a download or a stream, if not shared through “embed and spread” strategies in social networking sites or blog postings²⁴.

The quality of these clips has moved into in HD, with low cost tools such as Flip Video camcorders, or through the existing video recording functions of most consumer grade still cameras. Additionally, even through professional-level capabilities are now available in under-\$1000 cameras such as the Canon T2²⁵ series, many owners aren’t necessarily inclined to use the cameras as professionals would. More importantly, the behaviours of the audience *before* going into a live performance may have changed to the point of *not even bothering with a camera at all*. Related expectations also change for what happens *after* the event, such as a recorded version becoming available on the internet at some point.²⁶ These behaviours reveal at least some wider understanding of a digital ecosystem that surrounds the live concert experience. Whether or not the term “digital ecosystem” is at all familiar to the users/audience of the performance is beside the point.

With the **seedfeed**™ initiative, the intention is to innovate within this digital ecosystem by adopting these changing user behaviours and technological capabilities. By developing a prototype with Teradici’s PCoIP™ as a remote video platform, **seedfeed**™ will attempt to use a promising but as-yet-untested methodological framework from IDEO’s Bill Moggridge, (often referred to in this document as the “non-linear IxD methodology” for which Moggridge uses a

²⁴ Scott Kirsner, *Fans, friends and followers*, 1st ed. ([Cambridge Mass.]: Scott Kirsner, 2009).

²⁵ Clinton Stark, “Best of 2010: Canon EOS Rebel T2i DSLR camera,” Online magazine, *Stark Insider*, December 29, 2010, <http://www.starkinsider.com/2010/12/best-of-2010-canon-eos-rebelt2i-dslr-camera.html>.

²⁶ Edward Schieffelin, “Problematizing Performance,” in *Ritual, performance, media*, ed. Felicia Hughes-Freeland by Association of Social Anthropologists of the Commonwealth. (London; New York: Routledge, 1998), 199-212.

pinball table metaphor to describe its dynamics.²⁷ The related tools and methods that have developed from this framework though modifications, extensions, and other kinds of “tinkering”²⁸ are part of an emerging field of *interaction design*, or “IxD”. I have been involved officially in this field as a graduate researcher, as an artist and practitioner, and eventually as a faculty lecturer instructor with Simon Fraser University since 2002. Unofficially, my involvement in IxD goes back even earlier to when interaction design was just a part of new media and information technology disciplines while I was a student at BCIT and working on applied new media projects that were designed to work as digital media ecosystems.

Figure 6 Co-OPoIP digital ecosystem concept, MITACS presentation, June 2010



Years later, by the time this MBA project had officially started, a digital ecosystem was emerging from this work that could be seen in Figure 6 which is still heavily situated in higher education and technology contexts. At one time it was known under a PCoIP-inspired working title called “Co-OPoIP” and

²⁷ Bill Moggridge, “People and Prototypes,” in *Designing interactions* (Cambridge Mass.: MIT Press, 2007), 650, http://www.designinginteractions.com/downloads/DesigningInteractions_10.pdf.

²⁸ Steve Hargadon, “John Seely Brown on Web 2.0 and the Culture of Learning,” *K-12 Educational Technology: Web 2.0, Educational Social Networking, Free and Open Source Software, and the Future of Education*, January 20, 2007, <http://www.stevhargadon.com/2007/01/john-seely-brown-on-web-20-and-culture.html>.

signalled a significant archive of digital video recordings of live music performances that were produced during the course of this MBA project, i.e. from 2007-2010. The results of these recent digital video practices also follow previous digital video work from 2000-2007. Much of this content was recorded, if not produced, while I was a student and part of networks of other students. The content also features “indie” artists that should appeal to the same college demographic that **seedfeed™** will target for applied industry co-op initiatives that are capable of taking place remotely through PCoIP™.

The IxD method that has been refined and redeveloped over the course of this study is intended for use in analysing these archives of digital content. By creating a workable prototype from the archives, the methods and models that emerge can be applied to other digital video archives where similar co-op and industry internship work can be performed. In the digital and marketing context of **seedfeed™**, new works can be created, new skills and techniques learned, and awareness then generated for what is – in a digital sense – flowing *out* of a particular music venue or event where a live performance is taking place, not just what’s going on inside and onstage. These “flows” or “streams” of media are not exclusive to music related events and the archives that are produced from them. Professional sports teams and leagues have vast archives of content related to their “product”, whether it is on-field, on-ice, on-court, or, residing on a server. News organizations and nationally-funded resources like Canada’s National Film Board similarly have deep pools of content to draw upon and could also be used in similar education-directed ways that and generate additional value to their current uses.

Furthermore, these archives could themselves be pooled to create value not only from their own collections, but *between* collections of digital content. For a practical example, I recently was able to capture some of Leonard Cohen’s recent performance in Vancouver (December 2nd, 2010) and quickly edited together a short 3-song clip of the show’s encore (see Figure 7)

Figure 7 Fan-captured video from Leonard Cohen's Vancouver show (screenshot)

Click for video,
password = "fishing"



This 20-minute viewing experience is fine on its own terms, but while making it, I couldn't help but think about the kinds of 30-minute versions that could be made by adding a few contextual video outtakes from past documentaries on the legendary poet and singer. Alternately, maybe some sound bites from radio interviews, set to photos he's taken himself while on the road, or clips from old news programs on the CBC, etc. could have been added. Whether creating this short work was for my own viewing and listening pleasure, or was made as a gift to a family member who's also a Cohen fan, or was produced for an assignment in a course on new media authoring techniques where the deliverable was to create a 30-minute profile of a Canadian cultural figure, the point is that many different applied uses can take place by using the same *building blocks* from available archives. In simply reframing the purpose for this *in situ* concert footage, there would seem to be numerous possibilities in these cultural collections of digital media for someone with the motivation to *cultivate* value by creatively arranging and re-arranging (i.e. remixing) the building blocks.

Consider cultural theorist Raymond Williams' notion of how television's "flows" of information create more than just a technological ability to "continually stream words and images to a receiver, without pause or interruption, fostering an experience"²⁹. His very relevant description also suggests a flow "that is like an electronic river of sorts" which has emerged not from nature, but rather from a "mediatized marketplace"³⁰. Williams uses the metaphor of a river to describe this media phenomenon, but may as well be speaking of clouds and computing. Either way, the overriding metaphor is that of a digital *ecosystem*³¹ where again, value can be cultivated.

As such, the **seedfeed**™ initiative presents a potentially valuable tool for investigating digital ecosystems, which has become an area of research and policy development that is still in its infancy, but gaining strength in academia, business, and popular culture. The primary organization for digital ecosystem research is OPAALS, or Open Philosophies for Associative Autopoietic Digital Ecosystems.³² This group is not only trying to build a sustainable research community, but is also developing the theoretical foundation needed for research in this domain. On this theoretical end, OPAALS looks to address difficult concepts such as complex adaptive systems, cybernetics, and autopoiesis in creating a deep and interdisciplinary body of knowledge, which will be address in a limited way in later theoretical discussions of this project (see section 3.4). Using the perspective of digital ecosystems helps show how the implementation of information communication technology (ICT) can take on more holistic and systemic perspectives.

²⁹ Raymond Williams, *Television : technology and cultural form* (Hanover, NH: Wesleyan University Press ; University Press of New England, 1992).

³⁰ Stephen Kline, *Digital play : the interaction of technology, culture, and marketing* (Montréal ; London: McGill-Queen's University Press, 2003), 48.

³¹ Jenna Wortham, "App Store Is a Game Changer for Apple and Cellphone Industry," *The New York Times*, December 5, 2009, sec. Technology, http://www.nytimes.com/2009/12/06/technology/06apps.html?_r=2&pagewanted=1&partner=rss&emc=rss.

³² "OPAALS Website - Our Research," n.d., <http://www.opaals.org/research.php>.

Part of the mandate of this research group has been at the very least to look at the practical implications of digital ecosystems with respect to innovation in small-to-medium sized companies (SMEs). OPAALS then seeks to expand this perspective to larger business organizations and economic developments. In fact, the group's previous domain was named "Digital Business Ecosystems"³³, though it has since been shortened to widen its scope and relevance. When even the Commissioner of the National Basketball Association employs the term,³⁴ it's likely the concept has gained some traction beyond academic and high tech circles (Figure 8).

Figure 8 Apple's "digital ecosystem", photo from New York Times, December 5, 2009



³³ P. Dini et al., "Beyond interoperability to digital ecosystems: regional innovation and socio-economic development led by SMEs," *International Journal of Technological Learning, Innovation and Development* 1, no. 3 (2008): 416.

³⁴ Bill Simmons, "Not so Stern after all," *ESPN The Magazine*, February 27, 2006, <http://sports.espn.go.com/espn/page2/story?page=simmons/060216>.

2.4 Technological Xroads: education meets entertainment

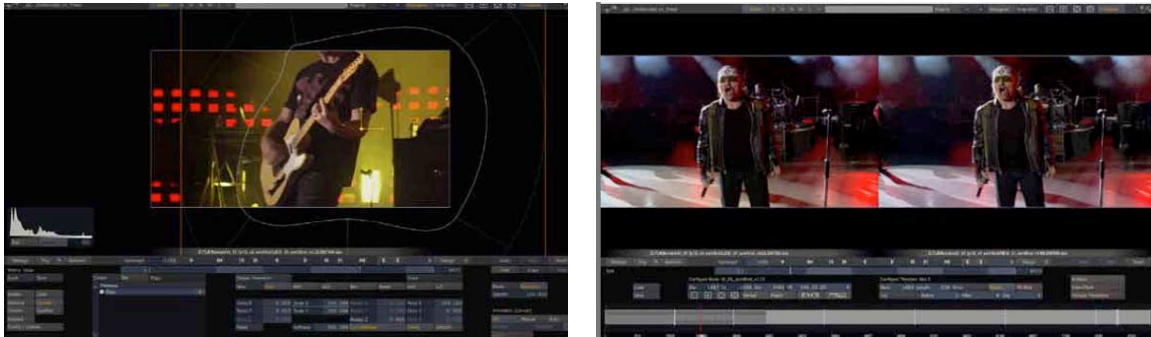
For **seedfeed**™ and for Teradici and its PCoIP™ technology, the role of digital ecosystem in framing the problem space for this project requires looking at the crossover between the digital ecosystem of higher education – currently and in the future – and a similar digital ecosystem for the entertainment industry. The applied side of this project in this respect is in using the **seedfeed**™ prototype as a way to conceptualize (if not put into practice) a co-op initiative where students can gain the kind of practical experience that is traditionally unavailable in lecture halls, specifically, from working “in the field” and in remote collaborations on video projects that originate from live music performance settings.

The video content captured at live music performances and developed through the **seedfeed**™ co-op program needs to be looked at in similar terms. That is, the content should be considered in terms of how it fits with similar digital ecosystems such as with YouTube’s role in higher education on one end, to the more traditional archives of academic materials in library reserves on the other end. For Teradici, not only can the **seedfeed**™ prototype be used to showcase the company’s PCoIP™ technology, but it also provides the ability to test out new features and implementations in higher education as well as in entertainment contexts. If successful as a distributed video collaboration environment based on PCoIP™, the **seedfeed**™ digital ecosystem could be used as a prototyping platform for other technology companies and their innovations whether in higher education, entertainment, or elsewhere.

For example, **seedfeed**™ could provide a valuable and ongoing beta testing venue for potential new features of future software releases such as Apple’s Final Cut video editing platform. Or it might be valuable for testing new audio and video recording hardware developments that are already beginning to play a role in the entertainment industry, specifically, 3D video recording and broadcast. For example, after I was able to see director Catherine Owens’

successful feature film *U23D*³⁵ in early 2008, while at the same time word was spreading of potential 3D televisions and 3D live sports broadcasts (which are now available on cable and pay-per-view television), part of my original vision for **seedfeed**™ included consideration for whether this kind of innovative and experimental content would actually be suitable and feasible for co-op learning initiatives.³⁶

Figure 9 *U23D* editing environment at Burbank's 3ality using Assimilate's SCRATCH



On the outset, the idea of students producing high-end 3D video content seems unlikely, compounded by the ongoing discussion of whether 3D technology is on its way back from a 1950s golden era, or just a recent technological “gimmick”. Furthermore the expected costs for acquiring 3D equipment and the costs of hosting twice as much data need to be considered and are potentially out of reach of budget-strapped colleges and universities, since stereoscopic video is produced using two versions of the same recorded camera angle (i.e. twice as much high definition footage).³⁷

However, in terms of the volume of content needed to fill up the airtimes of 3D specialty cable channels that have recently launched, there is an argument for concert films to fill this void. Capturing a concert in 3D requires no script or

³⁵ Nick Dawson, “The Director Interviews: Catherine Owens, *U23D*,” *Filmmaker Magazine*, January 23, 2008, <http://filmmakermagazine.com/directorinterviews/2008/01/catherine-owens-u2-3d.html>.

³⁶ Dixon, “Indie goes 3-D.”

³⁷ digitalmedia.net, “3ality Uses SCRATCH for Stereoscopic 3D Digital Workflow.”

special effects, just a switch in the digital ecosystem from 2D cameras to 3D equipment,³⁸ much like the switch from Standard Definition (SD) to High Definition (HD). Furthermore, editing of 3D content is technically still done in 2D editing environments for the most part. So the processes involved in creating a co-op program for 2D concert recording and production are essentially the same for a 3D version (Figure 9). Only some of the resources change. Whether such changes are feasible using PCoIP™ as a backbone of for a **seedfeed™** prototype, or beyond, the idea will at least be opened up for discussion even if it only acts as away to brainstorm around future design possibilities.

2.5 The Commodore Co-op: the original seedfeed™

The original initiative that motivated **seedfeed™** emerged from my own practice in developing a digital ecosystem of concert video artifacts from 2000 to 2007, and doing so while teaching at the same time. It was based on a vision for future learning environments that are better suited and more responsive to the kinds of digital media authoring skills, if not marketing skills, students would be expected to acquire in their post-secondary education, if not as part of being part of the general student experience of the YouTube® generation. As a result of gaining extensive experience in designing and delivering curriculum for these media and technology-inclined students while teaching design thinking and interaction design courses, I was able to spot systematic problems in these overlapping contexts.

Teaching any kind of cutting edge content is automatically challenging, if only on the notion that if the skills are cutting edge in the industry, it's the industry professionals who will have these skills, not teaching professionals. The filter of the classroom can be seen as cutting off the edge, rather than providing cutting edge learning. While understanding this premise, as a teacher (i.e. "those who can do... etc."), I could only approach my own skills from a non-professional perspective. Obviously less valuable than an industry professional's

³⁸ Dawson, "The Director Interviews: Catherine Ownes, U23D."

perspective, if the goal is direct industry knowledge, the only additional value I could provide would be in reframing these two points of view - the professional side and the educational side – as the space where innovation happens.

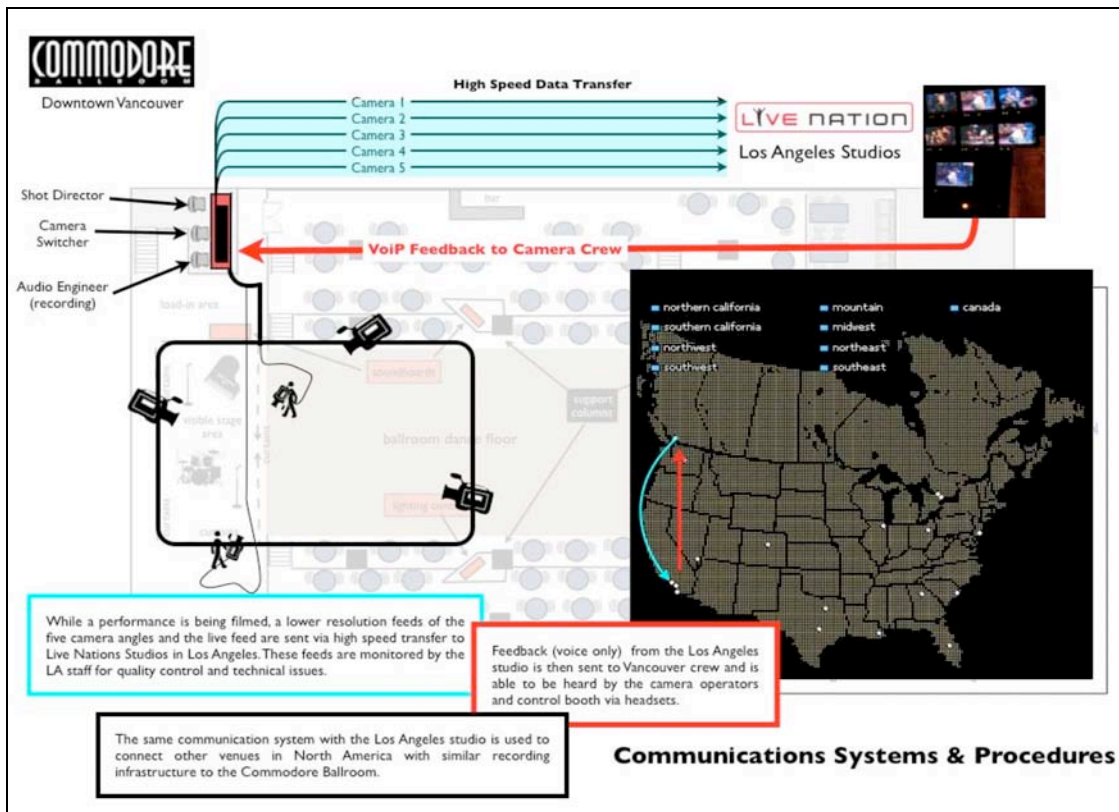
There are challenges when dealing with multiple perspectives, i.e. interdisciplinary study. They can sometimes be at odds, not just for the instructor trying to teach them, but also for students eager to become professionals but are clearly still students. There are few if any “best practices” when working between established fields, and this resulted in much trial-and-error success and failure early on in the process, i.e. where learning happens by reacting to a problem as given.³⁹ However, constant reframing that took place from being in interdisciplinary positions in learning and entertainment paid off in being able to spot ways to change overall learning *contexts*. The classic way of looking at this reframing, which is effectively the rationale for a co-op program, is the idea of taking learning out of the classroom on and into the “real world.”

With this perspective, new opportunities could be created for more engaging learning environments better suited for the kinds of content and learning activities required by high tech and mediated work environments. Of course, these environments would need to take full advantage of the interactive capabilities that make them interesting to begin with, and would need to put learning contexts in closer proximity to professionals who can mentor the development of students in the field. They’d also need to take advantage of digitized media and networked infrastructures.

For example, what if a networked video capture environment, like Live Nation’s recording infrastructure that connects the Commodore Ballroom to North American venues (Figure 10, below), could be reframed from a space to be entertained into a space for learning as well (with entertainment as an enjoyable secondary benefit)?

³⁹ Gregory Bateson, *Steps to an ecology of mind* (New York: Ballantine Books, 1973), 287.

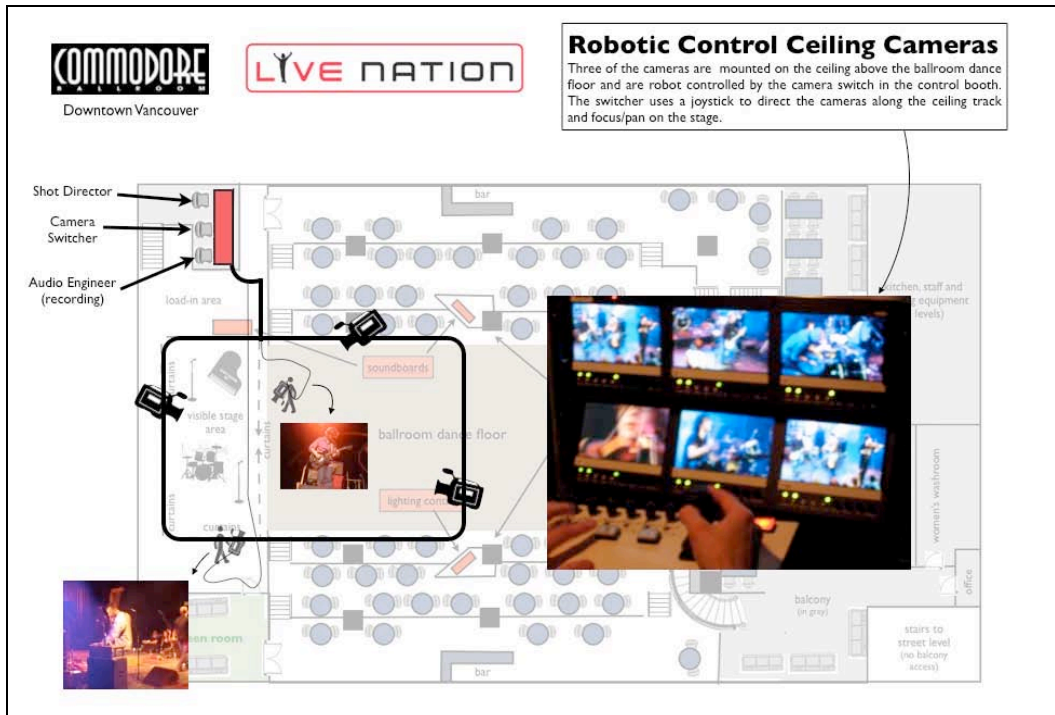
Figure 10 The Commodore Ballroom network of connected recording venues



I was able to see the potential for these kinds of innovative learning approaches and spaces because of my own ongoing practical work with capturing, editing and distributing digital audio and video recordings online. This was student work that I had begun in 2000 at a couple of live concerts in Europe with an inexpensive Sony Digi8 camcorder and a monopod.

The experimental concert video efforts I had been working on in the fall of 2007 (the same point in time that I started a part-time MBA program, just finishing here), eventually led to strong interest for an industry-supported intercollegiate co-op learning initiative around digital video production. By October of 2007, these same activities now had me involved in sophisticated high-definition recording and remote connectivity of the legendary Commodore Ballroom and its robotic and hand-held multi-person camera system (Figure 11).

Figure 11 Floor plan for proposed “Commodore Co-op” internship program, circa 2008

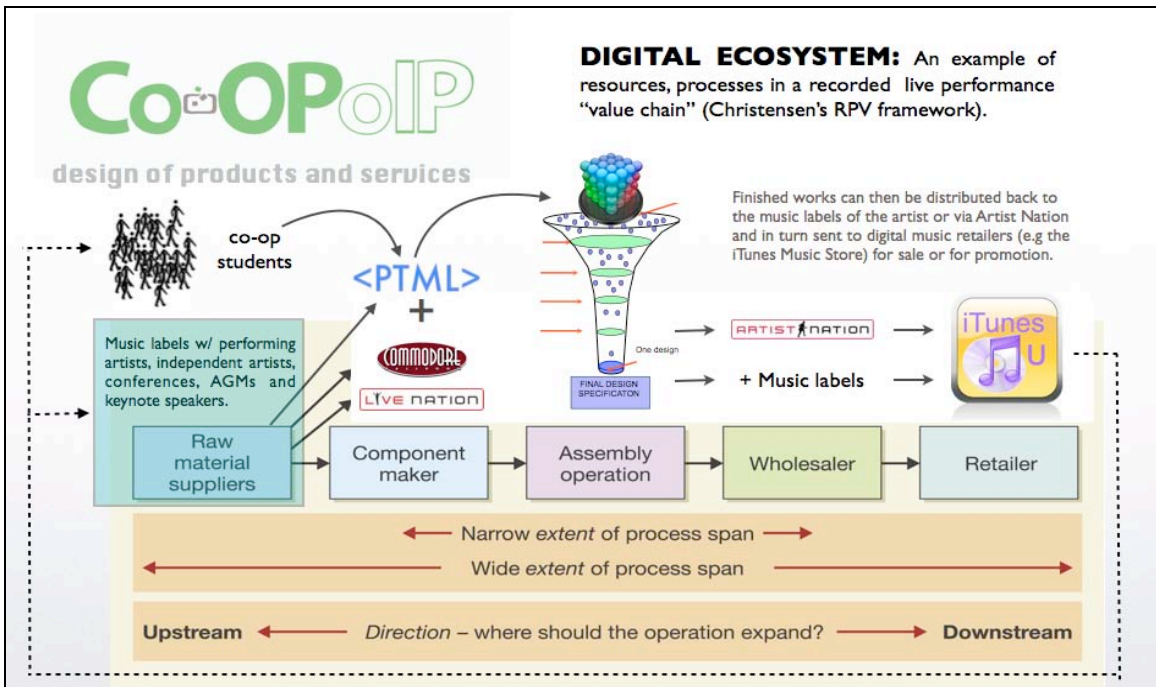


After years in the field, the experimental lo-fidelity camera work that I had begun in 2000 had developed into the opportunity to perform a multi-camera video shoot of The National’s performance at the Commodore Ballroom in October of 2007. This recording will be given greater attention later in this project as it is the focus on one of the analyses, as demonstrated in section 5: APPLICATION & RESULTS

The planning of what was essentially an early version of **seedfeed™** then began through academic-industry discussions and collaboration between Simon Fraser University and the operators of Vancouver’s iconic Commodore Ballroom (currently a Live Nation venue). The goal was to start up a co-op program for SFU students that would create an unparalleled learning environment and provide students with professional insights into techniques and industry best practices for video capture, archiving, post-production, and distribution of the various events taking place at the venue. The venue would in

turn receive a constant supply of film, design, and technology capable students for filming and working on video post-production of events in the venue, as shown in the “Co-OPoIP” digital ecosystem view in Figure 12:

Figure 12 Upstream/Downstream perspective of Co-OPoIP digital ecosystem



This original vision of the “Commodore Co-op” – later called “Co-OPoIP” as a working title for a revised PCoIP-powered version – aimed to give SFU students involved in film, design, and multimedia programs the unique opportunity to gain practical “hands on” experience, not just in video production but in all aspects of a digital video ecosystem for event digitization. At the same time as having a motivation to learn new skills, the co-op students would also have some motivation from the pay checks they’d earn through this applied learning. As a digital ecosystem, this co-op program requires students to consider distribution platforms like YouTube, Hulu.com, and iTunesU in the production of their work as much as considering which kind of digital camera and recording techniques should be used. In this sense, the idea is for the students to take an

overall view of the *system* as much as they need to take more detailed views of the components that make up the system (again see Figure 12).

2.6 Dealing with disruption

The innovation that I've believed for some time was possible between these two worlds – education and entertainment – has evolved into the design problem that I'm currently exploring, or *following*. By “following” I mean in the sense of John Seely Brown's position of “having the freedom, if not the responsibility, to follow the problem.”⁴⁰ The main *theoretical* result of this research, therefore, has been the coordination of educational and entertainment lenses in order to more clearly see the problem and opportunity presented by disruptive innovations in both worlds.

The practical results have been the continuing contributions of experimental digital media objects to the already robust archive that was developed in my past thesis work. In addition, the practical result of a workable IxD method from this project will also be a major point of discussion in later sections. These new contributions can be used to support arguments for creating innovative learning environments where the “river” systems of education and entertainment meet. In other words, trying to follow these streams of media all the way to a *sustainable digital ecosystem*.

In aiming for sustainability, and in **f**raming both **e**ducation and **e**ntertainment in this ecological perspective, we also need to factor in **d**isruption, i.e. the “**FEED**” side of this project. The following theoretical background section will for the most part address a key concept of current business thinking known as disruptive innovation. It is especially relevant to dynamic changes in complex systems where new technologies are constantly introduced, any one of them with the capability of reshaping entire markets and industries.

⁴⁰ John Seely Brown, “User-centered design,” 104.

3: THEORY

Traditionally, entertainment and media companies wouldn't look at students as their main customers, usually preferring to segment markets into generational age groups that define, for example, the "golden eras" of film or music over other periods of years. It just so happens – again, traditionally – that students fall into particular age groups, making this kind of market segmenting very easy, i.e. grade school students, high school students, undergraduates, grad students, mature students, etc. It can also be argued that for many *higher* education institutions, somewhat ironically, students are also *not* seen as the main customer.

Research-focused universities can be seen as part of a highly competitive game with other academic institutions, all chasing large and prestigious research grants and other sorts of funding from government and industry. Student tuition fees are still substantial, but act as secondary revenue to such research-focused institutions. To compare it to the entertainment industry, it is similar to professional sports teams that earn money from ticket sales to the main consumers of the sport, but ultimately will move to another city if the corporate sponsorship dollars aren't sufficient to compete with other teams.

Yet *disruptive innovations* that shake up entire industries often emerge from student-related work, or adoption of technology by student populations. Facebook and Napster are probably the most famous examples of game-changing disruptive innovations that emerged from students and their complex, adaptive, and highly mediated social systems. How do these systems emerge and become key markets for new technology products and ubiquitous computing applications?

The upcoming sections will provide some of the theoretical background for the issues at play in framing dynamics of education and entertainment with the sustaining and disruptive potential of technological innovation.

3.1 Disruptive innovation

TAGS: [DISRUPTIVE], [INCREMENTAL], [SUSTAINING], [AFFORDANCE], [OVERSHOOT], [UNDERPERFORM], [INCUMBENT], [NONCONSUMER], [JOB-TO-BE-DONE], [ABILITY], [MOTIVATION], [RESOURCE], [PROCESS], AND [VALUE].

To better understand this “dilemma”, the work of Harvard Business School’s Clayton Christensen has led to a set of theories on disruptive innovation, several of which will be discussed here. Issues addressed throughout his work relate to questions about what makes good theory (for innovation), what disruption means for finding the right customers for your product, and on how a firm’s capabilities emerge from a value system of prioritized resources and processes⁴¹. He also discusses value propositions that can be developed from understanding how and when to integrate versus modularize, while building consensus across the firm and the stakeholders of an innovation. Recently, he’s reflected on some key findings from his work in developing theories of innovation. These reflections include pointing out four important “faulty paradigms” that have driven the development of his theories of innovation:

1. **FAULTY PARADIGM #1:** The belief that the customer knows best so “Always Listen to Your Best Customers” and try to satisfy their needs.
2. **FAULTY PARADIGM #2:** The belief in the effectiveness of traditional marketing techniques such as market segmentation based on demographics. These might provide a very detailed description of a person in many ways, but misses what is most important: what they do or want to do.
3. **FAULTY PARADIGM #3:** The insistence that fixed or sunk costs should not be considered when evaluating future investments decisions, as though irrelevant.

⁴¹ Clayton Christensen, *Seeing what's next: using the theories of innovation to predict industry change* (Boston: Harvard Business School Press, 2004).

4. **FAULTY PARADIGM #4:** The assumption that by focusing on what you do best, i.e. core competencies, is the best strategy for growth. This kind of focus is exactly what leads companies to miss areas of innovation and growth.

From a systems perspective, since today's technology industries are complex and dynamic, changes to the parts of the industry affect the whole. Quite often, real innovation doesn't take place without having to deal with at least one of the four faulty paradigms listed above. The "innovator's dilemma" refers to a situation that arises when "incumbents" or market leading firms are able to serve their existing customer bases quite well – too well, actually – and are so focused on these customers that they fail to see innovative technologies that will fundamentally change, or "disrupt", the industry they lead.

Often, the market leading company discovers the disruptive innovation, then looks for reactions from industry analysts or customers so as to gauge the innovation's potential. However, the innovation is so new that markets don't exist for it yet, and even if value is seen in the innovation, it's not seen as lucrative enough to take to market. The innovation is then abandoned as the market-leading firm decides it is better to speed up the pace of developing innovations that support their existing customers. Market leaders, therefore, become focused on what made them successful against existing competitive threats, i.e. their "core competencies", or, what the firm does that competitors have difficulty imitating. However, this same focus leads the firm to miss out on more fundamental (disruptive) innovations that have the potential to reshape the market and industry for all the players involved ⁴².

In the meantime, as the market leaders are focused on their existing customers, industry start-ups learn about the disruptive technology and see opportunity. They keep their cost structure low, build the cheaper technology, and find new markets through trial and error. The start-ups get some initial success and then move up market and eat away at the low end of the market leader. The market

⁴² Ibid., xviii, 295.

leading company finally and reluctantly jumps on the innovation's bandwagon, the very innovation they discovered, yet ultimately fails. The market and industry have by that point shifted fundamentally towards the lower end of the market.

The classic technology example of a disruptive innovation happened when IBM's lower end minicomputer business eventually disrupted the entire industry for higher end mainframe computers (where IBM was the market leader). The entertainment industry has seen disruptive innovation in the form of YouTube's cheap – and more or less “free” – lower quality video content. YouTube has found massive success with its web player even though entertainment companies can provide much better quality versions. Alternately, in the video game industry the Nintendo Wii video game system has much less sophisticated video game quality, but has been able to reach many new customers through its motion-based interface. Both Sony and Microsoft have had to counter with their own motion-based systems well after the fact, possibly having missed out on the market of “nonconsumers” who have already adopted the Wii as their platform.

In terms of education, Christensen sees online collaborative learning technologies as potentially disrupting the traditional in-class lecture hall approach in allowing student to customize their learning paths in ways that are not possible in the mass-produced traditional model. Since these online collaborative learning technologies are often innovations that have emerged from research at higher educational institutions, the dilemma for academic innovators comes from: (1) being able to see future value emerging from the disruption, and (2) having the will to harness the disruption essentially by undermining the traditions of the existing academic system. To do this requires the organization – whether it's a firm in an industry or an institution in academia – to completely rethink how it views its resources and what it does with them.

3.1.1 RPV Theory: Resources, processes, and values

Christensen⁴³ argues that *resources*, *processes*, and *values* “collectively define an organization’s strengths as well as its weaknesses and blind spots.”⁴⁴

Resources are things or assets that the organization has available for use in its operations. *Processes* are the established patterns of work that allow the organization to transform the resources and put them into use, or, put differently, its *recipes*, *arrangements*, and *instructions*. An organization’s *values* determine the criteria for how resources are to be allocated and transformed, that is, what the firm wants to be and *what it wants to do* to get there. As Christensen explains:

The RPV theory argues that organizations successfully tackle opportunities when they have the resources to succeed, when their processes facilitate what needs to get done, and when their values allow them to give adequate priority to that particular opportunity in the face of all other demands that compete for the company’s resources.⁴⁵

In reflecting *what it wants to be*, a firm’s values frame its *self-image* or *worldview*. Christensen argues that market-leading firms will innovate, but only care about innovations that effectively *sustain* their self-image as the market leaders, i.e. their existing identity, who they are and what they want to be. Therefore, these firms will prioritize resources and processes that fit this self-image, quite rightfully, because it’s how they’ve succeeded and become who they are. Basically, what results is a process of framing business problems from an organizationally closed, self-referential perspective, i.e. focusing on its strengths and core competencies, as most business schools would prescribe.

3.1.2 Overshooting the market

When a market-leading company does come up with a *disruptive* innovation, rather than one that sustains their position, the innovation by definition doesn’t

⁴³ Christensen, *Seeing What's Next*.

⁴⁴ 279-280.

⁴⁵ *Ibid.*, 280.

fit their value system. It is therefore seen as an inferior product to the innovating company. Growth of these firms ultimately depends on creating value for its most profitable customers, and also depends on its investors for the needed resources to continue to grow their operations. The small emerging markets of a disruptive innovation may be attractive to other companies, but don't solve the growth needs of these large, market-leading companies.

As an example that will become relevant in later sections of this project, consider a software company that produces qualitative and quantitative analysis for researchers in academia an industry. The company's existing client base of professional researchers, because it is their income earning profession, will pay for the full-feature release of the software, or it will be licensed on behalf of these professionals by their employers, e.g. academic institutions, research firms, etc. New features that improve the software's capabilities may be added that are expected to generate an additional 60% markup on the high end product release, and this mark-up will likely be paid given the important role the software plays in the day-to-day work life of the professionals (regardless if the new features are adopted).

An alternative strategy would be to go after markets of less sophisticated users who aren't as yet using this kind of software at all, e.g. students who are learning about best research practices, and who are not likely going to pay for a full-featured release. To use the language of disruptive innovation, these *nonconsumers* (a term which will be addressed in section 3.1.3) have been "overshot". In the meantime, as part of the company's R&D strategies, an innovation may be discovered that would allow for basic simply qualitative research tasks to be performed easily using a much less sophisticated version of the company's software, one that is even capable of running off of a mobile phone or tablet computer, i.e. as an "app", However, this "bare bones" mobile version can only compete prices comparable to other apps, e.g. a \$.99 to \$19.99 price range, that is, far less than the \$500-\$1000 single-user license of a desktop version of the software. The software company is not likely going to

abandon its development efforts and innovation strategies for an unknown market of mobile users who are in most cases going to be students that the company's target income brackets. Despite the potential adoption of the innovation in a market that has no other competition, the efforts will instead be directed towards satisfying the needs of the company's existing and paying customer base. In turn, the mobile computing innovation is abandoned, or more dangerously, picked up by a new entrant that sees market potential in these nonconsumers.

Since markets for these innovations don't yet exist and can't be analyzed or justified, the innovation strategy is seen as too risky compared to strategies designed for the existing market. As the company focuses on its strengths by creating better products for its existing clients, it ends up at the same time "overshooting" the needs of other, completely attainable, though less lucrative, market segments. The demand for the market leading technologies that are being produced may not be there yet, and new features arrive before the market knows what to do with them. When this happens, companies have "overshot" all but the most sophisticated consumers by making products that are either too costly, or have too many features and are therefore too complicated to use.

3.1.3 Targeting "nonconsumers" and harnessing disruption

Nonconsumers are effectively those who the companies have "overshot" by making products that are too costly, have too many features and are therefore too complicated to use, or, both. Such products limit actual consumers to "people with significant financial resources or specialized skills or training,"⁴⁶ while nonconsumers need to get a job done but find that a product doesn't exist that has been designed for their needs. As a result they either "pay

⁴⁶ Ibid., 6.

professionals to provide the service for them, or do the best they can to cobble together a solution from existing products and services.”⁴⁷

Nonconsumers exist in every market for the reason that when these customers are consuming a product in one particular context, they’re not consuming it in another. For the firm, the reason for this behaviour should be the first concern of marketers, rather than segmenting the market on demographics. For example: consumers of feature films on DVD who never go to a movie theatre *due to convenience and location*. Similarly, a sports consumer watches a professional hockey game on television or at a bar, but *can’t afford* to go to an actual game. Or, consider an avid photographer that takes hundreds of photos regularly, but may be a traditionalist and more comfortable using an actual film camera, than using digital technologies. So instead of using a computer for uploading organizing, and printing off of a new digital camera, he or she instead drops the memory card off to a professional lab with *specialized skills* in order to have a set of prints made. In all of the scenarios above, the motivation – or lack there of it – results in *nonconsumption*. In turn, the presence of nonconsumers creates an opportunity for new entrants who can get past these constraints and “make it easier for people to do something that historically required deep expertise or great wealth.”⁴⁸

As mentioned previously, the success of the Nintendo Wii is a recent and relevant video game example of a product that found a market of nonconsumers. These non-consumers found high-end video game systems like the Sony Playstation and Microsoft’s Xbox too complicated to use, while others may have found the price of these systems too high. Others still may have bought the Playstation in order to use its built-in Blu-ray disc player, but still ended up being nonconsumers of the system’s video game capabilities. So while Sony and Microsoft continued to improve upon their existing products through better graphics and networked multiplayer capabilities, the Wii’s

⁴⁷ Ibid.

⁴⁸ Ibid., xvii.

underperforming technology of its simple game play, graphics, and intuitive motion-based interface captured the imagination (and dollars) of people who didn't care for high-end features and improvements.

Sony and Microsoft still found success with incremental improvements that were sustaining innovations newer versions of their game consoles, but didn't have the same value system in place to be able to see the untapped potential Nintendo found in non-gamers. The disruptive Wii was released and found success in markets not previously considered by the video game industry (e.g. for home-bound senior citizens who enjoyed games like Wii bowling). Since the market leaders of Sony and Microsoft were only set up to meet the needs of their core customers (i.e. the more hardcore gamers), they were unable to harness this disruption... at least initially, as Microsoft's "kinect" and Sony's Playstation "Move" have both moved into the motion-based games arena. This may be an indication of an established firm figuring out how to actually harness the disruption, which Christensen says can be achieved by setting up "an autonomous business with a cost structure that offers [room to move up-market]." ⁴⁹

Harnessing the disruption therefore requires creating separate business processes that are appropriate to the innovation and its potential. In the case of disruptive innovations, the new products and services offered by these autonomous business units would effectively *underperform* what is currently being offered in the market. Customers who were previously unserved or underserved will take an underperforming product over nothing and growth will occur until it becomes enough to change the structure and rules of the industry. Christensen's key example is IBM's creation of separate business units for its minicomputer business. This business eventually survived while its mainframe business – as well as its competitors in the mainframe business – all eventually

⁴⁹ Clayton Christensen, *The innovator's solution: creating and sustaining successful growth* (Boston Mass.: Harvard Business School Press, 2003), 43-44.

died off. It will be interesting to see how Microsoft and Sony's recent moves in motion gaming play out in the overall video game ecosystem.

3.2 The role of user/consumer behaviour in IxD

TAGS: [INNOVATOR] [EARLY ADOPTER] [CHASM], [EARLY MAJORITY], [LATE MAJORITY], [LAGGARD], [ENTHUSIAST], [PROFESSIONAL], [BIG BUSINESS], [SMALL BUSINESS], [GOVERNMENT], [MILITARY], [R&D] [TIPPING POINT], [SCENARIO], [PERSONA], [INCENTIVE], [MOTIVATION],[BEHAVIOUR], [GOAL] [DECISION MAKING]

Earlier methodological explorations leading to this work produced a framework for analyzing technology-mediated cultural objects through the interaction of different value systems⁵⁰. While the methodology developed at the time focused more on values associated with technological and cultural affordances, this time the focus is on the effects of digital technology on strategy, management, and design practice. While aspects of cultural psychology and related “frames”, “angles”, and “perspectives” from the previous work still remain, their importance – in particular, the role of *cultural psychology*,⁵¹ can be seen in terms of connections with emergent perspectives of behavioural economics and IxD.

Both in behavioural economics and in IxD, the focus is less on the characteristics of a product or on the demographics of a consumer as it is on what motivates someone to interact in certain way (such as buying, selling, consuming, etc.). For example, in both behavioural economics and IxD, the file sharing behaviours of music consumers need to be looked at in terms of opportunities and incentives that lead to the behaviours, as described recently by Clay Shirky:

The rise of music sharing isn't a social calamity involving general lawlessness; nor is it the dawn of a new age of human kindness. It's just new opportunities linked to old motives via the right incentives. When you get that right, you can change the way people interact with one another in fairly fundamental ways,

⁵⁰ Joel, A. Flynn, “Travels in Intertextuality.”

⁵¹ Michael Cole, *Cultural psychology: a once and future discipline* (Cambridge, Mass. ; London, England: Belknap Press of Harvard University Press, 1996).

and you can shape people's behavior around things as simple as sharing music and as complex as civic engagement.⁵²

What is fundamental to both interaction design and behavioural economics is trying to understand *why* people value goods, services, and experiences the way they do. Furthermore, behavioural economics focuses on how these values then lead producers and consumers to buy and sell. In IxD, the focus is on understanding what leads users to act on an object and behave the way they do. In addition, because human activity is always socially situated, it is about why people interact with others, either directly, or as importantly, mediated through design objects.

The upcoming sections address overlapping ideas, mostly in through the idea of innovation diffusion and what motivates the adoption and use of new technologies. Understanding user motivations with respect to innovation is vitally important for this project, since **seedfeed**™ is fundamentally an argument for why the innovative PCoIP™ technology should be adopted for use in higher education and further diffused in the entertainment industry.

3.2.1 Jobs-to-Be-Done theory and the motivation/ability framework

Christensen claims that most of the biggest successes in marketing history came from marketers “who sensed the fundamental job that customers were trying to get done — and then found a way to help more people get it done more effectively, conveniently, and affordably”.⁵³ The general failures of new product marketing have come from simply making an improvement to an existing product through better features and functions, or by “attempting to decipher what the average customer in a demographic wants.”⁵⁴ In considering disruptive technologies in both education and entertainment, we can get some perspective of these marketing issues.

⁵² Clay Shirky, *Cognitive surplus: creativity and generosity in a connected age* (New York: Penguin Press, 2010), 125.

⁵³ Christensen, “The innovator's guide to growth”; Christensen, *The Innovator's Solution*, 74-80.

⁵⁴ Christensen, “The innovator's guide to growth.”

Christensen offers another concept that helps better understand these ongoing issues in marketing, design, and technology: *Jobs-to-Be-Done Theory*⁵⁵. Put simply, this theory makes the case that a product's success comes from its ability to connect with tasks that customers find themselves needing to get done. The products that can best align with these particular jobs or circumstances end up being the real "killer applications [as] they make it easier for consumers to do something they were already trying to accomplish" (ibid.). He argues that segmenting markets in this way – i.e. in terms of tasks, jobs, activities – is far more effective than traditional approaches to market segmentation which take place along the lines demographics, psychographics, and product characteristics.

In earlier days of the internet's growth, bandwidth limitations once meant that in order to build software applications remotely, it was only feasible to send small files or strings of text and numbers-based code. Bandwidth constraints were not such a significant concern in this context, since small files and pieces of programming code effectively were the building blocks (i.e. the *resources*) of software applications (i.e. the *processes*, that were the instructions for compiling and operationalizing the software code). Communities where code and processes could be shared produced significant levels of technological innovation. In Christensen's terms, the reason for this innovation came from (1) the *motivation* to work collaboratively that existed through these open source and closed proprietary communities, as well as (2) the *ability* to collaborate by exchanging resources, as bandwidth wasn't a limiting factor at the time.

As is still the case today, if code didn't end up being used in software development at the time, it could reside in a searchable repository for reuse in future applications. In this way the ability to innovate continued through access to the repository, and only a motivation to do so would then be required in an open source environment. Some of these repositories were closed-network and

⁵⁵ *Seeing What's Next*, 281.

proprietary (e.g. within or between companies), thereby putting constraints on the ability to access the code. The tradeoffs for these constraints, however, can be seen as motivation in terms of ownership of the work (if ownership is important to the community). However, regardless of whether it was an open-source or a proprietary context, to effectively share these resources over the internet, any “heavier” content – such as audio, high resolution images, and of course, video – would likely have to be removed.

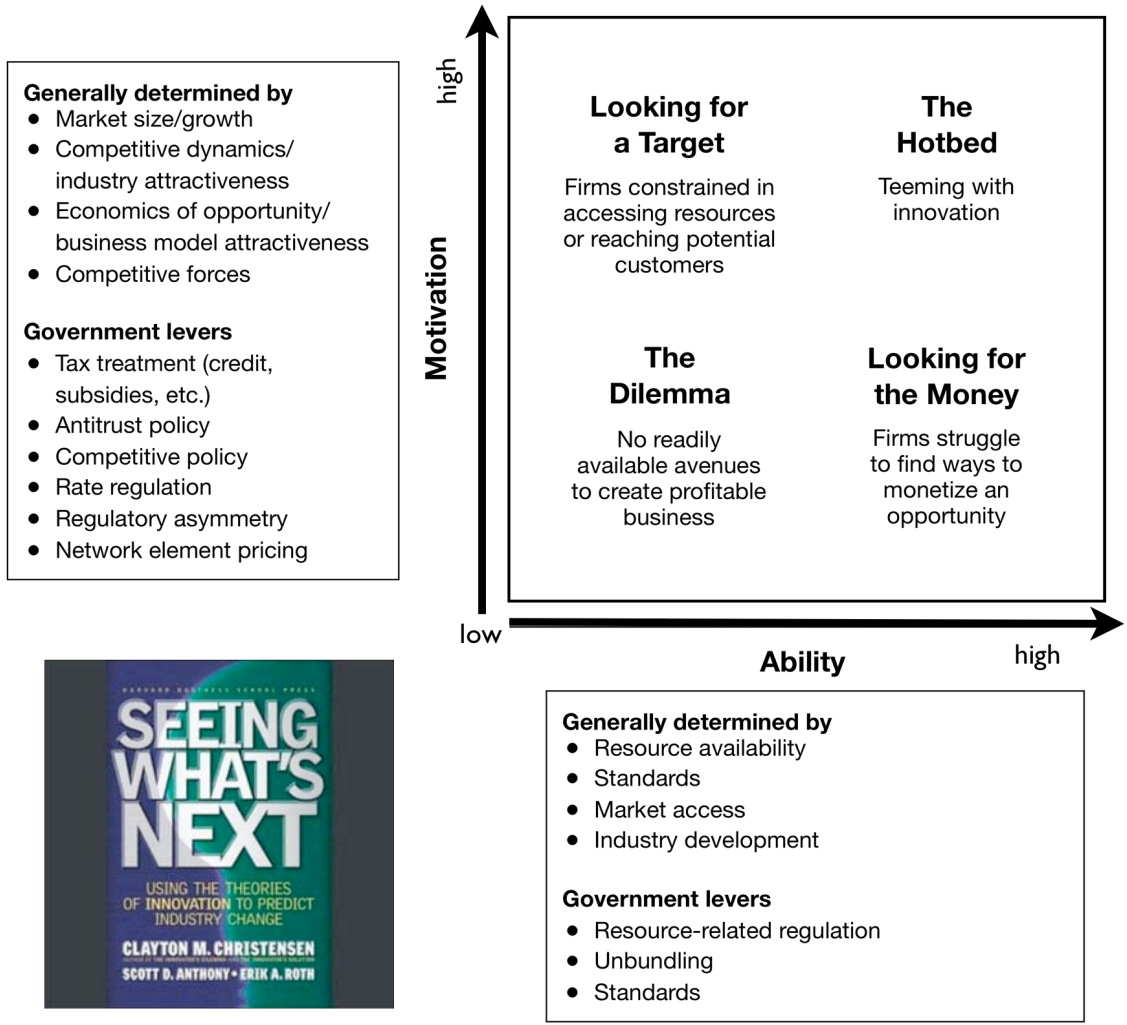
As bandwidth capacities increased and better media compression settings developed throughout the 2000s, it became easier to send higher quality audio and image/video content over the internet in similar ways to the exchange of programming code in the 1990s. These pieces of audio and video content can now be exchanged, arranged, combined, broken up, rearranged, and re-exchanged across the community with far more fluidity than was previously afforded when bandwidth and storage were much more limited. Multimedia resources are now similar to these “building blocks” of code, i.e. the modular “objects” in object-oriented programming applications.

Given increasing storage capacity, these resources can now also be stored in searchable archives for later development of future content. Digital media “objects” therefore become the *resources* in the RPV framework to be managed through the *processes* involved in non-linear digital editing platform. The ability now exists for such software platforms to allow users to conveniently access and experiment with multimedia resources through online content archives as seamlessly as though if the content were on a local desktop computer. This shift, which represents the value proposition for Teradici’s PCoIP™, moves the user’s experience closer to a *digital ecosystem* as the content moves into “the cloud”.

Technologically speaking, having the ability to work with remote resources seamlessly but centralized way offers valuable benefits, as described in previously in section 2.2 About Teradici. However, according to RPV theory,

these remote *resources* will only get used – or *processed* – if they are seen as *valuable* to an end product, i.e. as a desirable outcome for the ecosystem. The *motivation* to make use of content may already be in place through immediate opportunities in the market, or may come about through future opportunities, provided the *ability* exists to access and work with the content at a later date.

Figure 13 Motivation/Ability Framework, from *Seeing What's Next* (2004, p. 289)



While *motivation* is driven primarily by market incentives such as revenue potential, the *ability* to earn those revenues depends on whether industry's cost structure and resource availability are such that an expectation of profitability exists. Christensen's motivational/ability framework in Figure 13 suggests

“innovation flourishes when companies have both the motivation and the ability to innovate”⁵⁶. However, the market on its own doesn’t determine the potential for innovation. Importantly, there are key roles for other non-market forces to drive innovation as well, for example, “industry standards, unions, cultural norms, the state of technological development, a country’s intellectual property infrastructure, and most important, government regulation.”⁵⁷

3.2.2 Sustainability of technology adoption

Historically speaking, it’s not hard to find examples of technological innovation, but there’s an important distinction between inventing what might look like a technological breakthrough and the widespread adoption of such an invention. The inventions of interest are the ones that are adopted to the point where people’s behaviours change as a result, leading to the innovation become discussed as *radical* or *revolutionary*. The dynamic between a technology’s innovation and its adoption is one that unfolds over the timeframe that makes up the technology’s “lifecycle”.⁵⁸

For example, the original iPod was not much different than other MP3 players and/or portable USB or Firewire powered hard drives in its time, yet the adoption of Apple’s design in the early 2000s by consumers that were beyond the company’s traditional non-Wintel market can be looked at as a revolutionary point in Apple’s success. Similarly, Microsoft’s ability to establish its operating system and its integrated MS Office applications as the standard in business-related IT proved to be a critical development in its capture of what is currently 86% of operating system market share (compared to just over 11% for Apple’s OSX and 3% for Linux OS)⁵⁹. So how then does adoption take place?

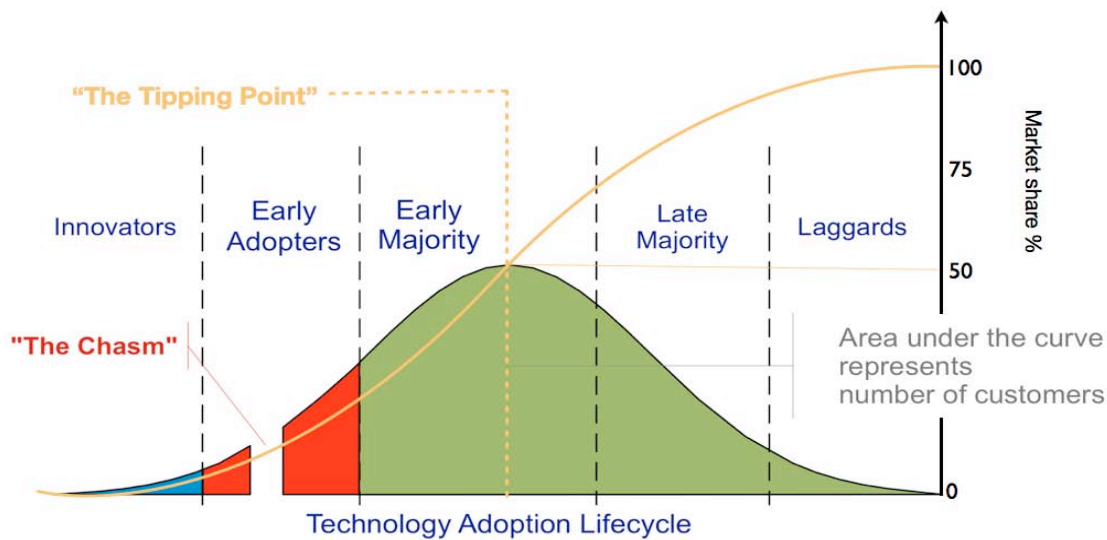
⁵⁶ Ibid., 290.

⁵⁷ Ibid.

⁵⁸ Everett Rogers, *Diffusion of innovations*, 1st ed. (New York ;London: Glencoe: Free Press, 1962).

⁵⁹ Ed Bott, “The 2010 OS scorecard: Microsoft loses a little, Apple wins a lot,” *Ed Bott's Microsoft Report*, January 2, 2011, <http://www.zdnet.com/blog/bott/the-2010-os-scorecard-microsoft-loses-a-little-apple-wins-a-lot/2818>.

Figure 14 Technology adoption “mashup”: Rogers (1962), Gladwell (2000), Moore (2002)



The famous Bell curve shown in Figure 14 will be referred to here jointly as the *technology adoption lifecycle*. It can best be described as a combination of the following models:

1. Everett Rogers' diffusion of technology or technology lifecycle (TLC) ⁶⁰
2. Geoffrey Moore's focus on "crossing the chasm" from the "innovators" to the "early majority" of Roger's lifecycle by way of a critical mass of "early adopters." ⁶¹
3. Malcolm Gladwell's recent terminology of the "tipping point" where adoption begins slowing down from an exponential rate of "early adopters" to a dwindling number of "late adopters" and "laggards". ⁶²

Prior to the explosion of online social networks and peer-to-peer (P2P) technologies, the direction of the technology adoption lifecycle ("mashup") could quite rightfully be argued through a three-phase model proposed by Xerox PARC alum David Liddle ⁶³. This model sees adoption as the progression

⁶⁰ Rogers, *Diffusion of innovations*.

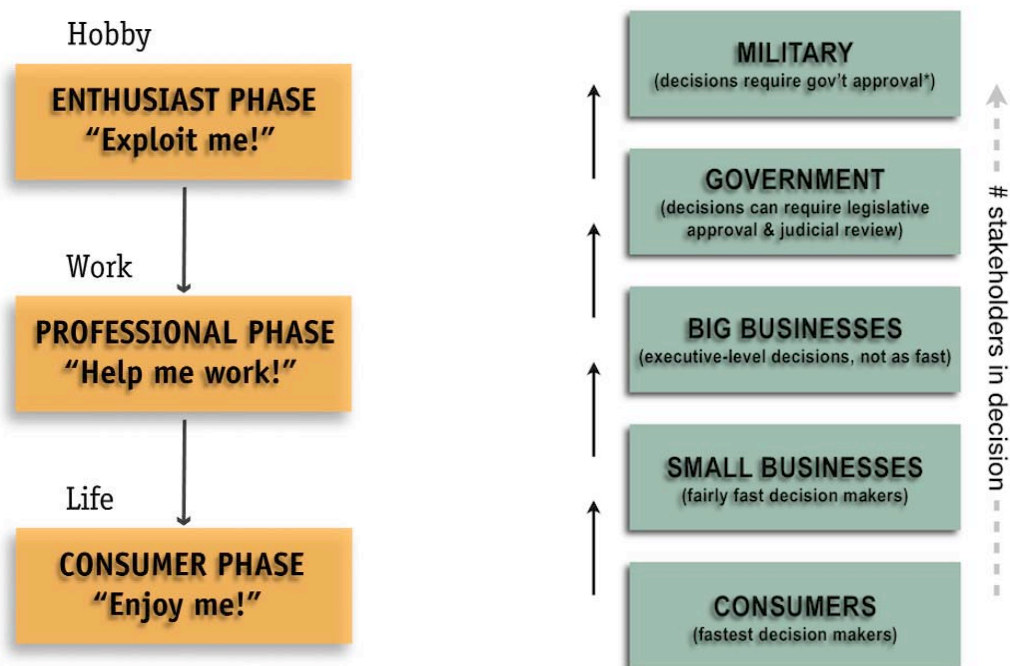
⁶¹ Geoffrey Moore, *Crossing the chasm : marketing and selling disruptive products to mainstream customers*, Rev. ed. (New York NY: HarperBusiness Essentials, 2002).

⁶² Malcolm Gladwell, *The tipping point: how little things can make a big difference*, 1st ed. (Boston: Little Brown, 2000).

⁶³ Bill Moggridge, "Adopting Technology," in *Designing interactions* (Cambridge Mass.: MIT Press, 2007), 237-317, http://www.designinginteractions.com/downloads/DesigningInteractions_4.pdf.

from an *enthusiast phase* (“Exploit me!”), to a *professional phase* (“Help me work!”), to the *consumer phase* (“Enjoy me!”). Venture capitalist Ben Horowitz of Andreessen-Horowitz recently commented on the similar order of adoption that for the last 20 years generally moved from *government* (e.g. defence and intelligence organizations, as well as education and research institutions), then to *business* (first large companies, then smaller ones), and finally to *consumers*.⁶⁴ Both models are depicted in Figure 15.

Figure 15 Liddle’s adoption model vs. Horowitz’ reverse model



Using the internet as an example, its origins as an application for the military and for academic research purposes from the late 1960s to the early 1990s would be the enthusiast phase of its adoption. By the mid-1990s it had reached the professional phase where enthusiasts began to value the potential for business applications of a decentralized global communications network. By

⁶⁴ Ben Horowitz, “Meet the New Enterprise Customer, He’s a Lot Like the Old Enterprise Customer,” *ben’s blog*, November 15, 2010, <http://bhorowitz.com/2010/11/15/meet-the-new-enterprise-customer-he%e2%80%99s-a-lot-like-the-old-enterprise-customer/>.

the end of the 1990s, the business applications for the internet's global communications capabilities were at the very least matched by actual or potential consumer applications. During this time, entertainment-related websites emerged that at least complemented, even competed, with existing traditional media in print, television, film, and music. The consumer phase could be seen as "business to consumer" (B2C) applications that created direct distribution channels from production to consumption in ways that traditional "brick and mortar" retail operations could not, e.g. buying pet food supplies via pets.com rather than buying the same product at a retail outlet.

What can be considered more "pure" technology examples of adoption lifecycles are found in software application adoption in the late 1990s. Key examples include "industry standard" applications like Microsoft Office for IT professionals in the business community, and software such as Quark Xpress and Adobe's Photoshop and Illustrator applications in graphic design circles. The development of these applications came about through numerous iterations of the software (i.e. "version" releases) that evolved through the feedback from enthusiasts in the graphic design community who understood the day-to-day practical needs involved in their field. Whether or not they considered themselves "professionals" being paid to do the job, or as artists or experts who were using the software for expression and education rather than for income, the result on the consumer phase was the same. For consumers, the value of learning the industry standard software applications outweighs learning a consumer-grade version, if only in terms of name brand recognition, but more importantly in terms of interoperability.

3.2.3 Interoperability and adoption

When it comes to adoption, even though the capabilities of the new software application may make it a better solution on the outset, concern may be for *interoperability*. In a non-technical sense, interoperability can be seen as the ability for having everything work as it was before, not necessarily better, nor worse. Interoperability for a new product therefore keeps the user's activities

situated in what are his or her *communities of practice*, rather than leading to the user having to adopt new behaviors that are no longer in keeping with these communities, or even new behaviours on top of those as a way of reconnecting with their communities. John Seely Brown explains these communities of practice in terms of participation with peers and discussions that lead to understanding of the larger context where skills are learned and tools are used, rather than simply the specifics of the skills and tools themselves:⁶⁵

Participants learn new techniques about software practice from watching the work of their peers, defending their own work, and participating in community discussions about emerging problems. That peer-based learning process is about *learning to be a practitioner* rather than just *learning about software*. Today's students don't want to spend years learning about something before they start to learn to be practitioners in that knowledge domain.

For example, an everyday consumer is given the choice between learning how to use Microsoft Office or a similar program such as AppleWorks. Even if Office had to be purchased and installed on a Wintel machine rather than the included version of AppleWorks on Macintosh system, even if there is interoperability between the applications, the value generated from the existing adoption of Office in the business community at large outweighs the savings in using the “free” version of AppleWorks. Similarly, many of the basic graphic design functions that consumers use in a professional application like Adobe Photoshop and Illustrator can be achieved using Microsoft Office. However, the industry standard for such functions is Photoshop, not Office. Therefore, the value of learning how to use Photoshop outweighs the savings achieved by performing the same tasks through already available or “free” software that is not considered industry standard.

For both education and entertainment, interoperability in existing communities of practice is key to adoption. Students will pay to take accredited and

⁶⁵ J. S Brown, “How to connect technology and passion in the service of learning,” *The Chronicle of Higher Education* 55, no. 8 (2008).

recognized courses on Photoshop and Illustrator, but will probably find less appeal for a course on “How to use MS Office for Photoshop and Illustrator-like effects”. In the end they may learn the same skills, but without the same official course credit that makes the Photoshop and Illustrator courses interoperable as transferable skills in the job market.

For an entertainment example, consider Apple’s move to offer songs from iTunes *at a premium* in exchange for no Digital Rights Management (DRM) locks or restrictions on the number of times a CD can be burned with the songs. Because the DRM songs make the consumers’ own digital ecosystems less interoperable, they are not seen as being as valuable as songs that can play across any music player. The existing practices of music consumers who listen to digital versions of songs on portable music players are affected by DRM technologies to the point where if the practices become too restricted and inconvenient, the technology may not be adopted. The reason Apple made this move was not to make more money off the premiums being charged from the non-DRM versions, but rather to make their entire iPod/iTunes digital ecosystem more interoperable. Just as students will pay for accredited classes that will get recognized when they show up at a job interview, iTunes customers pay a premium for files that can show up across computers and “standard” music playing devices, i.e. MP3 players as the standard, not devices that only play Windows Media Audio (WMA) or Apple Audio Codec (AAC) files.

In any event, the traditional direction of technology adoption through these examples is clear: consumers will defer to what professionals establish as the “standard”. Traditionally, this standard is established by the “experts”, that is, through the *enthusiast* phase. Unlike the *professional* phase, money is less of a concern than having the best version possible. Professionals, on the other hand, desire the best possible version that does not affect their ability to earn professional income. In other words, they will adopt the industry standard, such as a High Definition concert delivered on Blu-Ray disc, even though enthusiasts may be more enticed by an available 3D version of the same concert, but which

not playable on standard devices. Taken together, the *enthusiast* and *professional* perspectives result in “Pro” versions that basically consist of the same software as *consumer* or trial versions. However, the more expensive “Pro” versions unlock the features that are not available through the less expensive versions.

3.2.4 Flipping the adoption direction

While this technology adoption model continues to work in the direction of *enthusiast/professional* and then to *consumer*, the dynamic has also flipped at the same time. Instead of looking to the expert enthusiasts for gauging the adoption of technology, professionals are increasingly looking to consumers in order to gauge the best technology adoption strategies. In other words, for better or worse, there is at the very least debate taking place as to whether it is better to go with the expert picks, or to side with everyone else. Who’s the better bet? Audience or expert?

Essentially, network effects now come into play, with the standard being set by the technology that reaches a critical mass of adoption and increased adoption exponentially increasing the technology’s value. It now has to be asked if the best strategy for reaching this critical mass is by targeting the adoption at the enthusiast stage, basically betting on their appeal and authority with professionals in influencing technology adoption decisions. Or, is it best to try and capture a critical mass of less demanding general consumers as a signal to professionals to adopt the technology. This is vitally important to Teradici and the strategy of reaching for a critical mass of adoption by way of student and educational use.

For another example, consider the recent and phenomenal success of YouTube since its launch in 2005. We can compare YouTube’s success to the more moderate success of one of its competitors, the high-definition (HD) video platform Vimeo. Until YouTube’s recent upgrade to include high-definition resolution formats, Vimeo was considered to be the better online video

platform. Its ability to handle 720p HD resolution and extended length videos differentiated it from YouTube's standard definition (SD) and its ten minute time maximum. This quality difference resulted in Vimeo's success with video *enthusiasts* who wanted their work displayed and distributed in the highest possible quality. Meanwhile, YouTube's market clearly included a significant proportion of *consumer* phase users, e.g. people posting random clips of pets, friends, and family that were not intended for feature-length high-resolution viewing.

Because of this wide consumer base, a number of other online video platforms have recently come to market, ones that focus on user groups with their own needs. For example, fora.tv and Teacher Tube have been targeted to educators and researchers (i.e. the *enthusiast* phase of adoption), while Brightcove and Hulu were created as platforms to deal with video produced by large media conglomerates (i.e. the *professional* phase of adoption). The now defunct iFilm, an archive for short films and movie trailers promoting feature films, is an example of that fit both the *enthusiast* and *professional* phases of adoption. Online video platforms for enthusiast and professionals were clearly being developed prior to YouTube's success, including one from Google, who ended up purchasing YouTube in 2006. Yet the direction of online video's adoption does not fit the model of first attaining success with enthusiasts, to adoption of the platform by professionals on account of this success, then eventually reaching consumers. As Horowitz explains, the order of technology adoption has "completely reversed"⁶⁶.

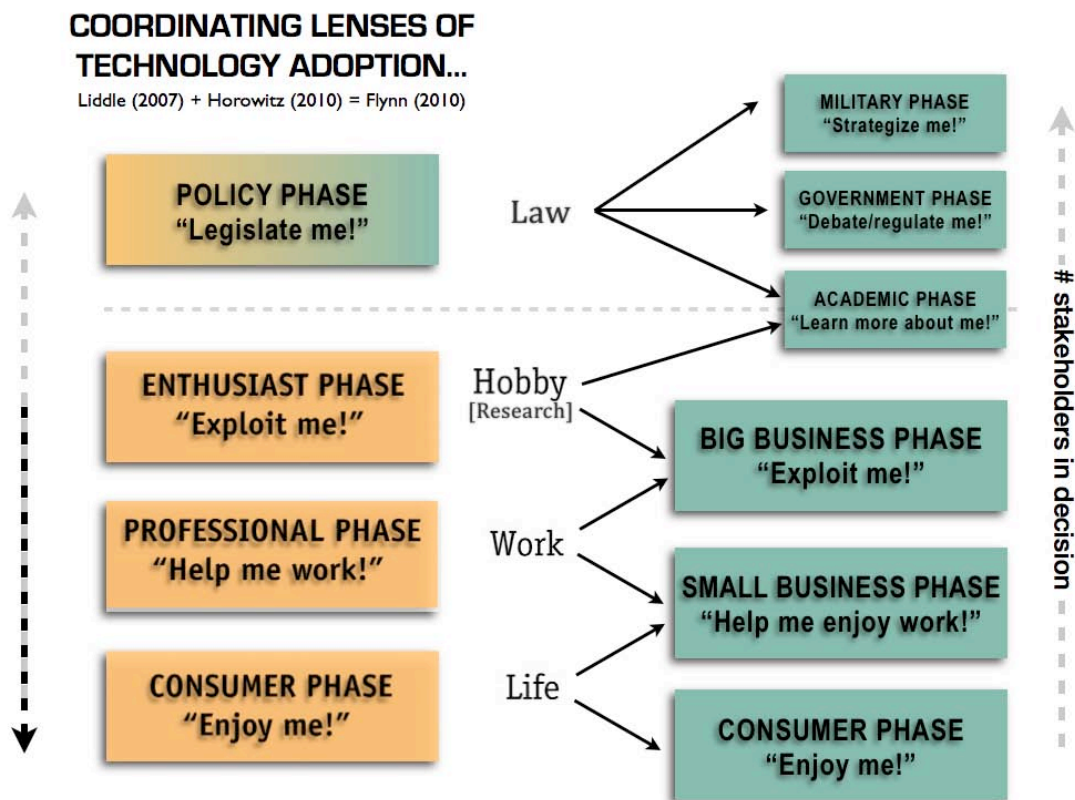
3.2.5 The adoption reversal and its relevance

Consumers on the low end, Horowitz believes, are now leading this reversal in the direction of technology adoption. This shift away from adoption by being led by enthusiasts at the high end, he continues, "is one is one of many profound

⁶⁶ Horowitz, "Meet the New Enterprise Customer, He's a Lot Like the Old Enterprise Customer."

side effects of broad scale Internet adoption.”⁶⁷ While Horowitz’s model has *government* and *military* in the place of Liddle’s *enthusiast* phase, for the sake of coordinating the models we can combine the categories (Figure 16). An apt comparison can be made between the military and higher education simply in their “notoriously complex decision making process”, as well as both having deep pockets (though less so now in higher education and its budget cuts).

Figure 16 A coordination of Liddle and Horowitz’s models, expanded and altered.



Regardless, academia and the military are involved in technology purchases and technology transfer decisions on a regular basis. Whether used by enthusiasts, government, the military or higher education, the common concern for these adopters is getting the *best* technology, rather than getting the best

⁶⁷ Ibid.

deal. For business and professional users, profitability would be a far more driving concern, that is where cost of adoption is important, but not if it cuts into revenues and lowers profitability. The key characteristic for consumers, who don't have deep pockets and may not be consuming for the purpose of making money or out of enthusiasm, their life and lifestyle needs while lead them to be price-sensitive in their technology adoption.

For **seedfeed**™, the adopters in the enthusiast range also include those in higher education and research institutions that traditionally have the advantage of “deep pockets” of funding. Furthermore, another level can be added for the “policy phase” (see Figure 16) where groups of enthusiasts pool their interest in ways that can influence, if not determine, the regulation of technology adoption. Regulation and legislation then further contribute to the changing adoption patterns that result from longer decision-making process in making use of “deep pockets” of funding. The adoption advantage therefore turns to those able to make adoption decisions quickly.

For example, prior to the internet's viability as a digital distribution model, entertainment and software companies couldn't distribute content to end customers without also having some sort of commitment on the end user's part. This commitment ordinarily came in the form of a fee to handle shipping costs, or a mark up price at retail locations or incorporated into a rental fee. Yet today, technology affords the ability to distribute all digitized content essentially for free. Software companies usually do so with free or trial versions, while media content often provides potential consumers with free preview clips of the larger works.

The shift from having to purchase or pay a fee to handle distribution costs to being able to freely evaluate versions of the content means adoption decisions have reversed. The decisions that lead to widespread adoption no longer start with the lower price sensitivity of enthusiasts and the “deep pockets” of government, military, and (at one time) academic institutions. Now, as Horowitz

claims, “consumers who can decide very quickly adopt first and the military – which has a notoriously complex decision making process – adopts last.”⁶⁸ Furthermore, because the consumer side effectively has “shallow pockets” and little time to make a decision, they not only can decide quickly, indeed they *must* decide quickly.

3.2.6 Technology adoption in education

While these “deep pockets” may continue for military spending, higher education is facing a different situation. As raised recently by both Christensen (2008) and Taylor (2010), the current budget crises in education are already disrupting technology adoption cycles at colleges and universities. However, the “deeper pockets” in research funding compared to funding for teaching and learning creates its own adoption system in academia: research faculty as the *enthusiasts*, teaching faculty in large and inflexible industrial-style lecture hall courses as well as in small and more adaptive tutorials make up the *professionals*, with the students falling into the category of *consumers*.

The adoption flip can be seen in this way by looking at, on one end, the constraints and processes set upon research faculty (enthusiasts) in regard to using their deep pockets of research funding that is supported by a number of stakeholders. The relative speed to which students on the other end, i.e. the consumers, can decide upon adopting a new technology doesn’t imply a large number of stakeholders in the adoption decision. Teaching faculty professionals may want to adopt an advanced and promising technology that their research faculty colleagues are promoting, in order to improve their day-to-day working lives. However, given increasing class sizes and course loads, it may instead make better sense to adopt the technology that students are already familiar, thereby opening up blocks of teaching time that would’ve been spent on training students to use the new technology.

⁶⁸ Ibid.

With the traditional technology adoption process now reversed, the rationale exists for educational institutions to adopt technologies that are already widely available and used by students i.e. the technologies and platforms students use in their *jobs-to-be-done* (see section 3.2.1: Jobs-to-Be-Done theory and the motivation/ability framework). If adopting these technologies is possible, it provides a better option than absorbing the costs of licensing and maintaining applications that students have little interest in using; they've already adopted their own applications to "get the job done". It also provides a better option than having the institution develop its own applications from scratch, only to be replaced by the popular choice later on.

In addition to needing the necessary budgets to "lock in" on a particular technology, there needs to be a compelling pedagogical reason for requiring students to adopt specific hardware and software. In other words, what can they learn from the use of the specific technology that isn't possible through other platforms? For example, if interoperability and group collaboration are critical to the learning environment (and many learning environments will claim this to be the case), then the adoption of a common technology platform can be successfully argued. But if this compelling case for using the technology as part of the course isn't strong enough, students will discard the technology once the course is completed since no one else in their social group is likely to be using it. Adoption decisions such as these are already being made very quickly at "grassroots" levels of student social groups, and by instructors who are aware of what's freely available and commonly used by students. In other words, the decisions are happening well before school officials and administrators are even aware of the need for a decision to be made.

Already, these fast and consumer-driven decisions are causing resource issues at institutions where policy decisions are out step with consumer behaviours. For example, at the start of the 2007-2008 school year, Simon Fraser University's bandwidth policies reflected the kind of network use that existed before YouTube's widespread adoption in the previous year. As the year began

and instructors attempted to demonstrate course-related ideas through relevant example found on YouTube, every attempt to play a video ended up failing after the first minute. Unknown to faculty and students, the university implemented a policy of “traffic shaping”⁶⁹ (often referred to as “throttling”) because of a university-wide restriction placed on video files. This policy failed to take into account the *jobs-to-be-done* for both student and instructors and the changing dynamics and challenges of teaching in contexts where high technology and media saturation are take as given. Since YouTube and other online video sites had basically been fully adopted by consumers and business users, the technology managers at SFU and at other colleges and universities facing similar scenarios were eventually forced to adjust their bandwidth and storage capacities to fit this increasing use and the growing ubiquity of online video.

Today it is effectively impossible to keep video out of the classroom. Online video can be used by instructors in order to show examples out in the (digital) world of concepts and course-related ideas being taught in the classroom that day. The video’s availability online makes it easier for students to review or see more of it after class and may not even need any storage and administration on the part of the institution if the content is already online and available.

Additionally, video can be integrated into the course’s practical learning activities by requiring students to author video-based presentations and reports. In either case, the use of cheap and available video technologies can provide a means of both save money and improve the learning experience. The downside of this video ubiquity is of course the entertainment possibilities it provides students to distract themselves from the actual course delivery taking place, for example, by watching a live sporting event, covertly, in class on a phone or laptop. Yet that kind of streaming video distraction can also be taking place over the same cheap or free wireless bandwidth that other students in the class are using to play networked, multi-player games.

⁶⁹ B. N Firouzabadi, “Cooperative proxy caching for peer-to-peer traffic” (Simon Fraser University, 2007), 5.

There are three key patterns to notice and take away from this theoretical overview of adoption, as well as from the practical examples that have also been used in presenting further dimensions to the problem space where education meets entertainment, by way of technology:

1. Adoption has already happened at the consumer level and this adoption cannot practically be undone;
2. Businesses will necessarily look at how to capitalize on this adoption trend;
3. Enthusiast might have some influence over consumers, but don't drive consumers to adopt: other consumers do.

The best or most innovative product – i.e. the one often favoured by enthusiasts – is not necessarily the one that eventually wins out in the adoption battle. Ultimately, technology adoption decisions come down to network effects and increasing the value of the network by having more users, i.e. by getting consumers on board. Or, the decisions are made through policies and regulations that students need to feel are observable, enforceable, and fair overall to remain in effect over the long term. In both cases, social relations lead to adoption, not the technology's capabilities. While the promotional publicity and ad campaigns of a new technology may push its new features in trying to promote brand recognition, the features are really secondary. What Berger claimed about print ads is as true today, if not more compelling and insightful, as it was in pre-digitized 1972: “publicity is about social relations, not objects.”⁷⁰

3.3 Patterns of mediation and coordinated lenses

TAGS: [PRIMARY ARTIFACT], [SECONDARY ARTIFACT], [TERTIARY ARTIFACT] [BUILDING BLOCK], [INGREDIENT], [INSTRUCTION], [CODE], [RECIPE], [GENRE], [STYLE], [PERSPECTIVE], [LENS], [FRAME], [METAPHRAME], [COORDINATE], [LEARNING LEVELS?]

It is important to clarify the term *object*, as its double meaning in the sense of design *object* and the *object* of design activity is fundamental to the problem space in this research project. All design is human activity, and it results in

⁷⁰ John Berger, “The language of advertising,” *Ways of Seeing* (London: British Broadcasting Corporation, 1972), <http://www.youtube.com/watch?v=BCDzPeQhCGE&feature=related>.

artifacts produced from this activity that ultimately can and do mediate future human activity. As a whole we call these past, present, and future artifacts *culture*. Design, including IxD, calls these artifacts *objects*, which have contributed to human culture over generations and can be defined as “the conception and planning of the artificial.”⁷¹ For **seedfeed**™, as an archive of digital video recordings of concert performances that are part of *popular culture*, it is essentially a collection of artificial perspectives that have become digital media objects. In the case of **seedfeed**™ and other concert-related media, the perspectives of the audience have become digital media objects through the introduction of the lens and the viewfinder of a digital camera into human *perspective* at a live music event.

3.3.1 Perspectives and meditational models

In conceiving and planning for design, it is important to understand how perspective is shaped by new technologies. John Berger’s view of perspective is that the technology of the camera completely and fundamentally changed the way human beings see the world, thereby changing human condition through new forms of media:

Perspective makes the eye the centre of the visible world. But the human eye can only be in one place at a time; it takes its visible world with it as it walks. With the invention of the camera, everything changed. We could see things which were not there in front of us. Appearances could travel across the world. It was no longer so easy to think of appearances always travelling regularly to a single centre.⁷²

Whether recorded digitally or through analogue means, a *media object* is a time-delayed representation of perspective. A media object can include any sort of subjective representation of an objective thing or space, such as a

⁷¹ Victor Margolin and Richard Buchanan, *The idea of design* (Cambridge Mass: MIT Press, 1995), 12.

⁷² John Berger, “Reproductions,” *Ways of Seeing* (London: British Broadcasting Corporation, 1972), <http://uk.youtube.com/watch?v=LnfB-pUm3el>.

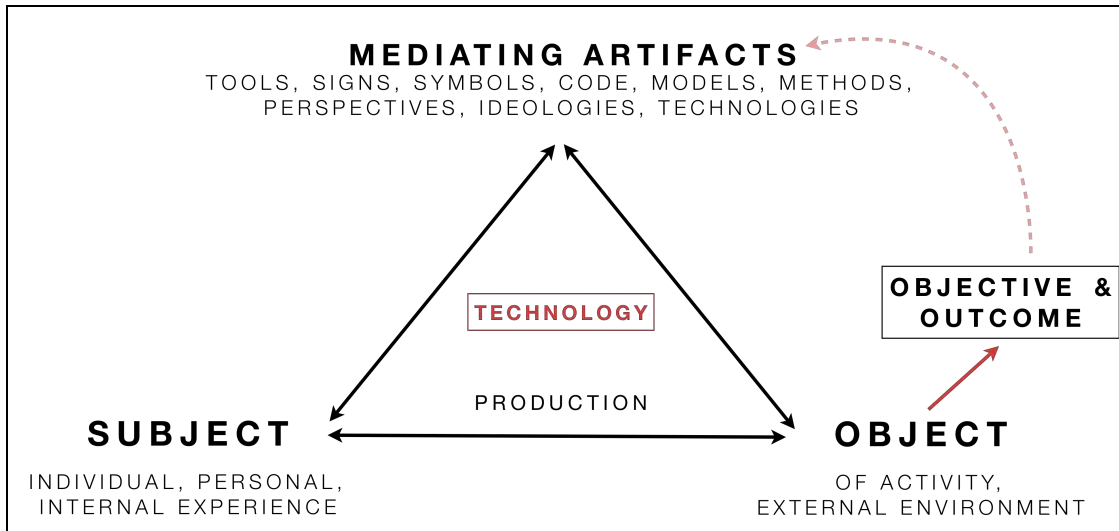
photograph of a celebrity, a painting of a pipe, a professionally-shot film or raw and unedited video recordings. A media object can be text-based, as a representation in written form, such as a description of a restaurant dining experience that acts as a review for other interested parties, then published in a newspaper or transmitted over digital networks. A media object can simply be a story, bound in a book and stored on a shelf, or sold at a garage sale, or ordered off of amazon.com.

Because of their diversity, while at the same time all being media objects, the result is a complex and dynamic ecosystem, composed of smaller systems within. Some objects are short-lived, temporary reverberations of a real-time event, perhaps taking place so closely aligned to the event in time that we see them as taking place “live”, though at the same time knowing it’s not quite happening in real-time. Past technological constraints didn’t allow for all of these recordings to exist for long periods of time, but when collected and stored – digitally or otherwise – collections of media objects become the *archives* that shape human culture and history. However, not all objects are created equal.

As humans, we subjectively perceive the qualities of an object in terms of what these qualities allow us to do, or, what potential *outcomes* the object affords us (Figure 17). In other words, “our perceptual systems are geared towards understanding what we can use objects to do and whether they are optimal for such purposes.”⁷³

⁷³ James Gibson, *The ecological approach to visual perception* (Hillsdale N.J.: Lawrence Erlbaum Associates, 1986), 127; cited in Christensen, *The innovator's solution : creating and sustaining successful growth*, 97.

Figure 17 Vygotsky's mediational model and basic activity system



In this way we act upon objects in as much as we produce them. Furthermore, we act upon objective things and spaces in order to produce objects that can then be used to act upon other objects, that is, as *tools*. For example, producing a hammer to build a house, building a camera to take a picture, using a picture to build a scrapbook, etc, etc. We design objects and use them as tools because of what they afford us in terms of future actions, and what constraints they allow us to overcome as *mediating artifacts* of human activity.

3.3.2 Affordances and constraints

The design idea of *affordances* is basically just the “glass-half-full” way of looking at its counterpart of *constraints*. A constraint is an equally important design term, and perhaps the most fundamental of all design concepts. Celebrated American designer Charles Eames claimed that “design depends largely on constraints”, if not “the sum of all constraints.”⁷⁴ Like building a car to get around the constraints of time and geographical distance, we design objects as tools in order to overcome constraints, or we design them as *art* for our own non-practical contemplation and reflection. The concepts of

⁷⁴ Charles Eames, "Design Q&A" with L. Amic, quoted in *Eames Design: the work of the Office of Charles and Ray Eames* by John Neuhart (New York: H.N. Abrams, 1989), 14.

affordances and constraints will be critical here, since this project deals with constraints in design, constraints in learning, constraints in business, as well as the affordances of a technology platform like PColP™ to overcome the constraints in these environments.

Drawing on the field of *cultural-historical activity theory*, the use of Vygotsky's basic model of mediated human activity in the production, use, and re-use of culture can be seen as the equivalent to supply and demand graphs that are standard in economics (depicted in subject-media-object triangles as shown in Figure 17). Like supply and demand curves in traditional MBA projects, Vygotsky's mediational model acts as the basic framework for my media and technology-focused MBA research. Engeström explains the model in this way:

In the model, the subject refers to the individual or sub-group whose agency is chosen as the point of view in the analysis. The object refers to the 'raw material' or 'problem space' at which the activity is directed and which is molded and transformed into outcomes with the help of physical and symbolic, external and internal mediating instruments, including both tools and signs.⁷⁵

The resulting dynamic is a tenuous balance between subjective and objective positions that is ultimately the space of *media*, i.e. the artifacts of human culture, the things, tools, representations, and knowledge that mediate human activity. This *middle ground* is also where perspectives – when objectified into media objects – can be shared with others, sometimes colliding and sometime coordinated through the way that objective spaces, things, and situations can be *framed* differently at different points of time.

Certainly, our subjective perspectives can and do collide when externalized and encountered by others, as can our intentions and actions. But they all can be *coordinated* and experienced collectively at some level. And that's really a significant *objective* with this ongoing academic work, to “engage multiple

⁷⁵ Yrjö Engeström, *Learning by expanding*, 1987, 78.

points of view,”⁷⁶ and leads to an approach for developing methodology using an appropriate camera-ready metaphor as a working definition, specifically, as “a coordinated set of set of lenses through which to interpret the world.”⁷⁷

3.3.3 Coordinated lenses

Cole’s definition of *methodology* as a “pattern of mediation in the process of inquiry”⁷⁸ is at the foundation of this project, as will be demonstrated in the upcoming 4: METHOD section. Cole’s definition of methodology, when applied in my previous and related research in these areas (though directed towards technology and culture rather than management of technology),⁷⁹ produced a *method* as a result to my study. This “coordinated lenses” method, later renamed “metaphraming,”⁸⁰ was developed by using a process of inquiry that combined perspectives of marketing, technology, and culture originally based on frameworks for deconstructing the video game industry.⁸¹ When modified from this framework was used to evaluate objects and processes of digital culture, specifically, the noun, verb, and buzzword known as *remix*.

Central to this previous method-producing activity and lens coordination was the discovery of a pattern of three-level systems across interdisciplinary fields. This common three-level pattern allowed for the integration of several theoretical lenses and created a very vibrant and dynamic discussion on the subject of remix culture, as represented in the modified model in Figure 18:

⁷⁶ John Berger, “Ways of Seeing (book excerpt),” 1972, <http://jan.ucc.nau.edu/~jsa3/hum355/readings/berger.htm>.

⁷⁷ *Cultural psychology*, 338.

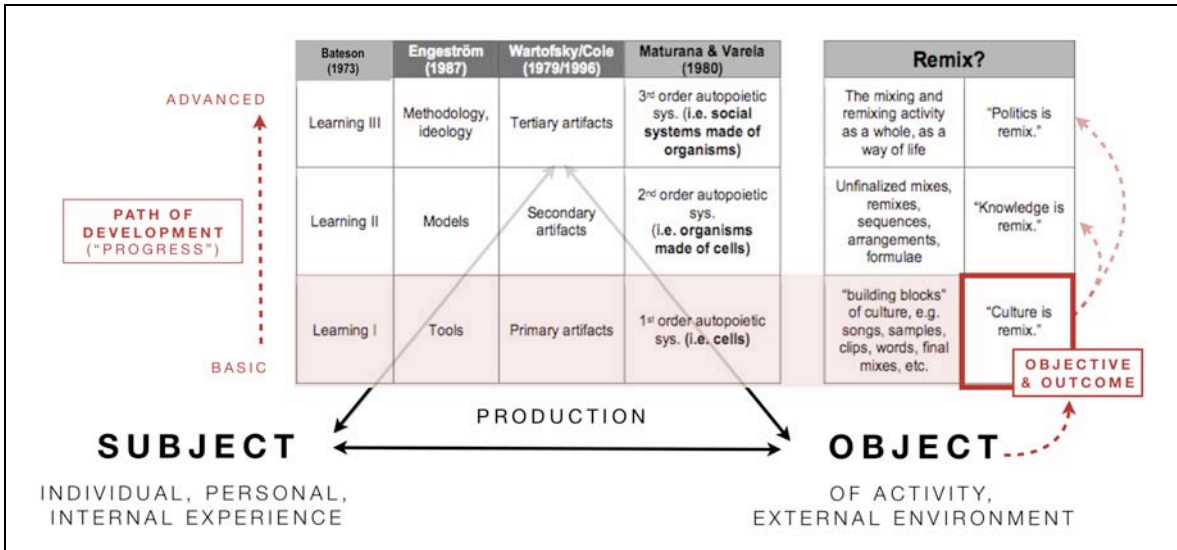
⁷⁸ *Ibid.*

⁷⁹ Joel, A. Flynn, “Travels in Intertextuality.”

⁸⁰ Joel Flynn, “Metaphrames and Interaction,” in *Proceedings of OURMedia 6th International Conference: Sydney April 9-13, 2007* (presented at the OURMedia 6th International Conference, Sydney, Australia, 2007), http://www.karmafia.com/papers/jflynn_metaphrames_feb07.pdf.

⁸¹ Stephen Kline, Nick Dyer-Witheford, and Greig De Peuter, *Digital play: the interaction of technology, culture, and marketing* (Montréal: McGill-Queen’s University Press, 2003).

Figure 18 Framework for coordinating theoretical lenses around remix culture



While the metaphraming method is more of a descriptive framework for discussing the inner workings of digital culture’s use and reuse of digital media objects as remixes and “mashups”, was able to coordinate theoretical frameworks from cultural and developmental psychology,⁸² cultural-historical activity theory,⁸³ and complex systems theory⁸⁴ in a way that tied to remix scholar and Stanford Law Professor Larry Lessig’s paradigm of: “Culture is remix. Knowledge is remix. Politics is remix”⁸⁵, as depicted earlier in Figure 18.

The method produced in my previous work achieved this coordination by describing remix culture in terms of a set of dynamic of self-producing three-level systems. Each system consisted of:

⁸² Marx W. Wartofsky, *Models: representation and the scientific understanding* (Dordrecht, Holland ; Boston: D. Reidel Pub. Co., 1979), 209-210; Cole, *Cultural psychology*.

⁸³ Engeström, *Learning by expanding*; Gregory Bateson, *Steps to an ecology of mind*.

⁸⁴ Maturana and Varela, *Autopoiesis and cognition: the realization of the living*; Mark C. Taylor, *The moment of complexity: emerging network culture* (Chicago: University of Chicago Press, 2001); Phil Graham, “Monopoly, Monopsony, and the Value of Culture in a Knowledge Economy: An axiology of two multimedia resource repositories.,” in *Cybraries: Literacies, Economies, Pedagogies*. (Lawrence Erlbaum.), <http://www.philgraham.net/monoposony.pdf>.

⁸⁵ Lawrence Lessig, “The Research, Review, and Remix of Scholarship in the Digital Age” (presented at the Scholarship in the Digital Age, Annenberg Center for Communication, University of Southern California, December 11, 2004), <http://www.iml.annenberg.edu/html/research/summits/summitsVideoPublic.htm>.

1. **“Building blocks”** (of culture) as representing modular bits and pieces, cells, components, ingredients, that can be switched in and out dynamically as resources to be considered for use or used in managing projects.
2. **“Mixes”**, which are the arrangements of the modular building blocks mentioned above, but are not actually the building blocks themselves, only the instructions on how to arrange these pieces. They can also be seen as recipes, methods, processes, strategies, all which can make use of varied building blocks in order to achieve a goal or objective. They can also be used as building blocks in other mixes, i.e. remixes. Because they don’t contain the actual pieces, but are just the instructions, they are more easily transferred to other communities and preserved as *knowledge*.
3. **“Frames”**, or the idea of perspectives of interest or value, or “lenses”² of perception that imply focusing on what’s relevant and excluding or deemphasizing that which is not.

The third level is of particular importance to the idea of coordinating lenses, and in effect it has theoretically framed my research in its interdisciplinary directions. In a subsequent conference paper, I would re-name this third-level in the remix system as *metaphrames*.⁸⁶ This name was meant to imply Cole and Wartofsky’s ideas on the powerful and useful role of metaphors as the most common kind of tertiary (3rd-level) cultural artifact.⁸⁷ It also referenced back on itself with Cole’s use of “lenses” to methodologically frame and solve research problems. Significant discussion has already been devoted in these past works to the complexities of methodological attempt just described, and the metaphraming method it produced as a result.

While challenging, the use of metaphor has been valuable in attempting to discuss and manage the abstract and intangible complexities of current technological systems. Describing these systems using terms like “cloud computing” and “digital ecosystems” is indicative of the important role that natural and ecological perspectives play in developing useful metaphors for complex and dynamic technological systems. A much deeper discussion of these natural metaphors, not only of their use but of their limitations as well, is

⁸⁶ Joel Flynn, “Metaphrames and Interaction.”

⁸⁷ Cole, *Cultural psychology*, 121-122; Wartofsky, *Models: representation and the scientific understanding*, 204-210.

important to the overall work taking place in the **seedfeed™** project, and a great deal of such discussion has taken place already and continues to do so. However, a further discussion in this direction must be limited. The focus from here on must be in coordinating the needed lenses that will extend and refine Figure 18's set of three-level frameworks in a way that ties back into previous discussions, i.e. disruptive innovation in education and entertainment, and the complex system taking place in IxD methodology.

3.4 The complex ecosystem of learning and design

TAGS: [1ST ORDER SYSTEM], [2ND ORDER SYSTEM], [3RD ORDER SYSTEM], [CELL], [ORGANISM], [COMMUNITY], [POPULATION], [SELF-REFLECTION], [ADAPTIVE], [COMPLEXITY], [ECOSYSTEM] [SUSTAINABILITY]

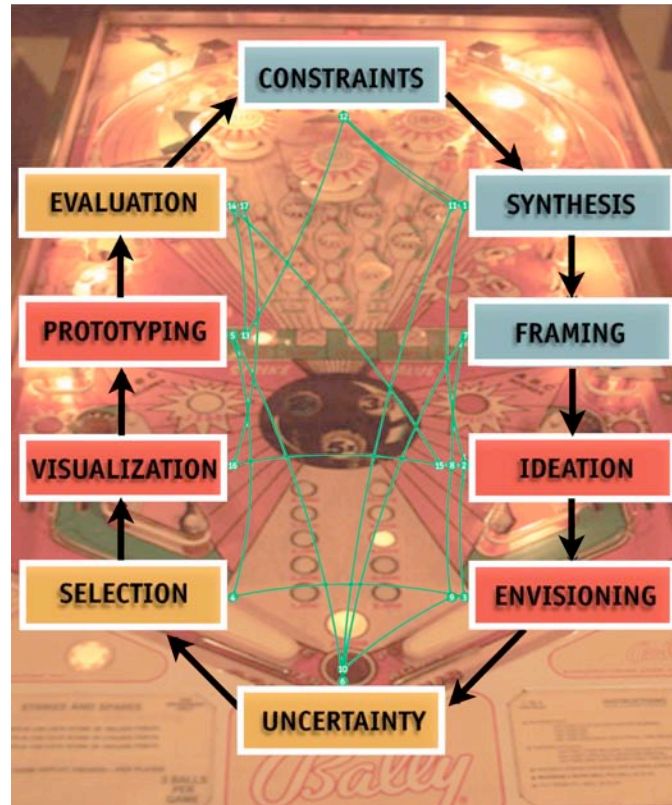
A necessary distinction needs to be made here between method and methodology. This distinction is actually consistent with the three-leveled systems previously discussed, particularly Engeström's classification of models and methods as secondary cultural artifacts.⁸⁸ Models and methods in this case are specific instructions, recipes, or arrangements of cultural "building blocks" that in effect act as knowledge that can be transferred across contexts (including generations). Methodologies, by distinction, can be seen as the tertiary level perspectives, values systems, and frameworks that produce the specific instances of method. So while methodology implies a goal to be attempted, method is a specific strategy for achieving this goal. By extension at the first level of tools, components, and building blocks are the "tactics" used to support a strategy in pursuit of a goal.

Therefore, when discussing Moggridge's IxD *methodology*, it is to be considered as such a framework for viewing the design process and its outcomes, but not as a specific step-by-step method found in traditional linear methodologies. From his own experiences in dealing with design situations at the influential design firm IDEO, he found that a linear, step-by-step set of instructions was not appropriate for the complexities and contingencies that

⁸⁸ Engeström, *Learning by expanding*.

designers face with today’s problems. Instead, he offers a non-linear framework where, even though it “will often be used in the same sequence, and repeated iteratively... the most productive process is usually out of order, it can sometimes seem almost random,”⁸⁹ like the pinball table in Figure 19:

Figure 19 Moggridge’s IxD methodology in *Designing Interactions* (2007)



This non-linear methodology becomes closer to a method by modelling ten activities as stages representing a common design process. The model suggest designers will normally try to move orderly and iteratively through the activities in a counter-clockwise direction (as represented with the black arrows). In terms of how the process actually plays out, Moggridge argues “the pattern is complex and less orderly than a clockwise cycle.”⁹⁰ Rather, it bounces around the various

⁸⁹ Moggridge, “People and Prototypes,” 729.

⁹⁰ Ibid., 730.

stages “more like playing with a pinball machine, where one bounces rapidly in unexpected directions”⁹¹ In his metaphorical representation, the pinball bounces between various points in the table, as represented with the curved green lines in the graphic.

While not explicitly stated, the pinball’s movement is constantly affected by the natural (metaphorical) pull of gravity towards the bottom end of the table. This natural pull of gravity can be viewed as a tendency towards *uncertainty* with respect to a design’s effectiveness over time. As can be seen in the collection of digital media that has come out of **seedfeed**™ development efforts, there is a natural back-and-forth (or in terms of the pinball table metaphor, *up-and-down*) between the certainties of defining some constraints to begin the design process, and the uncertainties that result as the problem space is further studied and explored.

The usefulness of this non-linear methodological view of design process is also its challenge and major criticism, that is, how to actually apply it. After presenting this framework and explaining the its elements (which all are all summarized discussed in APPENDIX 1: Moggridge’s IxD method explained”, there is little guidance that follows on what can be done to use this framework in a practical manner. For example, if sustainability is an objective for the design of a new product, and is seen as part of its value proposition, how can this IxD method be used to get there?

3.4.1 Steps towards ecology and sustainability

Whether waste production, or issues of current public discourse such as climate change and renewable energy, sustainability is a “hot topic”. The popularity of the term as a buzzword can be found in debates relating to the ecological challenges and the effects of human resource consumption on the planet. But what is meant by the term “sustainability” in design? And, for that

⁹¹ Ibid., 650.

matter, what does it mean to have an “ecological” view of the world? Or, how does one take “steps to an ecology of mind”⁹²?

In terms of the physical world and the things that we as humans produce and consume, sustainability usually comes into play in “cradle-to-cradle” discussions, such as in product life cycles assessment.⁹³ Designers use these perspectives when attempting to factor in the cost of waste produced as a designed object is used, as well as what remains from the object after it is used up. As designer Alice Rawsthorn describes in Gary Hustwit’s film *Objectified* (2009):

Sustainability isn’t just sort of a glamorous process of using recycled materials. To design may or may not be the color green. It’s about redesigning every single aspect of a company’s process, from sourcing materials to designing to production to shipping, and then eventually designing a way for those products to be disposed of responsibly. That’s a mammoth task, so it’s no wonder that designers and manufacturers are finding it so difficult.⁹⁴

So as more and more of the “things” that humans produce and consume end up in landfills, it becomes the responsibility of designers to take sustainability into consideration. Moggridge himself also appears several times in Hustwit’s film, and summarizes the sustainability problem as “the idea that what we do is not just the way we create some individual design, it’s what happens afterwards when we’ve finished our design and people have used it, this sort of cradle-to-cradle concept.”⁹⁵ He understands an ecological perspective as being the point

⁹² Gregory Bateson, *Steps to an ecology of mind*.

⁹³ William McDonough, *Cradle to cradle: remaking the way we make things*, 1st ed. (New York: North Point Press, 2002).

⁹⁴ *Objectified: A documentary film about industrial design*, Documentary (PlexiFilm, 2009), <http://www.objectifiedfilm.com/>.

⁹⁵ Moggridge, in Hustwit, *Objectified*.

of view from the user of “the interdependence of living things for sustainable design.”⁹⁶

In what Moggridge calls a “hierarchy of complexity”⁹⁷, the ecological perspective is positioned as the most complex from the point of view of a user, i.e. in terms having to design around the ecological concerns that present an increasingly complex number or relevant constraints (Figure 20):

Figure 20 Hierarchy of complexity (Moggridge 2007, p. 652)



In moving down this ladder, it can be seen how the constraints become clearer, more tangible, more measurable, and more responsive to direct action. For example, anthropometrics and physiology are taken most into consideration when designing around the size of people, and around direct physiological (i.e.

⁹⁶ Moggridge, “People and Prototypes,” 652.

⁹⁷ Ibid.

body-related) interactions with a system. Design and user interaction become responses to a system as it is, or as it is presented, in the kind of stimulus-response framework that regulates our bodies. Design and interaction here can be applied to designing around the animal world as well, though not in the ecological sense. For example, designing a horse and carriage system or a bird feeder obviously involve different levels of complexity, but are inherently related to the size of the animal and the way its body works, whether it's a horse or a bird or a human being.

Moving into psychology and sociology, that is, areas of complexity where humans start to move into much different worlds than animals, the level of complexity increases as the mind takes on an increasingly prominent role. Here, subjective qualities and effects on social relationships lead to awareness and understanding of *context*, i.e. not just responding to stimuli but the context that produces the stimuli, and aware of different ways a response take place. Language plays a dominant role in these areas, both *internally* (in mental models) and *externally* in objective communication in social systems, again, as part of the context for all human activity. Whether in physical or digital environments, there are social and psychological characteristics that allow humans to both connect *to* technologies and *through* technologies. Regardless of how complex the technologies are, what helps characterise these social and psychological factors is seeing communication not simply as a response to given situation. Rather, at the social and psychological levels, there is actually an understanding of the context of an activity and its implications in the “bigger picture” situation.

Finally, by the time the hierarchy has reached *ecology*, understanding has moved from the directness of individually-experienced physical and physiological activities, to internal mental processes of psychology, through the sociology of interactions between individuals and groups, and into the cultural systems, economies, and systems of language and communication that make up civilization and the human condition, i.e. anthropology. At the

anthropological level, the perspective of the world involves not just an understanding of how these systems play as part of “the human condition”, one that spans geography and generations. It also implies a belief in our own ability to guide this development over time and across cultures, i.e. we have the ability to shape or design our future, not just react to the world as it is. The ecological perspective is literally the natural next step, i.e. understanding how humans exist as part of natural ecosystems that have their own complexities and internal logic that may be at odds with human cultural systems. Sustainability involves an understanding of the increasing complexity of each of these steps towards ecology. IDEO’s Tim Brown, the design firm’s President and CEO, describes sustainability in design as having “to think about these complex systems in which our products exist.”⁹⁸ In this sense, complexity for the designer happens by taking on (acting upon the object) and taking in (through internalization) all the other levels of the hierarchy beneath it.

3.4.2 Back down the ladder of complexity, into the digital world

Ultimately, in age where information systems influence our lives daily as much as natural ecosystems, consideration now has to be given to the role of digitization at the anthropological level. While these digital ecosystems are not natural systems in their own right, the ecological awareness extends back down the hierarchy into the digital world of things that have no physical tangibility, but rather are made up of 0s, 1s, codes, and commands. Unlike the physical world, the information that forms digital spaces is inherently non-rivalrous and non-excludable in the sense of “public goods.”⁹⁹ For example, in the context of educational media resources that are completely digital, unlike physical textbooks, these resources are perfectly reproducible, and don’t get used up in the same way that natural and physical resources do.

Both physical and digital versions have differences in the complexities of their environments, even when they have been artificially designed to behave more

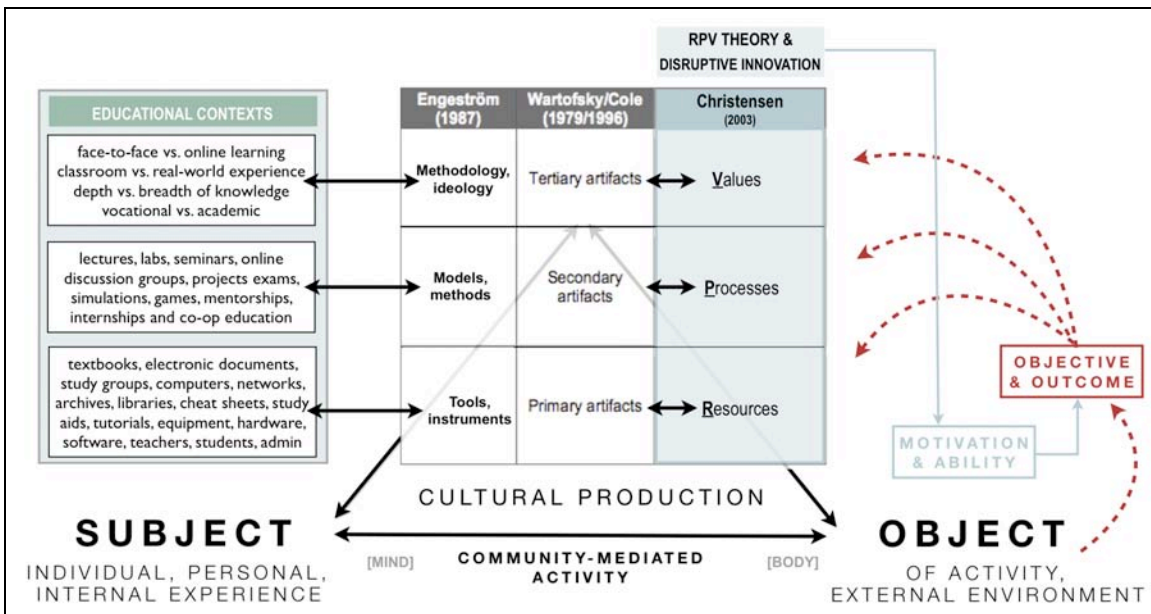
⁹⁸ Hustwit, *Objectified*.

⁹⁹ Dini et al., “Beyond interoperability to digital ecosystems,” 410–426.

like each other. Opening up a real world economy at the cost of its efficiency, in order for it to behave more like a digital equivalent, may only make sense after seeing the social value created by economies of sharing on the internet. In the other direction, our real world needs and the social benefits of privacy, identity, and accountability are added to digital systems that ultimately work fine, if not more efficiently, with anonymous users and less bureaucracy. Sustainability in design has to address these complexities in whatever form they take, as well as in the complexity of moving from one form to another.

As an example relating to the changing complexities and form of educational systems, consider the market and industry for textbooks – both physical and digital. To demonstrate the dynamics of the educational context in this case, Christensen’s RPV theory can be coordinated with previous meditational models and lenses (Figure 21)

Figure 21 Christensen’s RPV theory integrated with meditational frameworks



Tools of instruction – or resources – are valued differently depending on the kind of educational contexts and systems they’re found in, i.e. textbooks are useful

for individual study, less so for group work or on-the-job training. Students may find it easier to read a textbook, but may also value access to the same content on a smartphone due to time spent commuting to school on a train. Differences in the *processes* used in education lead to different emphasis on the tools and resources used, e.g. from face-to-face classroom models to online delivery, to differences between kinds of face-to-face learning, e.g. learning through one-to-one mentorships vs. in lecture halls of 200 to 1 student-teacher ratios.

Socially created copyright regulations are tools that affect the processes of educational delivery, whether intentionally or not. They can apply to the physical printing of course materials, and affect the processes around how these tools/resources are used in class. However, the regulations may not apply in the same way to their digital equivalents, nor are these digital equivalents able used or valued in the same ways. In other words, the ways in which these course materials depends on the values systems of students, faculty, and the institutions that are motivated to use the materials (or not).

A tipping point may have been reached¹⁰⁰ due to the high costs of licensing physical educational materials, e.g. the content that goes into the traditional printed course pack, in addition to the ecological effects of using limited natural resources for temporary materials (e.g. books) that can just as easily exist in digital form. Colleges and universities are now seeking to replace – rather than complement – these physical copies completely, that is, a change at the ideological and methodological (tertiary) level that is equivalent to Christensen's *values* in RPV theory.

Schools using technological alternatives in order to reduce operating costs in this way have different motivations and objectives than schools wanting to “leverage their massive investments in technology to provide students with

¹⁰⁰ “Copyright fees take schools to tech tipping point,” *The Ottawa Citizen*, December 21, 2010, <http://www.canada.com/Copyright+fees+take+schools+tech+tipping+point/4008701/story.html>.

better, more engaging and interactive learning experiences.”¹⁰¹ A school looking to reduce its environmental footprint, or open up classroom space, by increasing the amount of digital content it uses rather than physical resources finds itself in the same problem space, but for different reasons. These interests can be framed – within the same institutions - in such a way that they align to achieve both lower cost and better engagement, more classroom space and less carbon footprint, but one doesn’t necessarily lead to the other. Whatever the motivation or objective, the outcome is more content moving into digital archives. Yet as these archives grow and the different resources, processes, and values around them adjust to the complexities of the the growth, can the systems still be sustainable?

Clearly, there is a relationship between the increasing complexity of products, or of the systems in which these products exist, and designing with the objective of sustainability for these systems. We often refer to such complex systems as *ecosystems*, particularly when they exhibit renewability, or self-sustaining characteristics. With respect to **seedfeed**™, it can be thought of a *digital ecosystem* of student users, instructors, professional mentors, and different audiences all interconnected but interacting remotely around digital media objects emerging from pools of concert video recordings, or any other archive of digital media in need of a purpose such as being put to valuable use in collaborative online learning environments. Thinking of systems in this way – digital, ecological, complex, adaptive, or otherwise – has another connection to learning, in particular through the work of Gregory Bateson.

3.4.3 Hierarchy of complexity versus levels of learning

Just as Moggridge proposes a hierarchy of complexity for dealing with design problems, Bateson, a biologist and systems theorist,¹⁰² proposed a hierarchy of learning as his work moved into human development and cognition in the early

¹⁰¹ *ibid.*

¹⁰² Paul Tosey, “Bateson’s Levels Of Learning: a Framework For Transformative Learning?,” in (presented at the Universities’ Forum for Human Resource Development conference, University of Tilburg, May 2006, 2006), www.NLPresearch.org.

1970s.¹⁰³ The two are not unrelated, or at least are argued here to have conceptual connections that will help establish a theoretical grounding needed for approaching methodology as a “coordinated set of lenses through which to interpret the world.”¹⁰⁴ In this respect, a coordination of lenses should already be apparent, but if not, can be demonstrated by connecting these two hierarchies in what Bateson might call *patterns which connect*.¹⁰⁵

Bateson’s framework for “The Logical Categories of Learning and Communication”¹⁰⁶ consists of five levels, of which only the following are of relevance here:

Learning I happens when an individual acts on an object or environment which produces reactions that change the individual’s response as he or she learns of a set of possible responses, i.e. trial and error and learning by doing, rather than just the pure reaction of stimulus-response yes-or-no answers. In other words, learned behaviour.

Learning II happens when the individual figures out how to change the possible set of responses and their arrangements, for example, changing a “yes or no” answer to a “yes, if this..., no, if this...”, i.e. learning to learn, rather than by reacting. This is the common learning we think about as part of our formal and informal education, that is, training to be able to apply a learning pattern to a different set of conditions (i.e. in the real world and outside of the classroom), or even just in synthesizing the pattern as tacit knowledge in order to solve the problem faster.

Learning III, which is argued to be much more rare, happens when a contradiction is overcome between two different value systems, e.g. figuring out how to achieve a “win-win” situation and/or avoiding the “lose/lose”, or

¹⁰³ Gregory Bateson, *Steps to an ecology of mind*.

¹⁰⁴ Cole, *Cultural psychology*, 338.

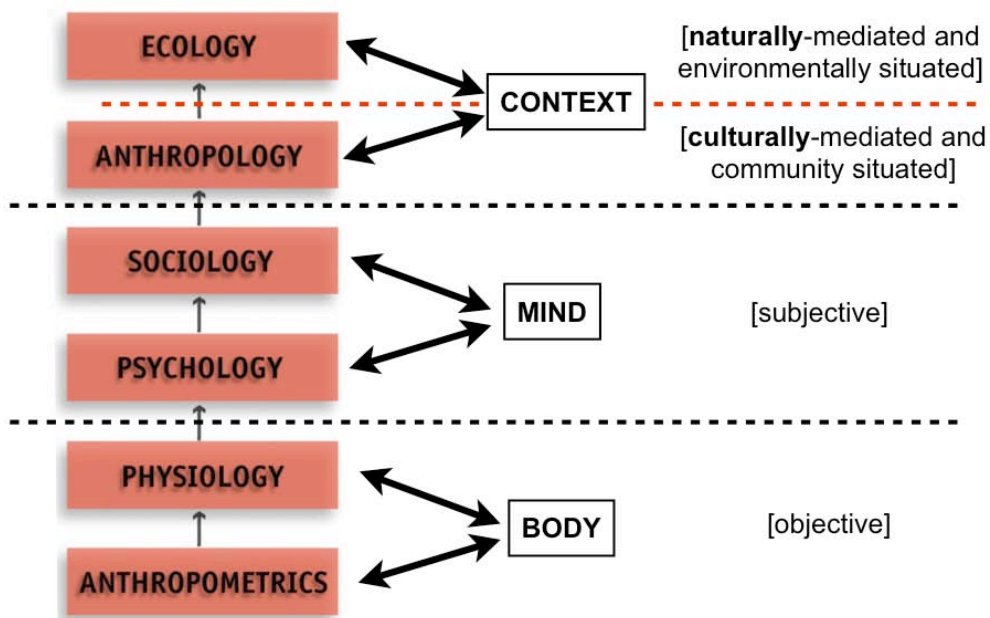
¹⁰⁵ Bateson, quoted in Tyler Volk, Jeffrey W. Bloom, and John Richards, “Toward a science of metapatterns: building upon Bateson’s foundation,” *Kybernetes* 36, no. 7 (2007): 1071; D. Whitehand, “Patterns That Connect,” *Leonardo* 42, no. 1 (2009): 10–15.

¹⁰⁶ Gregory Bateson, *Steps to an ecology of mind*, 250–279.

“double-bind” situations. It requires successfully coordinating different interests in a single system, which is why it is challenging over the long term, but also argued as what drives human development.

The descriptions of Bateson’s levels of learning, even though I had encountered them in previous research and had even coordinated them with my past methodological attempt (see Figure 18), have taken on a new perspective when looked at in comparison to Moggridge’s hierarchy of complexity. While exploratory at this stage, in looking more closely at the six levels of complexity, an argument can be made that they can also be grouped as three sets of pairs, as shown below in Figure 22:

Figure 22 Refining Moggridge’s hierarchy of complexity



Interestingly enough, this *body-mind-context* dynamic in is also represented in the Vygotskian mediation model of *subject-object-media*, itself a response to the Cartesian problem of dualism in the mind vs. body split.¹⁰⁷ John Seely

¹⁰⁷ Hargadon, “John Seely Brown on Web 2.0 and the Culture of Learning.”

Brown comments in this problem with respect to participation in certain academic communities of practice, more commonly known to students as “study groups”. Education and technology blogger Steve Hargadon notes Brown’s comments from a 2007 interview on “the culture of learning”:

One of the best indicators of success in college is if you know how to form and join study groups, where you socially engage with others and collaborate. Huge shift from Cartesian "I think therefore I am" (knowledge as a substance getting poured into your head) to "we participate therefore we are." It is in participation with others that we come into "being" and internalize our own understandings of the world.¹⁰⁸

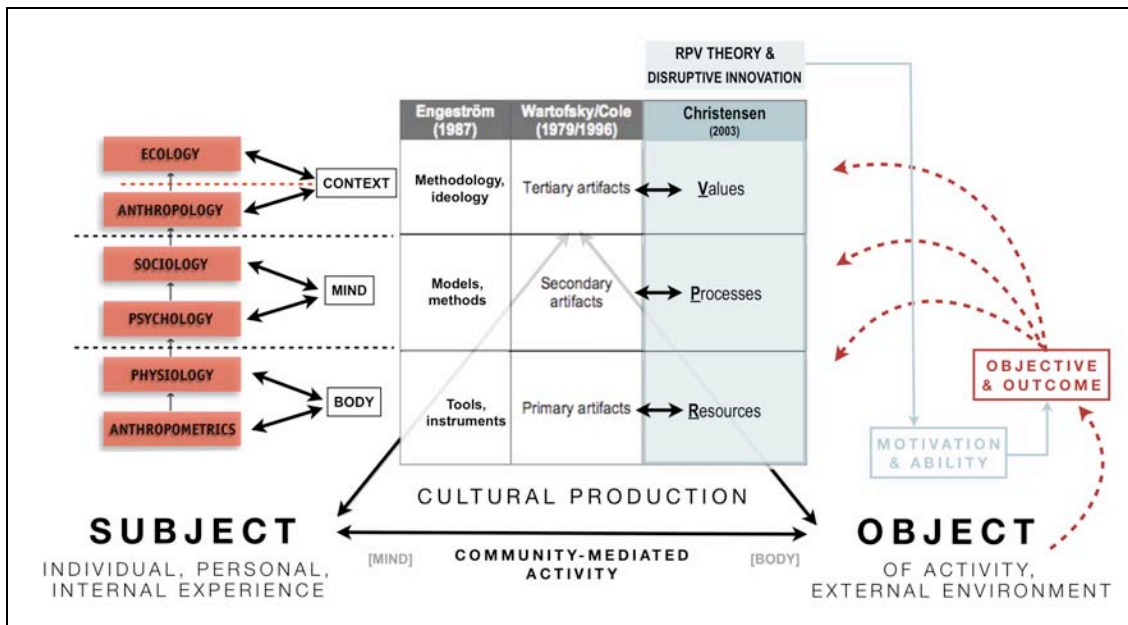
Therefore, the “huge shift” in learning has come from a greater understanding of interactions taking place within this dynamic and complex three-level system of human learning:

1. **Anthropometrics** and **Physiology** as areas related most directly to the *body* and its objective aspects;
2. **Psychology** and **Sociology** as most directly related to the *mind* and its subjectivity, whether it is the individual mind or through a social and collective sense of consciousness;
3. **Anthropology** and **Ecology** as most directly related to issues of *context*, that is, the mediating aspects of human cultural systems of artifacts and communities, as well as natural ecosystems.

While the contextual role of community in situating and mediating human activity is more clearly represented in Engeström’s version of the activity system (shown in a more advanced mediation models in Figure 25 in the upcoming METHOD section), the overall connections here are quite powerful and deserve additional discussion that is beyond the scope of this project. To visually represent how the connections are being made, Figure 23 (next page) shows Moggridge’s hierarchy of complexity added to previously coordinated mediation models, including Christensen’s RPV theory. Obviously, as the lenses coordinate, the system becomes increasingly complex.

¹⁰⁸ Ibid.

Figure 23 Coordinating IxD and the “hierarchy of complexity” with three-level systems



In comparison to earlier versions of the model depicted above, such as in the model shown in Figure 18 that emerged from my research in remix culture, some lenses have been added while others have fallen away. Specifically, Maturana and Varela’s three-order autopoietic system is no longer in focus, now replaced by Christensen’s RPV framework, and Moggridge’s hierarchy of complexity. There are practical reasons for this development, not only from the attempt to make use of Moggridge’s IxD methodology, but also because for the sometimes overwhelming difficulty of dealing with complexity.

Earlier in this work, what I was trying to do while positioning Moggridge’s IxD methodology within this research at its early stages, was find practical solutions for dealing with the complexities and non-linear dynamics of design for digital media archives. I believed I had already covered the issues of complexity in design through other sources, including from cybernetics, autopoiesis, and complex adaptive systems. At some point, however, this theory section collapsed under the weight of itself and the amount of writing directed to

complexity alone put the entire project in danger of metaphorically going “off the rails”. After some encouragement and convincing (!) on the benefits of cutting this section of theory out, if only for the general well being of the reader, I did so while extremely concerned about what was now left behind.

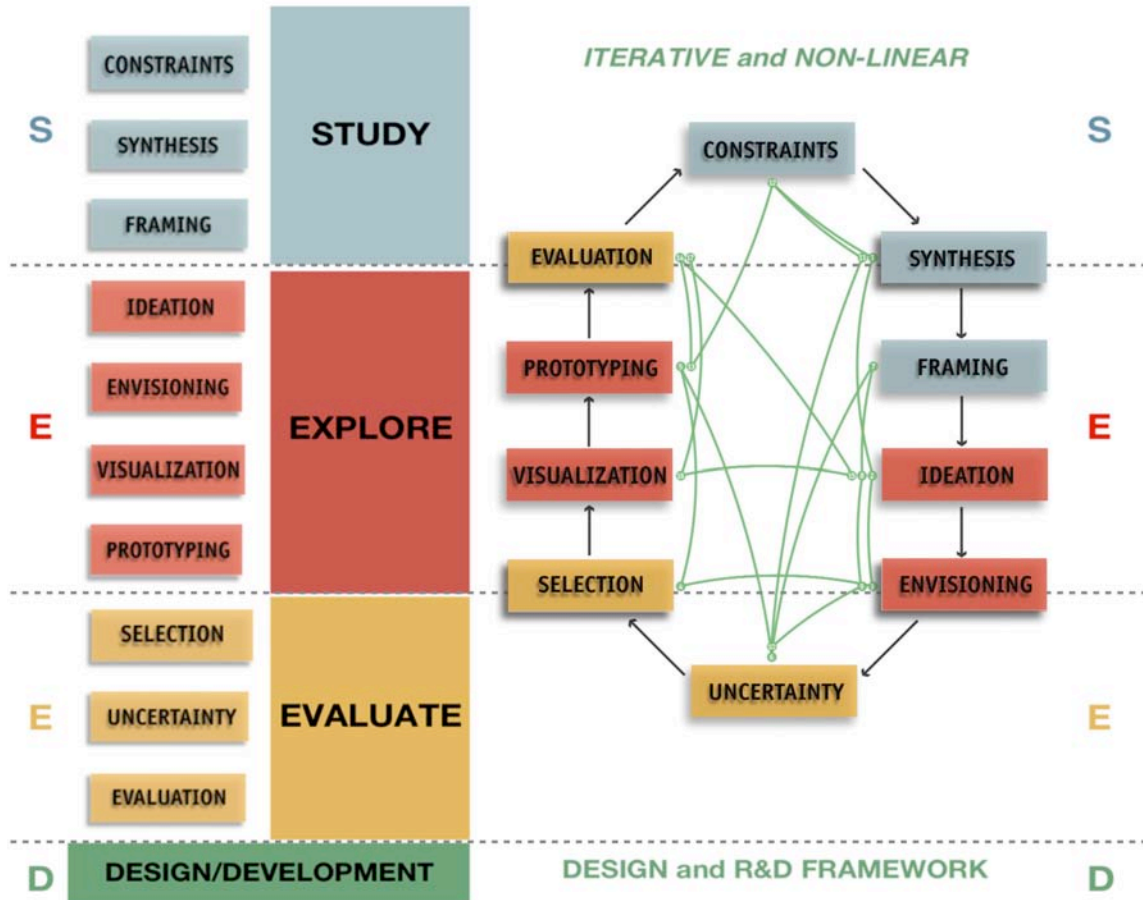
I found myself having made a significant issue of dealing with complexity by way of metaphors as useful and common tools where needed (e.g. “cloud computing”, “pools” of media objects, “streams” and “flows” of information, etc.). In trying to set up the non-linear “pinball” metaphor of Moggridge’s IxD methodology, a lot of chips (metaphorically speaking) had been put on the table, with respect to including adequate background on complex systems. Removing much of the complexity discussion suddenly left me wondering how the point of much of the material and rationale relating to the untried and untested IxD method was now lost.

In reaction, I felt I needed to find a way to *reframe* issues of complexity in design, but in a way that still kept in line with Moggridge’s methodological approach. Since I had already cut his “hierarchy of complexity” out of the project once before (as there was already enough material on complexity from other sources), it didn’t immediately come to mind to refocus on this model instead. But when I realized the hierarchy of complexity model could work sufficiently in this regard, it nicely led back to the ten-part IxD methodology, which is not surprising since Moggridge set up the methodology in the same way. The methodology will now be further investigated, refined, and reinterpreted in hopes of finding a way to put it to use as a specific method for evaluating digital ecosystems. In particular, this applied method needs to be useful in analyzing video archives in higher education and entertainment.

As for methodology itself, Moggridge depicts ten key stages of design activity, which are all discussed in detail in APPENDIX 1: Moggridge’s IxD method explained. Of note, Moggridge also colour codes these stages to reflect similar kinds of activities, and while he does not give names to these three colour

coded categories, we'll name them here in simplifying the model as S, E, E, and D or the **S/E/E/D** method (Figure 24)

Figure 24 Moggridge's IxD methodology, with Study/Explore/Evaluate categories added



These ideas on methodology have consistently shaped the arguments that have been presented up to this point. They have also given the reflective practitioner, author, and narrator of this work – myself – the ability to do some shaping of the problem from the outset. As it is a non-linear process, some of this shaping – or, more precisely, the coordination of lenses – has already been underway in previous work, and will continue to unfold in the sections that follow.

To summarize, this methodology consists of four inter-related and iterative stages, which have already been in practice here in this project:

STAGE 1: STUDY THE PROBLEM: or “S”

STAGE 2: EXPLORE THE POSSIBILITIES: or “E”

STAGE 3: EVALUATE THE ALTERNATIVES: or “E” (again)

STAGE 4: DESIGN AN OUTCOME: or “D”

Oh, and hope for a **SOLUTION...**

4: METHOD

While the digital content that has produced the **seedfeed**™ model has primarily come from recordings of live concert events and other performances, it can be applied to archives of other kinds of digital video content that can also be seen as part of a larger digital ecosystem. This “cloud” of multimedia content can be opened up for remote access and development by participating co-op students. An opportunity exists in this way for the **seedfeed**™ model to be used for research in digital ecosystems and innovation theory, or, in John Seely Brown’s sense of “rethinking and re-examining how value gets created” from a “ubiquitous-computing point of view”:

Technology is there to enhance our ability to be creative, to connect with other people, to learn from each other, and to learn from ourselves à la Donald Schön’s sense of “the reflective practitioner,” now extended to the reflective group... [and so] How do we engage multiple points of view? How do we use each other’s insights and triangulate our cognitive spheres to make maximal sense of the world at this moment in time?¹⁰⁹

The **seedfeed**™ project therefore presents opportunities for applied research in computer-supported cooperative work (CSCW) and educational technologies, even providing a test venue for hands-on applied learning, i.e. *learning-by-doing*¹¹⁰. In any research case, the **seedfeed**™ model requires participants to be “reflective practitioners”¹¹¹ in the work they are doing individually, as well as in the social context of “the reflective group.”¹¹² The previous theoretical background helps to establish the “cognitive spheres” and “coordinated lenses” needed to make “maximal sense” of **seedfeed**™ “at this moment in

¹⁰⁹ John Seely Brown, “User-centered design,” 101.

¹¹⁰ Mary Bateson, *Peripheral visions: learning along the way*, 152.

¹¹¹ Schön, *The Reflective Practitioner: how professionals think in action*.

¹¹² John Seely Brown, “User-centered design,” 101.

time”. However, the real usefulness of the theory and, in particular, Moggridge’s general methodological (IxD) framework will come from a move towards transforming these frameworks and building blocks of knowledge into **seedfeed™**’s very own *prescriptive method*.

4.1 The S/E/E/D prescription: model to method

As useful as it is to describe the general contexts of **sustainable ecosystems** of **event digitization** (i.e. **SEED**), while **framing** these ecosystems in terms of **education**, **entertainment**, and **disruption** (i.e. **FEED**), these perspectives only present descriptions of **seedfeed™**’s problem space. These are the descriptive contexts for the object of research, i.e. the “what” of the study, or at least what our perceptions of the object are. Its *prescriptive* angle, in contrast, suggests what to do when encountering this problem space, having recognized it through the descriptive lenses.

Within Moggridge’s non-linear IxD methodology and its ten-part model of typical design activities, a *prescriptive direction* can be taken by way of the four inter-related and iterative stages that Moggridge identified by grouping “activities of similar types”¹¹³:

STAGE 1: **STUDY** THE PROBLEM: or “S”

STAGE 2: **EXPLORE** THE POSSIBILITIES: or “E”

STAGE 3: **EVALUATE** THE ALTERNATIVES: or “E” (again)

STAGE 4: **DESIGN** AN OUTCOME: or “D”

Moggridge did not give the grouped activities names or descriptions, so the categories above act as my own contribution to the development of an actual method that is appropriate for this project and possibly of value for others, i.e. the **S/E/E/D** method. Additionally, this method provides a way to tie these

¹¹³ “People and Prototypes,” 730.

activities back into the **seedfeed**™ conceptual model itself, if not supporting its brand identity and marketability.

An issue with Moggridge's IxD methodology is that no real instructions were given on how to actually implement the framework in practice, other than using it for perception and description of complex design activities and how they unfold. There is no accompanying method explain how to make these activities unfold *better*. In other words, it's useful as a methodology, but less valuable if unable to produce more practical and prescriptive methods from its view of the problem space. Through the overall **seedfeed**™ conceptual model of sustainable ecosystems for event digitization (framed in terms of education, entertainment, and disruption), this prescriptive element has now been added.

The overall **S/E/E/D** method usually begins with an assessment of relevant constraints and dimensions (i.e. STUDY the problem), and eventually finishes by producing a final design solution (DESIGN an outcome), with a general tendency to want to move in an orderly direction from stage 1 to stage 4. However, in actual design practice, the process is non-linear by moving from one stage to another in any **S/E/E/D** order. Furthermore, while the intention behind these interrelated sets of activities is to design an outcome that will ultimately satisfy the needs of the problem/opportunity space, i.e. a *solution*; the actual outcomes may never quite get there. Instead, the system produces a continuing series of design iterations, or "strange loops", when coupled with reflection and evaluation on the outcomes.¹¹⁴ These recursive loops move *towards* a solution, but without ever reaching one. In other words, it is a system of perpetual prototypes and ongoing beta versions that become accepted as the unofficial standard.

Even when an "official" solution is reached, the process doesn't actually end since solving one problem may lead to other contingent problems – potentially

¹¹⁴ Taylor, *The moment of complexity*, 73-98.

“wicked problems”¹¹⁵ – or may only delay the impact of other problems temporarily. The successful iteration might also open up new opportunities that previously didn’t exist. The solution, as an *objective outcome*, in this way becomes a potential “building block” for new designs in the dynamic processes of a “perpetual innovation economy,”¹¹⁶ and therefore is in keeping the historically developing nature of human activity. In doing so, this particular *iteration* can be thought of as an *innovation*, and can be sustaining or disruptive.

4.2 Interdisciplinary Techniques

Theories of disruptive innovation obviously play a fundamental role in this project, yet there is innovation in a methodological approach here that coordinates lenses of disruptive innovation with emerging methods in interaction design. IxD methods are often used to address areas of product and service development where traditional market research techniques like questionnaires and surveys are too limited or may even be inappropriate. Emerging IxD techniques try to put more focus on understanding the motivations, values, and behaviors from the perspective of the user, i.e. user-centered design, rather than just focusing on the product and its features.

The “users” in **seedfeed**™ are for the most part students who are not directly customers of companies like Teradici, or Apple, or Canon, or of the promoters, artists, and venues involved in the event they’re capturing with branded equipment from various manufacturers. Rather, they are most directly customers of the University, though also part of a larger and much more complex digital ecosystem of their own. Again, IxD methods will be considered as the primary methodological framework in order to study interacting systems while making sure that the user is not left out of the picture. Moggridge’s IxD

¹¹⁵ Margolin and Buchanan, *The idea of design*, 12-17; H. W Rittel and M. M. Webber, “Dilemmas in a general theory of planning,” *Policy Sciences* 4 (1973): 155-169.

¹¹⁶ Kline, Dyer-Witthoford, and De Peuter, *Digital play: the interaction of technology, culture, and marketing*, 66-67.

methodology, while new and as-yet untested, is at least conceptually designed to address the complex and non-linear processes involved in the development of new technologies. To test the methodology requires it to be applied at the level of method, that is, using a set of instructions for operationalizing the study. This applied project therefore presents an opportunity to put such a method into practice, and perform design and market research on potential users and activity systems through the working prototype of the **seedfeed**™ model.

As an interdisciplinary discipline,¹¹⁷ IxD includes such fields as:

- The design of physical objects
- The design of physical man-machine systems
- The design of human-computer interactions
- The design of connected systems
- Global design
- Sustainable design

Stakeholder analysis, user-centered design, and prototyping techniques have become increasingly valuable in dealing with the complex adaptive systems and rapid technological changes that concern interaction designers. A toolkit of IxD techniques for solving what are often “wicked problems” in design¹¹⁸ can include the use of *cultural probes*¹¹⁹, *personas*¹²⁰, technology adoption models¹²¹, and *scenario-based design*¹²². Another technique, called *informance*, is particularly relevant to **seedfeed**™, as it uses live performance and video

¹¹⁷ Moggridge, “People and Prototypes,” 653-656.

¹¹⁸ Margolin and Buchanan, *The idea of design*, 12-17; Rittel and Webber, “Dilemmas in a general theory of planning.”

¹¹⁹ Bill Gaver, Tony Dunne, and Elena Pacenti, “Design: Cultural probes,” *interactions* 6, no. 1 (January 1999): 21-29.

¹²⁰ John Pruitt and Tamara Adlin, *The persona lifecycle: keeping people in mind throughout product design* (Amsterdam ; Boston: Elsevier ; Morgan Kaufmann Publishers an imprint of Elsevier, 2006).

¹²¹ Rogers, *Diffusion of innovations*; Gladwell, *The tipping point: how little things can make a big difference*; Moggridge, “Adopting Technology”; Horowitz, “Meet the New Enterprise Customer, He’s a Lot Like the Old Enterprise Customer.”

¹²² John Carroll, *Scenario-based design: envisioning work and technology in system development* (New York: Wiley, 1995).

recording in gaining insights into design situations¹²³. However, the IxD methods used in **seedfeed**™ will be supported by an ecosystem of related methods from fields such as cybernetics¹²⁴ and biological systems theory,¹²⁵ cognitive science,¹²⁶ cultural psychology and cultural-historical activity theory,¹²⁷ as well as disruptive innovation theory.¹²⁸ If these user-centered methods, including the use of increasingly real-time prototypes, or “live prototyping,”¹²⁹ can complement results from more traditional market research methods, better design decisions can be made to improve the **seedfeed**™ initiative as a whole.

4.3 Importance of prototyping activities

These interdisciplinary tools and perspectives can be extremely valuable in building working prototypes for interactive screen-based environments.¹³⁰ For **seedfeed**™, such a prototype will showcase Teradici’s PCoIP™ as a virtualization platform and Apple’s Final Cut Server as an editing environment. This prototype would be a representation of what co-op students would be presented with when accessing and editing the online audio and video content. For example, setting up a remote collaboration space using the multi-camera footage and soundboard audio of The National’s performance at the Commodore Ballroom in October 2007 was the intention for this content from the outset.

¹²³ Giulio Iacucci, Carlo Iacucci, and Kari Kuutti, “Imagining and experiencing in design, the role of performances,” in *The proceedings of NORDchi, The Second Nordic Conference on Human-Computer Interaction* (presented at the NORDchi, The Second Nordic Conference on Human-Computer Interaction, Aarhus, Denmark,., 2002), 167-179, <http://portal.acm.org/citation.cfm?id=572040>.

¹²⁴ Stafford Beer, *Decision and Control: The Meaning of Operational Research and Management Cybernetics*, 1966.

¹²⁵ Maturana and Varela, *Autopoiesis and cognition: the realization of the living*.

¹²⁶ Norman, *The design of everyday things*.

¹²⁷ Cole, *Cultural psychology*; Engeström, *Learning by expanding*; Wartofsky, *Models: representation and the scientific understanding*.

¹²⁸ Clayton Christensen, *The innovator's dilemma: when new technologies cause great firms to fail* (Boston Mass.: Harvard Business School Press, 1997).

¹²⁹ Moggridge, “People and Prototypes,” 711.

¹³⁰ *Ibid.*, 702.

A technical and cost-effective solution, however, was becoming increasingly uncertain when the idea first came about shortly after the October 2007 recording, mostly due to high-definition (HD) content from non-professionals using consumer-level cameras was become more and more common and setting HD as a standard. Potential solutions at the time from StashSpace.com, Yahoo's Jumpcut, and VideoEgg¹³¹ seemed to support Standard Definition video, but the question was whether HD would make these solutions irrelevant. With PCoIP™ ability to handle HD resources remotely, in conjunction with Final Cut Server's asset management processes, **seedfeed**™ now had a potential technical solution that at least merited refocusing this research and building a working prototype around The National's Commodore Ballroom Standard Definition content for testing the concept and in preparation for HD versions.

This prototype will obviously be of interest to existing and potential industry stakeholders on the **seedfeed**™ project, beginning with Teradici, and will act as an important communication and visualization tool in this regard. The prototype is also of interest to SFU's ACS/IT Services, who will be involved in its implementation at the SFU Surrey campus from the outset. As this university-wide department is responsible for setting up and administering most of the high tech equipment at SFU's campuses in Surrey, Burnaby, and downtown Vancouver, SFU's IT Services would like to test out Teradici's platform as a potential solution for reducing the significant time and fiscal burden of software and hardware installation, administration, and maintenance. Given that the three major campuses are located in three different regions of the Greater Vancouver and Lower Mainland regions, the virtualization and cloud computing aspects of the platform may have significant benefits for the university while also presenting a potential model for other educational institutions in the Lower Mainland or elsewhere.

¹³¹ Marshall Kirkpatrick, "StashSpace to Take Full-length Online Video Editing to the Masses," *TechCrunch*, October 2, 2006, <http://techcrunch.com/2006/10/02/stashspace-to-take-full-length-online-video-editing-to-the-masses/>.

Of course the activities of students with respect to video capture, production, compression, archivization and access to these archives is ultimately a key concern with the suggestion of a co-op program of this nature. The role PCoIP™ would play in these activities needs to be fully understood, as a suggestion for the University to direct more financial, technical, and human resources towards more use by students of HD content would likely be dismissed. Therefore, the operationalization of the methods developed here needs to go along with an understanding of the unit of analysis in the research.

4.4 Unit of Analysis: User-centered, socially-situated activity

In terms of *what* is to be looked at using the lenses that have been coordinated in this emerging IxD methodology, cultural-historical activity theory¹³² provides a very useful unit of analysis: an activity.¹³³ Using activities, argued as “the basic units of development and human life”¹³⁴ allows for the analysis to include appropriate layers of context that can keep the analysis grounded in practice.

With context built into this unit of analysis, the object being studied has a way to take in the social effects that situate any activity. There are always collective, community-based factors that mediate any activity that need to be taken into account, even if only interested in individual actions. To show this jointly-mediated activity, two activity systems are depicted in Figure 25 with a partially shared object (see “object₃” in the diagram) as a minimum unit of analysis.¹³⁵

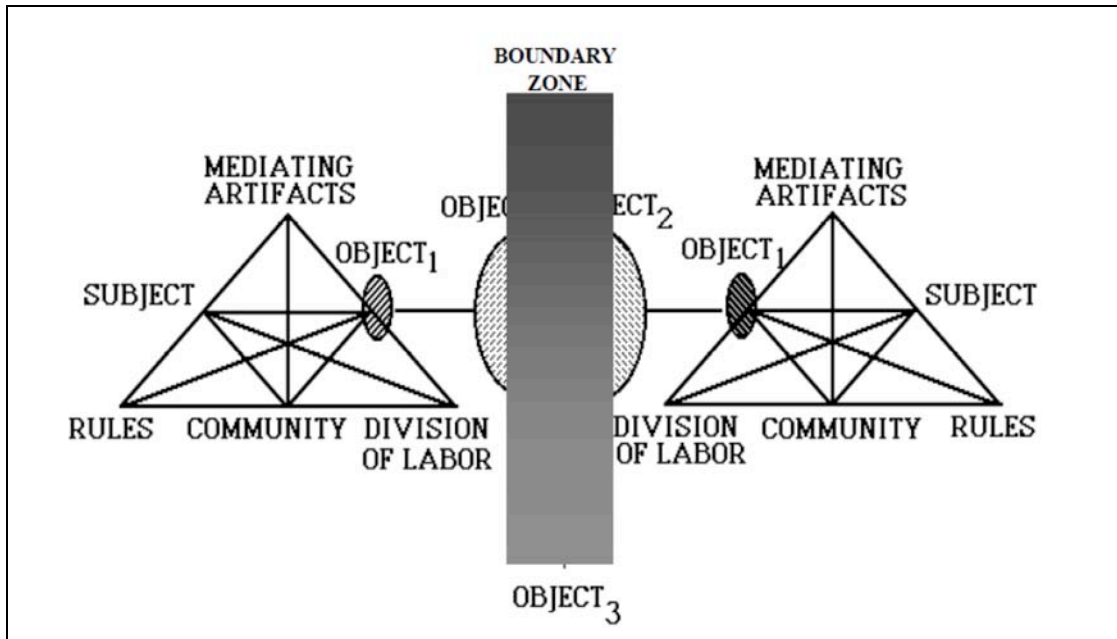
¹³² L. S. Vygotsky and Michael Cole, *Mind in society: the development of higher psychological processes* (Cambridge: Harvard University Press, 1978); Engeström, *Learning by expanding*.

¹³³ Kari Kuutti, “The concept of activity as a basic unit of analysis for CSCW research,” in *Proceedings of the second conference on European Conference on Computer-Supported Cooperative Work*, 1991, 249–264.

¹³⁴ *Ibid.*, 255.

¹³⁵ Yrjö Engeström, “From design experiments to formative interventions,” in *Proceedings*, vol. 1 (presented at the The 8th International Perspectives in the Learning Sciences: Creating a learning world, Utrecht, Netherlands: International Society of the Learning Sciences, Inc., 2008), 3–24.

Figure 25 Two activity systems with partially shared object as a minimum unit of analysis



The use of activity as a unit of analysis is based on the following set of assumptions¹³⁶:

1. All human activity is collective and mediated through instruments, signs, processes and procedures, machines, methods, laws, work organizational forms, accepted practices, and situated within communities of some sort.
2. Individuals can and do participate in more than one activity at a time. In other words, we all multitask on some levels, even if we don't realize it while doing it.
3. Participants may not understand the activity's purpose, nor may be able to recognize the activity's existence in the community to which they belong.
4. Activities are distinguished by their objects, that is, the thing or space that is being acted upon, whether tangible and physical, or as conceptual and language/symbol based.
5. An object is anything that is independent of human consciousness, which can include processes, relations, shared concepts, meanings etc., not just physical and tangible things.

¹³⁶ Kuutti, "The concept of activity as a basic unit of analysis for CSCW research," 254-256.

6. Every activity has an active subject, i.e. the individual or group that acts upon the object and understands the purpose or motive of the activity, i.e. the objective.
7. Participants that are unaware of the motive or purpose of the activity are still subjects, but the not active subjects that define the activity through conscious and purposeful action.
8. Activities develop historically, and this historical development is driven by contradictions within the activity that produce change.

Finally, another important feature of activities are their “double nature”.¹³⁷ They have both internal (mental) and an external (social) components, leading to the effect of reciprocal transformation between subject and object. As in McLuhan’s (in)famous quote: “We shape our tools and thereafter our tools shape us”.¹³⁸

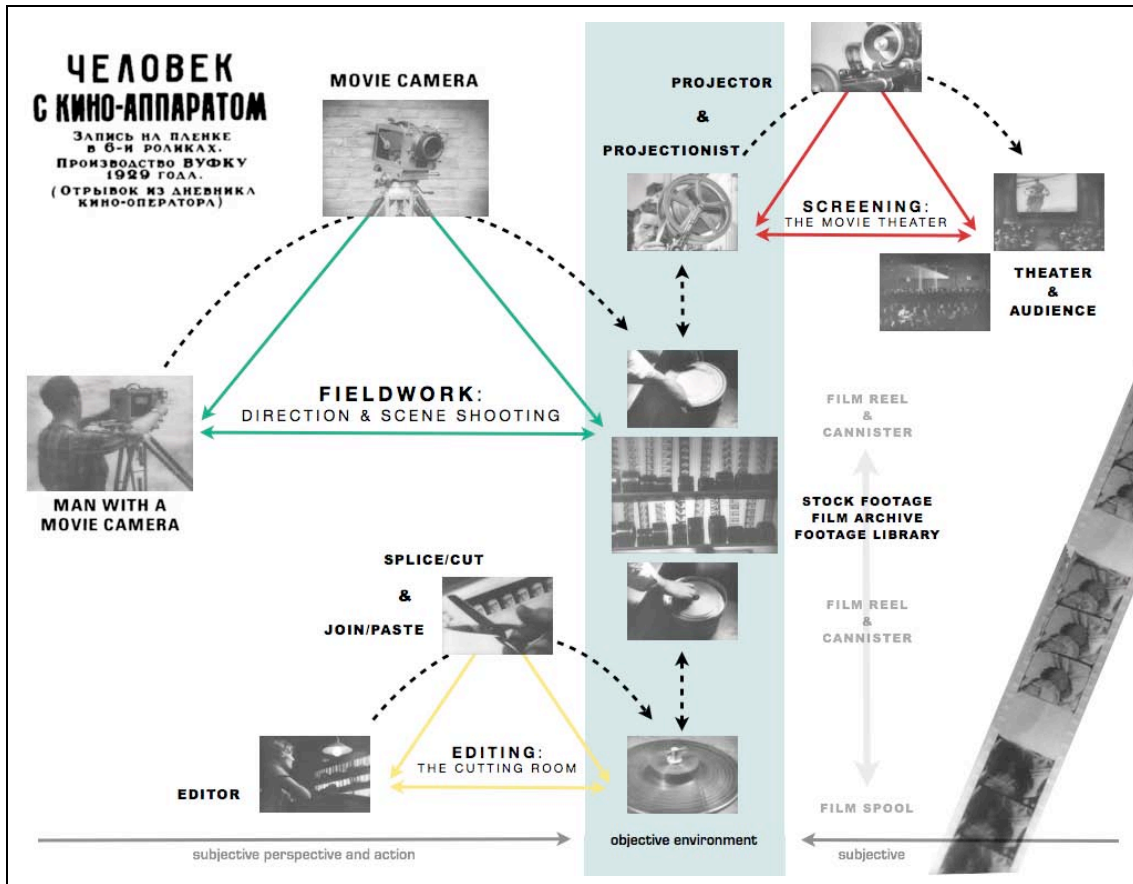
In demonstrating the filmmaking unit of analysis as being shared and interdependent, Figure 26 depicts activity systems related to the 1929 avant-garde silent film *Man With a Movie Camera*. As a silent film, it obviously uses unspoken means to effectively communicate how we shape both perceptions and representations of ourselves through the tools and technologies we use. To this effect, the film’s director, Dziga Vertov, seeing and presenting himself as more than a filmmaker (credited as the “author/supervisor of the experiment”¹³⁹). The filmmaking activity can be seen, even in the age of analogue traditional film, producing levels of complexity through shared and collaborative activity. Figure 26 is an attempt at depicting the same “out tools shape us” message and the dynamics of mediated activity using Vygotsky’s basic mediational triangles with shared object of activity.

¹³⁷ Ibid., 258.

¹³⁸ Marshall McLuhan, *Understanding media: the extensions of man* (New York: New American Library, 1964). *Note: McLuhan's famous quote is repeatedly attributed to this book, but it is rarely cited with a page number. Despite owning a 1966 printing of *Understanding Media*, I have yet to find the page on which this mysterious quote resides.

¹³⁹ Dziga Vertov and Michael Nyman, *Man with a movie camera*, 2003.

Figure 26 Avant-garde silent film *Man with a Movie Camera* (1929) as activity systems



While Vertov’s methods were constrained to analogue film technologies, the processes of cutting/splicing, joining/pasting, and archiving resources for editing continue today, even though the editing room has become editing software. This diagrams depicted above can be contrasted to representations of a digital, YouTube-based model in Figure 2 and a version applied to Teradici’s PCoIP™ model in Figure 5.

4.5 Operationalizing the methodology

The “operationalization”, of the methodology – that is, putting it in practice – to where it becomes an applied *method* is perhaps best communicated through an actual demonstration. This will be the focus of the next section of the

project, 5: APPLICATION. However, some preliminary discussion of the first general sets of activities in the method, i.e. the STUDY activities, can be outlined here as these activities have already been going on to some degree with the previous theoretical background section.

This first set of STUDY activities in the method, which generally starts the design process, involves trying to find all the relevant constraints by analysing and codifying them in the form of “tags”. Alternately and interchangeably, the less contemporary term “codes” is used instead of “tags” when applied to more formal academic and scientific settings. Framing of the problem space (i.e. the object of study and of action) using these tags can then take place wherever and whenever applicable, not just in a particular order laid out formally in a set of instructions. The tags should come from existing theoretical knowledge (see 3: THEORY), but can also emerge in practice as the problem is further explored and evaluated. For example, Moggridge’s IxD methodology already provides ten ready-to-go tags for each of the activities in the framework, but in studying the problem and exploring possibilities, new tags emerge from innovation theory, activity theory, cybernetics and systems theory, and other aspects of the problem space’s theoretical background. Tags become building blocks – or, using terminology from Christensen’s RPV theory,¹⁴⁰ they become *resources*.

After enough tagging has been performed so as to have a sufficient body of contextualized data, processes then follow to more systematically describe and select from the data and give the tagging activities greater contextual meaning. Tags can be synthesized for overlapping concepts, then arranged and represented in (multiple) ways that best reveal new relationships and insights into the problem/opportunity space. Other tags can be identified as only providing descriptive information (e.g. dates, locations, etc.), which is useful, but can be separated from tags that provide theoretical insights. These insights can be seen as values, since value judgments all the way from the initial

¹⁴⁰ Christensen, *Seeing What's Next*, 289-290.

selection of the tags, ongoing evaluation in whether to keep or remove a tag that is in use, and eventually to the arrangement and representation of the tagged data. We now have a way to produce information – *categories* – out of raw data,¹⁴¹ then use that information to model the data in ways that produce valuable insights, even with a simple table-based approach (Table 1)

	S	E	E	D
Category:	Study the problem	Explore the possibilities	Evaluate the alternatives	Design an outcome
Tags include:	[constraints] [synthesis] [framing]	[ideation] [envisioning] [visualization] [prototyping]	[uncertainty] [selection] [evaluation]	Compare intended outcome vs. actual result of event
Additional tags that could be used include:	[date] [venue] [artist] [location] [resources] [processes] [abilities] [motivations] [etc]	[date] [venue] [artist] [location] [resources] [processes] [abilities] [motivations] [etc]	[date] [venue] [artist] [location] [resources] [processes] [abilities] [motivations] [etc]	n/a

Table 1 Sample matrix-style representation of tags

In the upcoming section, 5: APPLICATION & RESULTS, other approaches for presenting the analysis will be shown, such as the increasingly common “data clouds” featured as part of blogs and other websites that make use of *folksonomy*, and “classification of mechanisms adopted in social and collaborative environments.”¹⁴² More sophisticated software tools for qualitative data analysis will also be given attention as key components of an applied **S/E/E/D** method. Such tools – which include applications like Atlas.ti, HyperRESEARCH, and Dedoose – also provide powerful and flexible ways to represent qualitative and quantitative data.

¹⁴¹ Engeström, *Learning by expanding*.

¹⁴² Oleg Shilovitsky, “Does Folksonomy Work for PLM?,” *The Daily Think Tank Blog*, March 3, 2009, <http://plmtwine.com/2009/03/03/does-folksonomy-work-for-plm/>.

5: APPLICATION & RESULTS

A working prototype of the **seedfeed**™ model that makes use of PCoIP™ for its technology platform and The National's video archive as its content is set to begin upon completion of this MBA applied project. In relation to the upcoming work, the objective for this MBA project component has been to provide the research context and methods that can be used for the prototype's development, launch, and ongoing evaluation. The **seedfeed**™ prototype's objective is effectively the same, as it will become in its own right a tool for studying, exploring, evaluating, and further developing other parts of the existing archive of digital video concert recordings.

Similarly, the prototype can be used in researching, designing, and marketing other potential archives of digital video in the entertainment and cultural industries. Ideally, with the use of the methods that have been developed in this project, including the upcoming **seedfeed**™ prototype, opportunities for creating value will be found by developing the needed processes for making best use archives of digital video content. This content may relate to concert video collections and student co-op programs, or could come through other potential applications that emerge throughout the development process.

The work in this project has so far been able to (1) *study* the problem space, and (2) *explore* a number of possibilities, for example, different kinds of archival content and technologies that could be used for prototyping. In addition, and perhaps most critically, it has been able to (3) *evaluate* the digital media resources that are part of a larger digital video ecosystem. Furthermore, the development of this very method – called **S/E/E/D** – has come about through the same process of *study*, *explore*, and *evaluate*. In this regard, and as shown in the preceding theoretical background, the methodological problem presented in this work has been studied at length, explored in terms of different

combinations of coordinated lenses, which have then been selected from and are currently being evaluated in the development of this project.

In truth, there are actually two objects of study: (1) the digital media object, whether as an individual work, a sample of works, or as the entire archived collection, and (2) the **S/E/E/D** method itself. On the outset this may seem unconventional, and in fact it is a radical approach to dealing with methodology, but it is not without historical precedent. In fact the entire field of cultural-historical activity theory is premised on method being both “product and prerequisite” or “the tool and the result” of the study.¹⁴³ This key point will be addressed in greater detail as the first conclusion of this applied project (see 6.1 STUDY: Creating a method by studying it... and vice versa. However, for the analysis directly taking place here, a selection of digital video samples from the archive would appear to be the logical starting point.

Instead of analyzing an entire prototype that is itself a complex system of digital media objects and not yet ready for analysis, a *selection* of a limited number of events will instead be made from the larger archive. Specifically, two events and their resulting outcomes will be selected for comparative purposes. This comparison will be done in two ways, and will be very limited and preliminary for the purpose of this project. Specifically, the analysis will be done by:

1. Comparing events through the contents of the study, explore, evaluate, and design categories of each event, and
2. Comparing the application of the S/E/E/D method in both cases, that is, evaluating how the method was applied,

It must be pointed out clearly that depth of analysis is not the goal here; rather the goal is to evaluate the viability of the emerging **S/E/E/D** method for future and more extensive use in the overall development of the **seedfeed™** prototype. Again, prototyping work will follow the completion of this MBA project and will address issues of depth of analysis, but in the meantime,

¹⁴³ Vygotsky and Cole, *Mind in society*, 65.

criticisms of the project in such terms are understandable. These criticisms are accepted from the outset, as they are argued here to be necessary and practical for the research intentions of **seedfeed™**, if only for the overdue completion of this MBA.

In order to get a better sense of the rationalization for selecting these two events, and in relation to the arguments put forward in this project, a set of preliminary operational steps will be performed around these two events and the media produced from them. This will help to clarify *how* to approach the emerging IxD method, **S/E/E/D**, as has been developed in this MBA project.

5.1 Define the event and its activities

[EVALUATION] [SELECTION] [FRAMING]

The results of this first stage of the applied **S/E/E/D** method should be self-evident from previous discussions of concert filming and digital media archive development. However, for the sake of clarification, the event can be defined as involving the following activities:

- Documenting and archiving live music performances using digital video technologies, or through analogue technologies that can subsequently be digitized for remote, non-linear, multi-user access.
- Producing output that can generally be viewed as “concert film,”¹⁴⁴ which includes professional quality material, lo-fi DIY (Do-It-Yourself) recordings, “rockumentaries”, presskit materials, bonus “featurettes” on concert film DVDs, web download and streaming of concert video, including content for mobile devices and tablet users. It can also include audio recording and other media captured for the purpose of creating concert film footage.

¹⁴⁴ David Bartholomew, “Reviews: The Last Waltz,” *Film Quarterly* 33, no. 2 (1979): 56-60; Stephen Severn, “Robbie Robertson’s Big Break: A Reevaluation of Martin Scorsese’s The Last Waltz,” *Film Quarterly* 56, no. 2 (December 2002): 25-31.

- Distributing this output through one or several media channels or formats to an audience, whether for viewing in HD or SD on a theatre screen, on a television screen, on a computer monitor, or on a small screen or tablet mobile device, via cable and satellite broadcasts, internet download and streaming, or other distribution means.

The number of technological formats, distribution channels, and intentions that define the activity and its participants all help to reveal the term “concert film” to be much more complex than perhaps originally thought. However, these complex qualities do suggest that calling the activity part of a larger *digital ecosystem* is appropriate.

5.2 Consider historical development

[FRAMING], [CONSTRAINTS],

Using *activity* as a unit of analysis, a number of conditions have been highlighted previously in 4.4: Unit of Analysis: User-centered, socially-situated activity. A critical aspect of this approach is for historical development to be taken into context. This is based on the recognition that “activities themselves and their elements are under continuous development, and this development is not linear nor straightforward, but uneven and discontinuous.”¹⁴⁵ Without historical analysis, any attempt to guide the development of an activity effectively proceeds blindly.¹⁴⁶

As contradiction within and between activities is seen as the key driver of this historical development, uncovering where these contradictions are taking place or where they’ve actually been resolved in the past needs to be part of the methodological approach in the project.

¹⁴⁵ Kuutti, “The concept of activity as a basic unit of analysis for CSCW research,” 254.

¹⁴⁶ Ibid.

5.3 Ideate and select an initial set of tags

[IDEATION], [SELECTION], [FRAMING]

The ten types of activities in Moggridge's IxD methodology have already been established as a starting set of tags to build from. This initial set consists of:

- | | |
|------------------|--------------------|
| 1. [Constraints] | 6. [Uncertainty] |
| 2. [Synthesis] | 7. [Visualization] |
| 3. [Framing] | 8. [Prototyping] |
| 4. [Ideation] | 9. [Selection] |
| 5. [Envisioning] | 10. [Evaluation] |

5.4 Find other frameworks and tags

[IDEATION], [FRAMING], [SYNTHESIS], [SELECTION]

In addition, we can supplement the above ten tags with tags that are relevant to other methodological perspectives (i.e. “coordinated lenses”) which have been addressed in previous sections. We can therefore include other keywords as “tags” (or “codes” depending on contemporary versus academic/scientific preference). The all tags have been bracketed as “[name of tag/code]”.

- **From cultural-historical activity theory:** [historical development], [contradiction], [constraint] [instruments], [signs], [procedures], [machines], [models], [methods], [ideologies], [laws], [rules], [organizational structure], [best practice], [subject], [active subject], [object], [objective], [reflective practice].
- **From cultural psychology:** [primary artifact], [secondary artifact], [tertiary artifact] [building block], [ingredient], [instruction], [code], [recipe], [genre], [style], [perspective], [lens], [frame], [metaphrame], [coordinate]
- **From cybernetics, complex systems, and learning theory:** [1st order system], [2nd order system], [3rd order system], [cell], [organism], [community], [population], [self-reflection], [adaptive], [complexity], [stimulus-response], [trial-and-error], [learning-to-learn], [double bind], [win-win situation], [lose-lose situation]

- **From disruptive innovation theory:**
[disruptive], [sustaining], [affordance], [overshoot], [consumer], [nonconsumer], [job-to-be-done], [ability], [motivation], [resource], [process], [value].
- **From technology adoption and innovation diffusion:**
[innovator], [early adopter], [chasm], [early majority], [late majority], [laggard], [enthusiast], [professional], [big business], [small business], [government], [military], [R&D], [tipping point] (*and [user] as will be noted below)

Reflecting on the results of this process reveals what is currently a non-exhaustive list of tags, as new ones may emerge as they become relevant while doing the tagging. It also reveals three other important considerations to be taken into account:

1. **Overlapping tags:** Many of the tags overlap conceptually, but have different names from their respective fields, e.g. [building blocks], [primary artifacts], [ingredients] and [resources]. All are essentially the same idea and will be combined at later stages of the analysis, so it is fine to be unconcerned about the overlap at early stages of the process.
2. **Non-linear tagging:** In moving non-linearly, as the methodology allows, I've already gone back and added tags to earlier sections, as well as to this section. This kind of non-linear approach is not only expected, but advisable, as it creates a sort of "dead reckoning" approach.¹⁴⁷ Non-linearity in this way allows the researcher to look back from time for emergent aspects of the problem, while self-reflexively locating his or her own role and position in the problem space.
3. **Multi-pass tagging:** Following from the non-linear character of the methodology, as well as from the non-linear tagging approach just mentioned, the entire pool of tags doesn't need to be in use on a single pass of the data. Instead, the researcher should select a sub-group of tags to work with on a first pass, then do multiple passes using the same group, or

¹⁴⁷ Ron Wakkary, "Framing complexity, design and experience: a reflective analysis," *Digital Creativity* 16 (2005): 71.

switch to other sets of tags. This may lead back to the first consideration, i.e. “overlapping tags”, but goal is to find these connections anyway.

While revisiting various sections of this work, I found a number of tags that seem appropriate for adding to the larger pool of tags as it begins to take form. While I missed these the first time through, the non-linearity of the method allows for their inclusion now. For example, I originally missed the obvious tag of “user”, which is as fundamental to IxD and technology adoption “consumer” is to business and economics. I suspect more tags will emerge in this way.

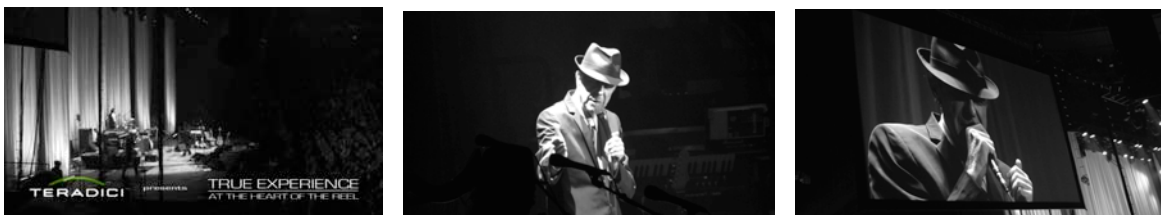
As part of this process, I’ve added subheadings not only to headings in this section, but also to headings in the theoretical background of section 3: THEORY. These earlier subheadings may have some additional tags not seen above in section 5.4, which has been left as originally entered, but have been collected for application in upcoming analyses in a “master tag/code list”.

5.5 Choose an event(s) that feature the activity

[SELECTION], [EVALUATION], [SYNTHESIS], [CONSTRAINTS]

In looking at the entirety of the digital video archive of concert video from which a **seedfeed™** prototype will be developed (see APPENDIX 2: Chronological event listing), I had to make a decision on which event was best suitable for a sample analysis. Several of my more recent recordings and productions appeal to me at the moment, since they have already been produced and uploaded to YouTube and Vimeo, and have also received excellent comments and reviews.

Figure 27 Leonard Cohen, December 2010, Vancouver BC, three-song encore



One in particular, a recording I made from the recent Leonard Cohen concert in Vancouver on December 2, 2010 (see Figure 27), was especially difficult to pass up due to its timeliness, as well as being the last of the concert clips to take place within this MBA time frame. It was also appealing as a potential selection on account of the artist involved – Leonard Cohen – and the influence that his writing and music (or his depressingly subtly and self-deprecating wit) has had on my own work. Some of the viewer responses to this work while it was posted briefly in the week following the concert include:

*From sturgess66: Terrific video - the angles are quite unique - the sound is fantastic. And promise of more to come. FULL SCREEN!*¹⁴⁸

From b4real: Thank you so much for these unusual and extremely beautiful videos. I really appreciate their different point of view. Great sound too!"

While the clip has since been taken out of public access on recommendation of Cohen's manager,¹⁴⁹ it does not lessen its appeal for use here. The appeal for using this clip may actually be most related not to simple numbers, for example, the odds of repeating this event, given Cohen's 76-years or, or the odds of repeating this event, given the price of tickets that must have factored in a "once-in-a-lifetime" convenience charge. As Scorsese claims about wanting to film The Band's final concert, "I couldn't let the opportunity pass. It was this kind of crazy desire to get it on film, to be a part of it."¹⁵⁰

Despite the Leonard Cohen clip's particular appeal for use here in closing out the research project, especially with the Teradici tie-in its credits that I added in producing it, upon further reflection and evaluation it was clear there was only

¹⁴⁸ sturgess66 and b4real, "CONCERT REPORT: Vancouver, B.C., Canada, December 2, 2010," *leonardcohenforum.com*, December 9, 2010, <http://www.leonardcohenforum.com/viewtopic.php?f=44&t=23972&start=60>.

¹⁴⁹ Robert Kory, "followup regarding video from Vancouver show," December 11, 2010.

¹⁵⁰ *Revisiting the Last Waltz* (MGM/United Artists, 2002), <http://www.imdb.com/title/tt0077838/>.

one appropriate selection from the archive that could be made at this stage. This would be the initial event in 2007 that kicked off the idea for **seedfeed™**.

5.5.1 Under Construction

The event featured a New York band called The National, who were friends of mine from some previous “fishing trips”, with whom I had worked before on other filming experiments, and whose work has become increasingly noticed and popular since their October 3rd, 2007 performance at Vancouver’s legendary Commodore Ballroom. From the video recorded at this event, I had already produced a “prototype” video clip called *Under Construction*¹⁵¹ This rough cut was produced at the time to communicate several key concepts with respect to design, lo-fi DIY (Do-It-Yourself) filmmaking, and my digital media research work in general. The National’s first-ever gig at the Commodore is therefore the appropriate choice for the other work to analyze.

The recording featured a six-camera operation, unprecedented for my team and three cameras more than any previous concert filming attempt we had made. Furthermore, it had excellent audio quality from a direct soundboard feed into a camera positioned next to the band’s live sound engineer. After reviewing some of the show shortly thereafter, I was happy enough with the results, in fact, that I intentionally put this recording aside and left it unedited on a hard drive, with the exception of the *Under Construction* test clip (a prototype, in a sense). The intention for this content was as material not only in this MBA project (as I had just started part-time courses in October 2007), but also as potential demonstration material for and intended co-op program that was being discussed between the Commodore, Simon Fraser University, and Live Nation.

In terms of potential selections from the **seedfeed™** archive that could be used in testing out the **S/E/E/D** method, the Commodore-related material was the appropriate selection for an analytical starting point. However, upon further

¹⁵¹ Joel Flynn, *The National - Under Construction at the Commodore Ballroom*, Standard definition (SD) (Vancouver, BC: The Commodore Ballroom, 2007).

reflection, I believed it would be more effective to select *two* events to compare and contrast in the analysis, rather than only using the *Under Construction* clip. For the other event I decided to go outside of the archive as a way to create an immediate contrast. Specifically, I decided to use The Band’s final performance in 1976 at San Francisco’s Winterland Theater, and Martin Scorese’s subsequent film from this event, 1978’s *The Last Waltz*.

5.5.2 Visiting and Revisiting The Last Waltz

The Band’s final performance in its original line-up at San Francisco’s Winterland Theater on Thanksgiving Night, 1976 was a landmark event in the history of popular music. It featured an extensive number of the group’s contemporaries, who all wanted to make an appearance that night and play some music with their friends out of respect for The Band’s talents and legacy. Originally intended only for the archives, a recording ended up being made of the show on 35mm film by a young and upcoming film director named Martin Scorsese. The outcome of the filming became the classic concert film *The Last Waltz*, released in 1978 and regarded as one of the best of its genre.

The information available on the making of this definitive concert film provides numerous relevant examples for discussing IxD methods, even though digitization and the entire field of interaction design had yet to emerge. Importantly, the selection of this event also points to the idea of “historical development” in activities that are mediated by tools, instruments, technologies, signs and language in social contexts. *The Last Waltz* and, more specifically, the “making of” feature that accompanies the film’s 2002 DVD release – called *Revisiting The Last Waltz*¹⁵² – create excellent examples for use in testing the **S/E/E/D** method.

5.5.3 A study of contrasts

This selection of *The Last Waltz* as an event in this analysis comes with the realization that it is not officially part of the archive, as it predates the 2007 to

¹⁵² *Revisiting the Last Waltz*.

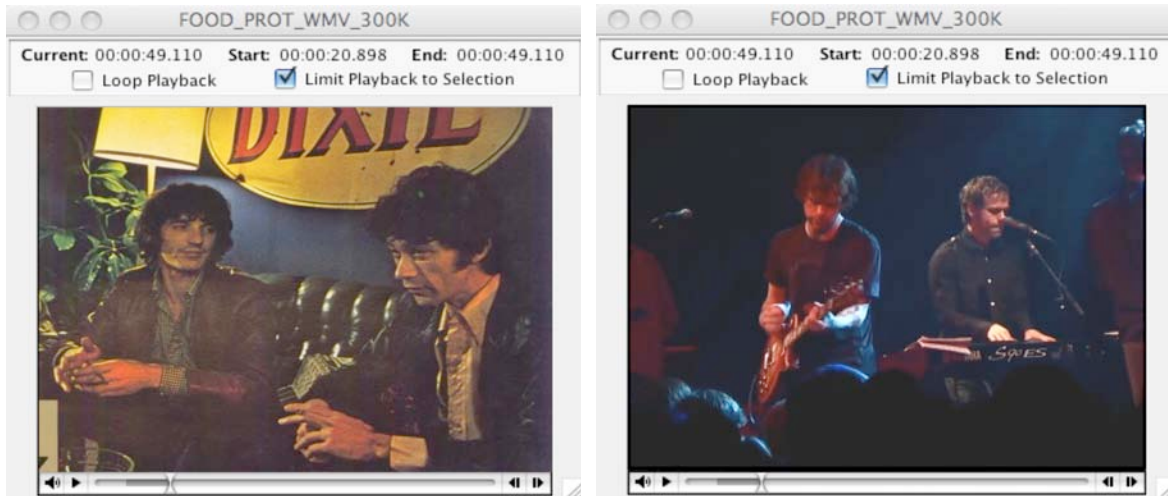
2010 timeframe when this MBA project took place. In fact, this event even predates the 2000 to 2007 timeframe of prior concert video recording and multimedia research that led to **seedfeed™**. Finally, this non-**seedfeed™** event presents a different perspective for analysis, that is, on the basis that I had no involvement with it or with the creation of the related motion picture and other materials such as the DVD bonus feature *Revisiting The Last Waltz*, though I did personally transcribe all the dialogue from the twenty-minute featurette for use in the analysis.

The alternate event to The Band's final performance is of course the *Under Construction* example, recorded over thirty years later in October 2007 at Vancouver's Commodore Ballroom. It is very much in contrast to Scorsese's finished work, which was recorded on 35mm film, not Standard Definition digital video. Unlike Scorsese's internationally released and reviewed motion picture, *Under Construction* is an intentionally unfinished work – a prototype – designed for highly experimental approaches for digital production and networked technologies. *The Last Waltz* features The Band, all Canadian except for the drummer, at the end of their playing days as a band, wrapping up a career by playing the first American venue they ever played together.

As for The National, the New York band from Cincinnati, Ohio with the American(mary.com) website,¹⁵³ the Commodore show that became *Under Construction* marks their first and only appearance at one of Canada's most celebrated venues. Their performance featured no guest performers, except for their opening act, Annie Clark (a.k.a. St. Vincent). Far from finishing their career, The National were just hitting stride with a breakthrough album, 2007's *Boxer*, that has set the stage for the increasing mainstream success through their most recent album, 2010's *High Violet*.

¹⁵³ Matt Berninger, "The National - The Better Propaganda interview," interview by Alan Williamson, Webpage, 2005, <http://betterpropaganda.com/content.aspx?id=359>; Matt Berninger and Scott Devendorf, "The National," *Americanmary.com*, 2010, <http://www.americanmary.com/index.php>.

Figure 28 HyperRESEARCH's video analytics tool, showing two events to be compared



Of course, Scorsese's film was shot by professionals, friends of his from "the Industry", whether from New York, California, or other parts of the world. *Under Construction* was recorded by a small group of non-professionals, Vancouver locals including myself and other digital media artists, now ex-students, whom I've met through many years of multimedia research and teaching at SFU's School of Interactive Arts and Technology (SIAT). As a whole the *Under Construction* prototype is therefore much removed from the 35mm feature film of Martin Scorsese, though both share a common passion for live music.

5.6 Select a mode and/or tools for representation

[EVALUATION], [VISUALIZATION], [FRAMING], [CONSTRAINTS], [SYNTHESIS]

The next step in this method is to select, at least temporarily, a way to represent the analysed data. This could come in the form of a text-based report, or more visually through bar graphs and pie charts or other standard representation tools. Or it might come through new approaches to representing data and analysis, such as "cloud tags" (see Figure 29), or maps that show relationships between categories/nodes of meaning, some even using 3D.

Figure 29 Free web-based “tag cloud” mapping sample from TagCrowd.com



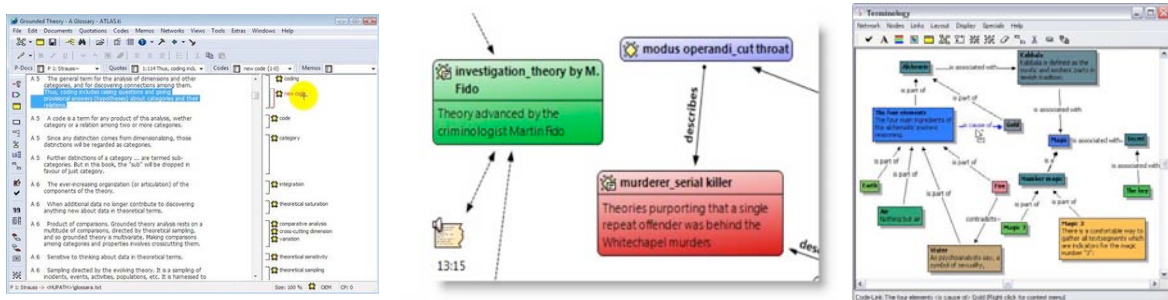
Simple and free tag clouding can be done with TagCrowd.com’s beta version, such as the example in the top image in Figure 29, which uses text from a journal article on *The Last Waltz* as sample data¹⁵⁴ The more sophisticated representations shown below the simple tag cloud, are able to rank and display tags and events by size and proximity.

Qualitative research software also exists that allows for data from various sources – including multimedia sources – to be analysed and coded using similar tagging approaches. One of the more popular applications in the research community is “Atlas.ti” for Windows OS, while the Mac OS equivalent can be found in the “HyperRESEARCH” application from software company ResearchWare (actual company name, not to be confused with the synonym for “spyware”). The full version releases of these applications come with “theory building” tools that allow the user to test data and codes against possible emergent patterns seen in relationships in the data, i.e. “patterns of mediation”

¹⁵⁴ Severn, “Robbie Robertson's Big Break:.”

or “coordinated lenses” in the process of inquiry¹⁵⁵. Since the **seedfeed™** project is based around digital video, while my work is done mostly in Mac OSX applications, I decided to begin this analytical process using the HyperRESEARCH trial version, even though a similar trial version exists for Atlas.ti but only runs on Windows operating system (or Mac-based emulators).

Figure 30 Screenshots from the Atlas.ti qualitative analysis tool



As part of the non-linear process that characterizes this method and the project as a whole, after performing an initial analysis using the trial version of HyperRESEARCH’s data analysis tool and finding it too limited for the task, further research led to a new tool to consider. This web-based and cross-platform qualitative analysis tool, called “Dedoose” (Figure 31) has been added to the project’s evolving digital ecosystem. It uses Adobe Flash in a webbrowser in order to create a platform independent application that stores data in “the cloud” rather than running off of a local desktop.

As will be shown, the Dedoose application and its capabilities will become a key point of consideration in this work’s development, including future opportunities that are possible in reframing **seedfeed™** around Dedoose.

¹⁵⁵ Cole, *Cultural psychology*, 338.

Figure 31 Dedoose logo and project interface



Regardless of the application chosen or how the data is tagged, organized, and represented – or even whether it is stored locally or in “the cloud” – there needs to be ongoing evaluation of the tags themselves as part of the system, not only to add new tags as they emerge or but to trim away unused tags. The non-linear aspect of this looping, iterative, and interactive process is definitely a challenge, but is perhaps best met by attempting an application of the method. The best method may be to put *theory* into *practice*.

5.7 Analyse and represent!

This analysis will attempt to apply the tags that have been pooled from iterative review and re-evaluation of previous sections of this project, particularly section 3: THEORY. The results of this tagging activity will then be categorized and visualized in attempting to find insight and value from this analytical process and use of the **S/E/E/D** method. Originally the categorization and visualization was only going to take place through a limited table/matrix presentation, as the goal wasn't so much the results of the analysis, but rather to gauge the viability of putting this new method into practice (see Table 1 Sample matrix-style representation of tags in section 4.5 Operationalizing the methodology). The original intent with this table was just to see if the methodology worked in terms of operationalizing it as an actual method, i.e. as a prescriptive set of steps and stages. Of less concern was measuring how well the method works at this very early point in its development.

In doing so, and while trying to organize all the tags into a “master list”, I ended up finding and reviewing Researchware’s “HyperRESEARCH” application,¹⁵⁶ and discovered a free trial version available from their website. On the outset, even this trial version seemed to offer significant potential time saving, in both performing the analysis and then in organizing and representing the results. As mentioned, the Atlas.ti application was also considered, as I had some prior experience with it while performing qualitative analysis in other graduate studies, but it is only available as a Windows application. Since HyperRESEARCH had both Mac OSX and Windows PC versions, I decided to download, explore, and evaluate its features as part of this overall digital ecosystem analysis.

5.7.1 FIRST ITERATION: HyperRESEARCH and *The Last Waltz*

HyperRESEARCH’s most appealing feature, especially for this project, is its *intereoperability*, i.e. as a Mac and PC cross-platform application designed to work directly with QuickTime video clips. This kind of platform and media integration and media interoperability allows for tagging to take place directly on time codes rather than in having to transcribe dialogue prior to applying codes in a text-based format. (see Figure 28 in 5.5: Choose an event(s) that feature the activity) While the application’s functions showed some promise, after performing the analysis, it also proved to be a frustrating interface to deal with. This was especially the case when dealing with QuickTime videos, i.e. the strong selling feature that eventually led me to adopt the software for this project.

As mentioned, the ability for HyperRESEARCH’s qualitative analysis tool to integrate digital video data, imported directly into its interface, was a key selling point in deciding to try it out for this limited analysis. This was especially the case when using the *Revisiting the Last Waltz* DVD bonus feature for the video

¹⁵⁶ ResearchWare Inc., “HyperRESEARCH Quick Tour,” Corporate website, *Researchware Simply Powerful Tools for Qualitative Analysis*, December 26, 2010, <http://www.researchware.com/products/hyperresearch/quick-tour.html>.

data in this regard. There were no issues in importing a QuickTime movie version of *Revisiting the Last Waltz*, nor were there problems in following the HyperRESEARCH tutorials for multimedia analysis. I therefore began selecting small clips from the movie, and would annotate these selections with direct quotes transcribed directly from the dialogue. From the “master code list” I had set up, I performed some initial analysis using the extensive list of tags I had identified and collected in earlier sections.

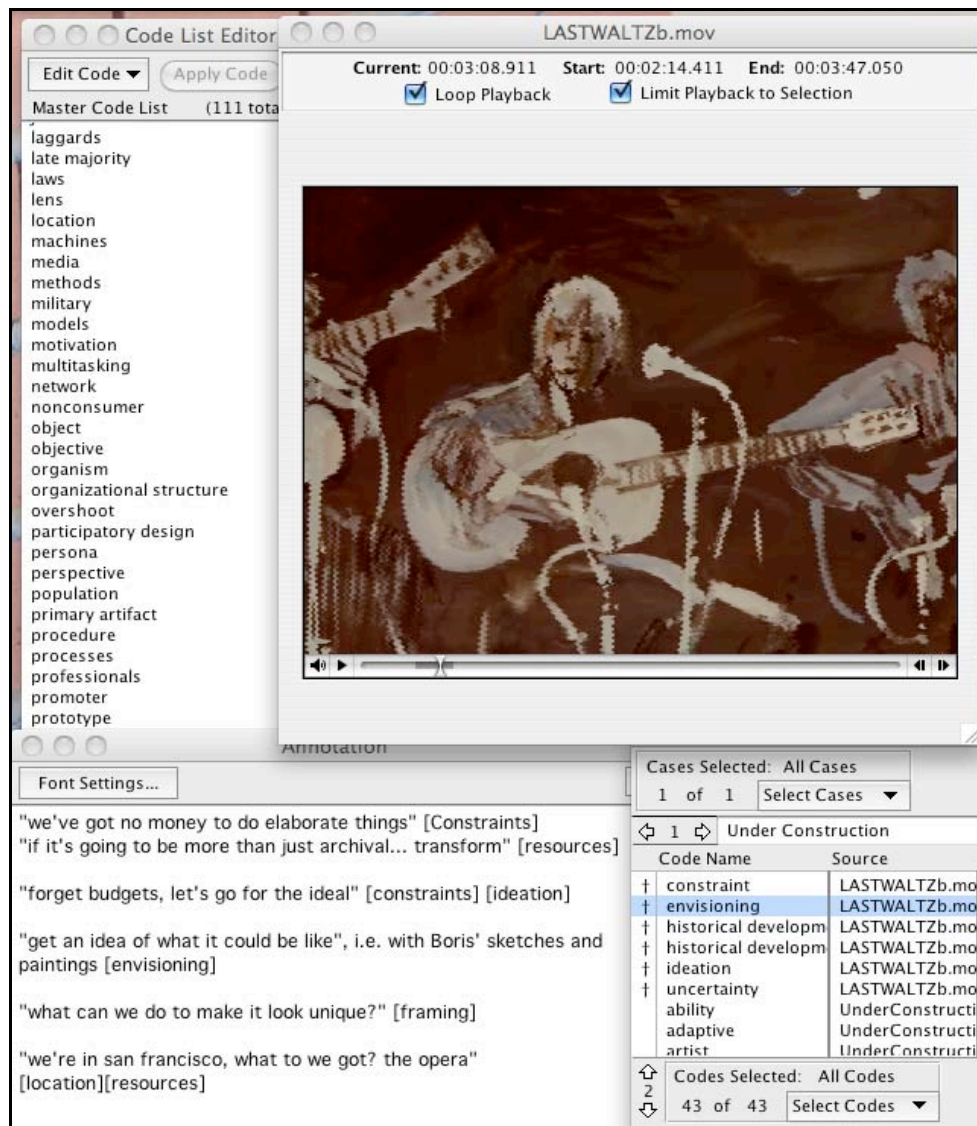
The process broke down entirely due to HyperRESEARCH’s movie player interface. Indeed, it broke down to the point where I abandoned the analysis effort altogether, even though it was only a short, twenty-minute movie clip. While not convinced I had abandoned *Revisiting The Last Waltz* completely, as there was still wonderful data in the movie that could potentially be analysed by a different approach, I had to move on at least temporarily to another source of data. This was unfortunate because while I had some trouble with the HyperRESEARCH movie player’s interface at first, I initially wrote it off as to not knowing the proper commands for navigating clips.

After a few more attempts at creating tagged and contextualized data from the movie file, I had some content that looked like the screenshot in shown in Figure 32. While promising, and after researching the help pages for how to navigate the movie clip more precisely, it became clear that the interface at present just didn’t allow the user to easily make short selections from the larger video clip. There were some commands that allowed frame-by-frame movement, as well as the ability to precisely enter time codes for >in< and <out> points, but these features were time consuming and not conducive to the researcher’s need to do fast and iterative “passes” at the data when tagging.

It should be pointed out that my background in video editing makes me a bit more sensitive to design problems in a video-based interface such as this. However, I also have to reflect on the practice from the position of “jobs-to-be-

done”¹⁵⁷ for an academic researcher. This kind of user has to scour through significant amounts of data in a tedious coding or tagging process. If scanning and marking up video files isn’t at least comparable to selecting blocks of text, the user may simply end up working off of a text transcript of the movie instead, thereby undermining the value of working with video in the first place.

Figure 32 HyperRESEARCH video interface screenshot, code list, and annotation box.



¹⁵⁷ S. D Anthony et al., “Forward: Reflections on Disruption,” in *The innovator's guide to growth: putting disruptive innovation to work* (Harvard Business School Pr, 2008), 1-8.

EVALUATION:

As an experienced editor, I could recognize the major issues I was having with HyperRESEARCH had to do with the interface to the video, not in dealing with video in general. For another researcher without experience in digital video, the same experience may have left him or her feeling as though special skills in digital media were required for effective multimedia-based analysis. This is not the case, or at least shouldn't make that much of a difference given the ubiquity of digital video in today's world. Regardless, using the video features was problematic and frustrating, so much so that I thought about cutting up the video into very small pieces that could then be tagged/coded and embedded into a word processor document. However, the thought of doing so destroyed at least some of the perceived value of this qualitative analysis software.

The greatest frustration with the scenario just described, at least from my perspective, is the understanding that a significant amount of value was lost just because of this one critical interface problem. Even though the software is Mac-based, it fails to completely take advantage of the built-in capabilities of video playback and simple editing features that are standard in QuickTime. Instead, even Web-based video content on YouTube shows better tagging features and more responsiveness in terms of the ability to navigate video content efficiently and accurately for tagging purposes. This raises the question as to why a much more functional design wasn't at least licensed from a third party in order to provide the needed functionality for video-based qualitative research. Or, why more priority wasn't given to the development of an in-house solution, especially if video and multimedia features are a key strategy in HyperRESEARCH's marketing efforts.

Regardless, the effort spent in trying to fine tune video selections became too onerous, and with limited analysed data and even less time available for analysis, I didn't yet know whether the rest of HyperRESEARCH could provide

the kind of data representation I was hoping for. Since I needed to see a more fully developed set of tagged content, I left the video analysis of *Revisiting the Last Waltz* off to the side while I concentrated on an analysis where selections of text could be easily highlighted and tagged instead.

5.7.2 SECOND ITERATION: HyperRESEARCH and *Under Construction*

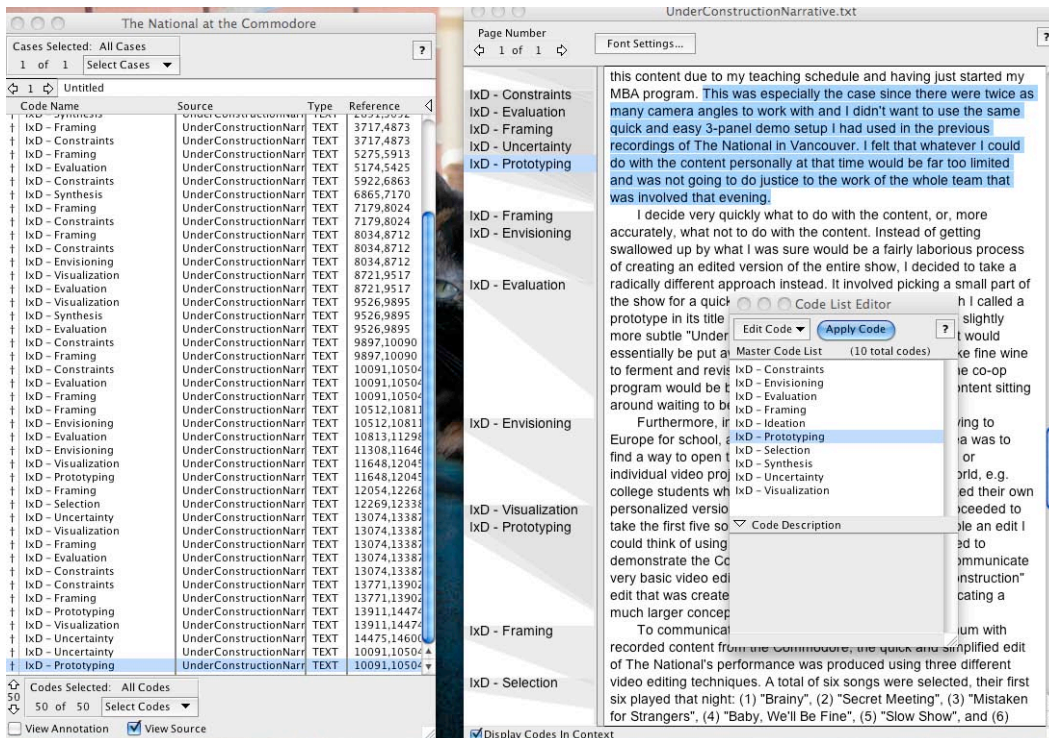
For *Under Construction*, a video some times referred to as the “Commodore test clip”¹⁵⁸ or “prototype”, a video-based analysis was avoided completely. Instead, the approach would be to use a text-based tagging analysis only, perhaps later supported by selections of video. In the first attempt with *The Last Waltz* data, I had begun to create a pool of tags to work with, so after abandoning this direction in favor of *Under Construction*, the first thing I did was to enter all the codes I had into a Hyperresearch “master code list”. Instead of video, for the data I decided to write an overview narrative of the event that lead to *Under Construction* (and now to seedfeed™). The entire narrative was originally found in this section but has since been moved to APPENDIX 3: The National - Under Construction.

Once again, I followed the step-by-step HyperRESEARCH tutorial and tour on the Researchware website, and submitted the narrative description of the Commodore Co-op scenario as a data source. I proceeded to try tagging an initial pass of the text-based data, but again the application’s interface became a problem. This time however, it had nothing to do with video. The problem now was in being unable to find a clear way to organize the tags as suggested in the HyperRESEARCH website and help sections. For example, I simply wanted to create groups and subgroups of tags that could be revealed and hidden, when needed, while doing the analysis. After not being able to find a reasonable way to do this, or even a way to easily sort or colour code the tags, I decided to scrap this attempt and try again.

¹⁵⁸ Joel Flynn, *Under Construction*.

On the next attempt using the same data source, I limited the tags to only the ten activities in the IxD methodology (i.e. the one that uses Moggridge’s “pinball” table metaphor). Since the original idea was to organize results in table form, that is, under the categories of STUDY, EXPLORE, EVALUATE, and DESIGN categories, I felt that even this limited approach might reveal an insight. With the ten tags in place, I proceeded through the data until reaching the trial software’s maximum limit of fifty entries (see Figure 33). While I was close to reaching the end of the text on this first pass, I was now constrained in adding any additional sets of tags that I hoped to use to look for other relationships in the data, e.g. connecting IxD tags to disruptive innovation tags. Given these limitations, I decided to go about annotating the tagged entries that I did have available and investigate motr HyperRESEARCH tutorials in order to see how the data might be presented differently.

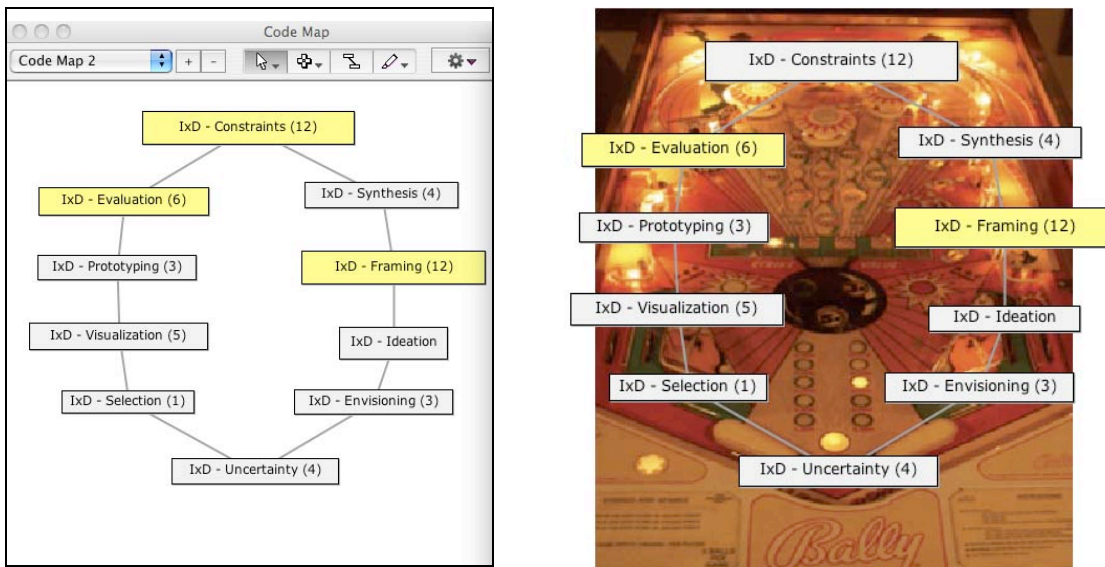
Figure 33 HyperRESEARCH trial version interface text-based data analysis



After annotating all the tagged entries, I was able to produce a report where the settings offered various options for the information to be presented. I was also able to produce a map that could be used to show relationships between the tagged items as nodes on a flowchart or mind map. While this map feature did have the option to allow nodes to be sized relative to the frequency of tag use, this seemed to be the only feature that could reveal any insight automatically from the data. Frustrated again by the limitations of the software, I discovered that while I did have the ability to highlight text, such highlighting was only possible using a yellow highlight. Again, the HyperRESEARCH application had no apparent way of organizing by colour coding to address this issue.

In order to demonstrate the potential for insights in using the HyperRESEARCH software, as used in a the limited way provided in this example, as well as to show the significant challenge the user faces when asking the software to go beyond these limitations, I've reconstructed Moggridge's IxD diagram in two versions using HyperRESEARCH's mapping feature (Figure 34):

Figure 34 HyperRESEARCH mapping tool (left), and image placement feature (right)



While I could create the map and frame it in the same way as represented in Moggridge,¹⁵⁹ I could only work with yellow highlight, or, add a background image (see Figure 34). This kind of functionality, to refer to Christensen's theories of disruptive innovation, can definitely be characterized as *underperforming*, though I'm not sure this less sophisticated capability would work for many nonconsumers, as they'll likely to continue "nonconsuming". Unless the full-function version has significant abilities that are not apparent in this trial version, I can't see enough value in HyperRESEARCH's ability to represent data in what are supposed to be compelling and insightful ways, at least not enough value to warrant the effort in using it for extensive qualitative analysis involving repeated tagging/coding processes.

EVALUATION:

With respect to the data that was analysed in this second iteration, the nodes in the reconstructed IxD framework in Figure 34 (i.e. Moggridge's non-linear "pinball" metaphor methodology) do actually provide some insight. The three highlighted nodes are the ones whose tags show up in the analysis most often, with [constraints] and [framing] leading the way with twelve tags each, and followed by [evaluation] with six tags. Again, this was only a rough pass at the data, and had to be cut short due to the fifty-entry limit of the HyperRESEARCH trial version application (to be fair, the trial version of Atlas.ti also has a fifty-entry limit). These preliminary results can be interpreted as:

1. Representing my own biased perspective in activity theory, which is fundamentally a dynamic framework of constraints in tension, e.g. subject v. object v. media v community, etc
2. Indicating a back-and-forth between framing and reframing activities and constraints in the Commodore Co-op situation, leading to a circular dynamic as evaluation measures the frameworks against their constraints,
3. Suggesting that the Commodore Co-op initiative was mostly in an early stage of design at the time, i.e. much of the activity performed here was in trying to find the right value framework to use in arguing the case to both Live Nation and SFU.

¹⁵⁹ Moggridge, "People and Prototypes," 730.

In performing this analysis, it also came to my attention that I missed out on including activities of envisioning and visualization that are clearly apparent in several of the figures of earlier sections (see Figure 10, Figure 12). Even so, with the fifty-entry limit on the trial version, these additional data wouldn't likely have been analysed even if I hadn't missed them the first time through.

These are useful insights to see represented in visual form, if not as potential touch points for further discussion. However, for the applied IxD methodology (a.k.a. the **S/E/E/D** method) to be useful strategically, the payoff from the amount of coding or tagging that it prescribes has to be better than what seems to be the limits of the HyperRESEARCH application. Admittedly, what was used for the analysis was the less than full featured version, with less than the full data, and with a limited set of tags. Yet with the right mix of visualization capability, video analytics, and rich data to work with, there may value to the approach. One thing is certain: there's only going to be more and more video-based data to work with in the future.

5.7.3 THIRD ITERATION: Dedoose as late-breaking game changer

After frustrations with the video interface and limited visualization capabilities of the HyperRESEARCH trial version, I had little intention of using qualitative data analysis software for additional analysis in this project. My evaluation of the activity was such that I didn't feel any further effort in this direction would be of benefit to the work at present, and so it would probably be better to redirect these efforts. I did consider transcribing by hand the *Revisiting The Last Waltz* video and running it through the analysis software, but since the trial version of HyperRESEARCH was still limited to fifty entries, the results would've still been seen as too limited to draw any further conclusions. In other words, the trial version of the software had made its points.

Not long after making the above decision, and reflecting on it in an initial "Results" section for this document, I did some searching on the web for additional instructions on how to use the HyperRESEARCH application.

Specifically, I wanted to check for other ways to represent the data visually, even other software that might be available. While searching in web forums where there was discussion of qualitative data analysis tools, I came across a discussion forum posting from Eli Lieber¹⁶⁰, one of the principals of SocioCultural Research Consultants, LLC.

Figure 35 Dedoose cloud-based mixed-data analysis application, demo project



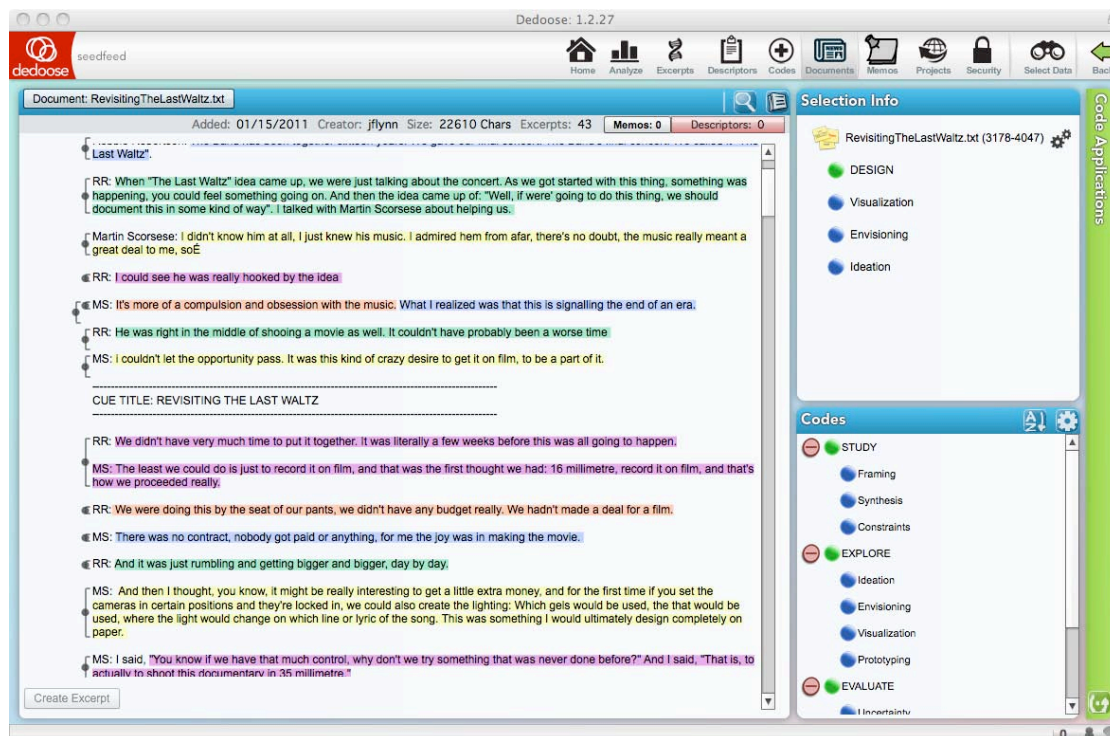
The posting from June, 2010 announced the recent release of a web-based application called “Dedoose”, a platform-independent, “cloud” based application designed to integrate both qualitative and quantitative data analysis. Since it is web-based, there’s no software to download, but instead requires signing up for a trial account. I proceeded to sign up an account for **seedfeed™** and was provided with a full-featured interface with an empty

¹⁶⁰ Eli Lieber, “Omni qualitative analysis software?,” *The Omni Group Forums*, June 23, 2010, <http://forums.omnigroup.com/showthread.php?t=9358>.

“seedfeed” project and a sample project, see Figure 35 above, with a wide range of analysed data, tags/codes, “descriptors” and visualizations.

Noticing right away that the trial account was not limited in terms of number of “tags” or “codes” (which they use interchangeably), nor were there any limits on the amount of coded entries from data analysis, I began to reconsider whether I should make another attempt at analysing *Revisiting The Last Waltz*. As pointed out in the user manual, Dedoose’s video analysis tools were unfortunately still in development, but the additional functionality of the application – both in terms of qualitative and quantitative approaches – seemed worth exploring. Therefore, I made a decision to painstakingly transcribe by hand the *Revisiting The Last Waltz* documentary, found in APPENDIX 4: Analyzing The Last Waltz, in order to at least use text-based data in order to try a limited set of Dedoose’s features.

Figure 36 Dedoose text-based tagging interface featuring *Revisiting the Last Waltz*



The amount of time needed to transcribe the documentary left the analysis process, at least on this pass, very limited. As opposed to the use of the trial version of HyperRESEARCH, the limitations of this Dedoose analysis weren't from restrictions of features and processes, but rather from the realization that I could actually enter a significant amount of data and perform a significant amount qualitative tagging/coding. Furthermore, I could also spend a significant amount of time adding additional layers of qualitative and quantitative "descriptors" to better organize and represent the project data. The limitation now moved from limited features to not having enough time to properly enter in all the rich data that could make best use of Dedoose.

For example, in addition to creating tags/codes for Moggridge's ten design activities, I could also subcategorize these under my STUDY, EXPLORE, EVALUATE, and DESIGNING categories in the **S/E/E/D** method. I was also able to create other "sets" of tags/codes such as the ones for disruptive innovation and cultural psychology that were determined earlier in the project. I was also able to add "descriptors" such as dates, names, locations, budgets, and even things like "recoding format", "reel", "audio source", etc. that are all relevant to the **seedfeed**™ project. What started as a simple exploration of another data analysis application, which I figured would be limited like the trial versions of HyperRESEARCH and Atlas.ti, turned into an equally limited analysis only because I didn't have time available to really explore this application's features.

Though I couldn't get to an in-depth analysis, Dedoose did have the capability for me to set up the framework for the entire set of events in the **seedfeed**™ project, i.e. all the events listed from October 2007 to December 2010 in APPENDIX 2: Chronological event listing. This was possible by converting the table in Appendix 2 into a spreadsheet and creating "descriptors" in Dedoose that matched the spreadsheet columns. By simply importing the spreadsheet into Dedoose, the **seedfeed**™ project now takes form within a qualitative and quantitative mixed data analysis environment. Given the value of "coming up

with the right framework”,¹⁶¹ as established in Moggridge, this is not insignificant development considering the frustration from using the trial version HyperRESEARCH application.

Figure 37 Dedoose “descriptor” sets featuring seedfeed™ project chronology

EVALUATION:

The limited use of Dedoose was able to produce several important evaluations:

1. **PLATFORM INDEPENDENCE:** The platform independent web-based application was already clearly superior to product Atlas.ti simply in terms of intereoperability. I can definitively state that I would not adopt Atlas.ti for this research because so much of my working environment with video is in the Mac OSX environment. Certainly, I am able to run Windows-based applications on the Macintosh computers that have Intel-based

¹⁶¹ Moggridge, “People and Prototypes,” 731.

architectures, but the trial versions I have of software that allows for this cross platform interoperability has already expired and presents an obstacle to the overall digital ecosystem that is best avoided by a web-based application such as Dedoose

2. **TARGETING NONCONSUMERS:** Because Dedoose is web-based and the data and analysis from projects resides on the company's servers in "the cloud", questions naturally arise as to how traditional users – i.e. the qualitative research market in industry and academia - will respond to this kind of system. However, Dedoose's strategy may be in anticipating "nonconsumers" who don't use this kind of software because it has traditionally been specialized for academic and industry researchers. Dedoose's future market of nonconsumers may be those in the technology industry – if not today's batch of technology-savvy students, i.e. people who are already more comfortable with cloud-based applications and with having their data reside outside of personal computers. The use of the more commonly-used and contemporary "tag" term, rather than "code", may be evidence of this strategy. However, initial versions of the application currently feature the "code" term in its initial launch for existing markets.
3. **MULTIMEDIA DATA IN THE CLOUD:** The explicit mention in the Dedoose user manual that the application is currently limited to text and text with inline images, but will incorporate other kinds of data resources – such as individual images, PDFs, audio files, and digital video – indicates the potential scalability of this application to uses beyond traditional academic and industry research. While the goal for this kind of multimedia capability is not surprising, since Atlas.ti offers such feature, the most striking analytical insight, at least from my framing of the problem space, is in considering how this data is going to be managed in a cloud-based environment, i.e. Who will manage it? Where will it be stored? How will it be accessed? And with respect to video, what level of quality will be used?

While the analysis performed with Dedoose was limited, the three insights above – and the questions they raise – are more than sufficient to lead to several important conclusions for the **seedfeed**™ project. Some of these conclusions address what appears to be a significant opportunity for creating value out of the project's archive of digital media and its integration of PColP™ remote video protocols through upcoming prototype development.

In evaluating the problem space as it now appears after significant theoretical study and practical exploration, what the space seems to suggest is at least a reframing of the problem. This reframing would consider the kinds of future *jobs-to-be-done* that Dedoose users may have involving video data accessible through PColP™ technology. This perspective opens up an opportunity for Teradici's interests in higher education, one that would compliment potential digital video-based co-op initiatives being prototyped with **seedfeed**™. Strategically, the **seedfeed**™ prototype and Dedoose uncover a significant market relating to research activities that already take place in academia and industry, and where digital video is an increasingly valued source of data.

I think it is fair to say that despite their limitations, these new lines of research provide more solid empirical possibilities of founding a psychology on the study of everyday activity. With the further development of video-recording techniques and the fusion of video with computer technology, we can anticipate new developments in research on multi-person joint activity in the context of its institutional settings.¹⁶²

In concluding *Cultural Psychology*, Cole sees new lines of research emerging in the study of everyday activities. It would be interesting to know how his view of future video-recording techniques in research now compares to the role that digital video ecosystems now play in the everyday activities being studied. Regardless, whether for research, entertainment, or industry-situated student co-op programs, there is apparently room to improve the video research tools.

¹⁶² Cole, *Cultural psychology*, 342.

6: CONCLUSION

From time to time in a fisherman's life, it does turn out that he has to set himself new conditions. Usually this is because he has found some new and more exacting or more exciting way of engaging the attentions of his fish rather than because the results of the old one have become too certain. The new conditions or the new method open up a whole new field of exploration and the days are once more lively and good.¹⁶³

This project has taken its share of turns, which is not unexpected given a methodological framework uses the metaphor of a pinball table. The development the **S/E/E/D** method, as an application of this interaction design (IxD) methodology, has been a practical design outcome of this study. It has involved several stages of exploration and evaluation, not to mention the complete reframing of the problem space around the **S/E/E/D** method. By “following the problem” in this way, the following conclusions can be made:

STUDY: The method is both tool and result, prerequisite and product, so in studying the problem using the method, it develops the method itself.

EXPLORE: The method provides a way to “anchor” when exploring the problem space, especially when reframing happens through visualization of the complex system.

EVALUATE: The method has led to a reevaluation of coordinating lenses in the theory that underpins this research.

DESIGN: The method has led to practical marketing opportunities for PCoIP™ and the **seedfeed**™ initiative by looking at jobs-to-be-done in education and entertainment, then considering the resources and processes needed to do these jobs.

¹⁶³ Roderick Haig-Brown, *Fisherman's summer* (Toronto: William Collins Sons, 1959), 252.

The upcoming sections will now deal with each of the four key conclusions in greater depth.

6.1 STUDY: Creating a method by studying it... and vice versa.

The first conclusion that can be drawn from this study is the connection between IxD and current research in cultural and developmental psychology, in particular, cultural-historical activity theory. While the object of research for early 20th century developmental psychologists such as Vygotsky concerned the learning and development that takes place in children, our current contexts have to look at learning and development that goes beyond the constraints of age and physical classrooms. Rather, computer-supported cooperative work settings (CSCW) need to be considered for both real and virtual spaces as learning spaces become increasingly networked by ubiquitous computing.

These learning communities and mediated spaces can and do exist through mobile applications on smart phones and tablet PCs that are part of a larger digital ecosystem for high technology skill development. It can involve working on projects remotely with peers and/or mentors in other parts of the world using through the use of video technologies like Teradici's PCoIP™. These "virtual machines" and virtual collaborative online spaces can be created, and are argued to be more cost-effective and secure with PCoIP™ by centralizing the data and the processing, while decentralizing the end-user experience.

The key conclusion in this regard is not so much whether it can be done (i.e. setting up such collaborative learning spaces), but in understanding how IxD methods can be used to improve the design of these spaces, and, consequently, increase their value. If all the pieces are there in order to create the spaces, and they are seen as valuable uses of such resources, it becomes a matter of finding the right method to put it all together.

This "search for method" was fundamental to Vygotsky's work, albeit in a different context, as it is here:

The search for method becomes one of the most important problems of the entire enterprise of understanding the uniquely human forms of psychological activity. In this case, the method is simultaneously prerequisite and product, the tool and the result of the study.¹⁶⁴

This radical position – analysing the same method that is being used for the analysis – in not only creates an inherently complex system, but requires non-linear development to even be considered. Moggridge’s general IxD methodology is both of these: “the process does not look like a linear system diagram, nor even a revolving wheel of iterations, but is more like playing with a pinball machine, where one bounces rapidly in unexpected directions”¹⁶⁵ and where “the pattern is complex and less orderly than a clockwise cycle.”¹⁶⁶

Yet when a step-by-step method is required, complexity and non-linearity present present the potential for a “wicked problem”, e.g. where the problem has no definitive formulation, no right or wrong solution (just better or worse), no immediate or ultimate test, and where the wicked problem is unique, but interdependent as a symptom of other wicked problems.¹⁶⁷ The **S/E/E/D** method achieves a balance between structured and ill-structured “wicked” problems in this regard; therefore, it can be seen as overcoming the contradiction of *non-linear-step-by-step*. The method, as formulated here, does provide a set of steps or stages to work through, but recommends intentionally looping back on these stages and their component activities (such as evaluation, framing, prototyping) as much as recognizing that the process will do its own looping back, regardless of the designer’s intent.

In turning methodology into method, the stages that **S/E/E/D** works through, as well as the proposed tools and resources used for doing so (PCoIP™, Dedoose, digital video archives), may be seen as a significant practical achievement for

¹⁶⁴ Vygotsky and Cole, *Mind in society*, 65.

¹⁶⁵ Moggridge, “People and Prototypes,” 650.

¹⁶⁶ *Ibid.*, 730.

¹⁶⁷ Horst Rittel and Melvin Webber, quoted in *The idea of design*, 14.

lxD in this regard. However, the limitation at this time, given the newness of **S/E/E/D** as a practical method, is the lack of repeated applications and testing in order to gauge its value for business, technology, and design management purposes. In the interim, this project has effectively sketched out how the **S/E/E/D** method can be applied, rather than making any conclusions on how well it works based on very limited analyses.

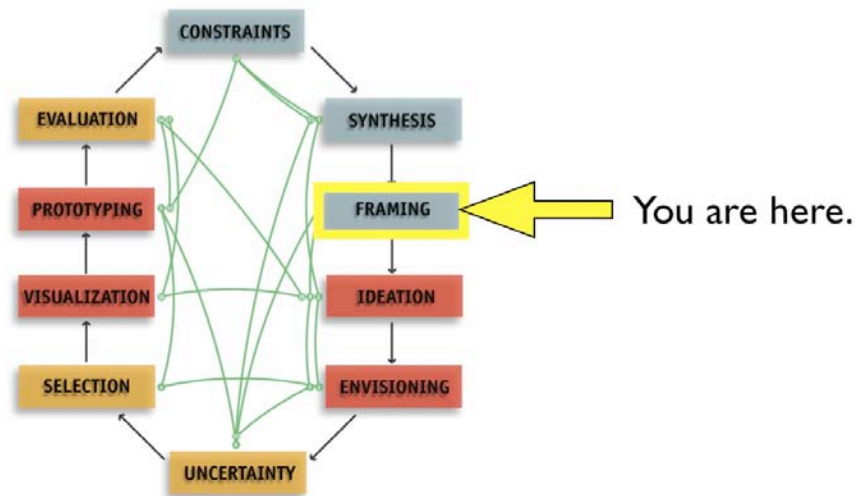
6.2 EXPLORE: Using the method to find your bearings while exploring

The **S/E/E/D** method, and the lxD methodology in general, are also valuable in showing a specific role for what is called a radical “reframing” of a problem space, where, “if the problem led you to suggest radically reframing some fundamental hypotheses about how the world works, you did it,” thereby “following” that problem wherever it led you.¹⁶⁸ The issue with this idea of “radically reframing fundamental hypotheses” is the uncertainty that comes from the thought of even attempting a radical reframing, and where it may or may not lead in the design process. It’s an especially tough argument to sell to a client, investor, or other stakeholder in the design process and therefore affected by the radical reframing (even though there may be a completely valid argument for doing so).

What the lxD methodology in general, and the **S/E/E/D** method in particular, provide is a visual map of where reframing takes place in relation to other design activities (Figure 38)

¹⁶⁸ J.S. Brown, in C. Thomas Mitchell, *New thinking in design: conversations on theory and practice* (New York: John Wiley & Sons, 1996), 104.

Figure 38 Getting one's bearings after radically reframing a design process



Therefore, with the IxD framework as a visualization tool, the potential impact of reframing can better be seen in order to deal with it whether reframing happens by design or by circumstance. For example, an event causes a reframing that initially must be addressed in the “STUDY” part of the methodology by reconsidering all the relative constraints and synthesizing them into the system. Other activities will follow at some point, such as visualization, uncertainty, evaluation, etc. but don’t need to be focused on until a sense of the new constraints can be synthesized into new design ideas and strategies. This would seem a better outcome than feeling lost and helpless in the design process when fundamental assumptions need sudden change.

In fact, several “reframings” have already taken place in this project, the most recent – and perhaps most significant – has been reframing the problem space around the opportunity presented with the Dedoose application. The application of PCoIP™ in film and media co-op programs is no less valid an idea, and will be demonstrated through the **seedfeed™** prototype as it still addresses the needs for practical hands on learning and industry best practices in video production. It still provides a technical solution to dealing with the amount of digital video content in higher education and in the entertainment industry, specifically, how that content can be better managed.

However, the quantitative and qualitative research tools that will analyse this “heavy” digital video content will also have needs for best managing video-based data in research projects. By reframing the problem around the kinds of jobs and processes researchers dealing with video content will need to do in the future, an opportunity emerges for PColP™ to be the backbone of the qualitative video-based infrastructure, if only for reasons of centralization and security of data. While centralized, if the video data can be accessed anywhere in the world through PColP™’s ability adapt to available network infrastructures, while also keep clear of regulatory and legal issues relating to where the data is hosted, it could well be the basis for disruptive innovation in R&D fields.

6.3 EVALUATE: Re-evaluating lenses, coordinating a breakthrough

A significant theoretical achievement has been accomplished through this MBA project, and though it may seem like an aside in some respects, it’s what I feel is actually the most significant contribution of the work as a whole. The breakthrough was a result of what Bateson refers to as a “double bind” situation that I had created in my work through the use of complex biological systems as a metaphor for digital ecosystems. My reliance on this metaphor, specifically of “autopoiesis,”¹⁶⁹ went back to my previous graduate degree on remix culture, and was even in the title of that earlier thesis project. Therefore, I was heavily invested in this metaphor for complexity and found it hard to avoid when dealing with discussions of complex systems and methodologies in IxD.

This time through, however, my MBA project involved rethinking this past research work and make use its approach of *coordinating sets of lenses*¹⁷⁰ in order to add another lens: the business and strategy perspective through Clayton Christensen’s RPV theory¹⁷¹. While I did this, I found it impossible to

¹⁶⁹ Maturana and Varela, *Autopoiesis and cognition: the realization of the living*; Taylor, *The moment of complexity*; Graham, “Monopoly, Monopsony, and the Value of Culture in a Knowledge Economy: An axiology of two multimedia resource repositories..”

¹⁷⁰ Cole, *Cultural psychology*, 338.

¹⁷¹ Christensen, *Seeing What's Next*, 289-290.

side step the issues of complexity theory and adaptive systems when entering this discussion. Before long I found myself again discussing the work on autopoiesis by Chilean biologists Humberto Maturana and Francisco Varela.¹⁷² Unfortunately, this discussion reached a point where it was obviously overburdening the entire MBA project and putting it at risk. At the same, ignoring this discussion or removing it all together would punch a major hole in the background, theory, and method sections, leaving a number of “empty” arguments that were as much of a problem as the use of complexity theory. This no-win situation was effectively a “double-bind”¹⁷³, i.e. a contradiction that had to be moved beyond in order for development to take place, but somehow it did get resolved.

The way this contradiction was resolved stunned me a little, and the “zen” of how it happened leaves me shaking my head. I was struggling very badly in trying to figure out how to remove the discussion of Maturana and Varela’s concept autopoiesis because it is a challenging and somewhat inaccessible term to use, and because of its relationship to my past work (also challenging and somewhat inaccessible). The issue was whether this discussion was of any benefit in my current MBA project, regardless of how I felt about it. Indeed, when starting the project, I wanted to replace any focus on autopoiesis with Christensen’s three-level RPV theory in order to integrate a more business-focused set of lenses into the work. However, I wasn’t sure how to remove the autopoiesis term from the models I had set up in past work (see Figure 18) without explaining the term first. So I began moving in the direction of a discussion of complexity and complex systems, since it was going to be needed anyway in making the case for Moggridge’s complex and non-linear IxD methodology. And so, several earlier versions of this MBA project included extensive discussions of complex systems that were eventually being cut, for the better, but not without some resulting contradictory tensions.

¹⁷² Maturana and Varela, *Autopoiesis and cognition: the realization of the living*.

¹⁷³ Gregory Bateson, *Steps to an ecology of mind*, 201.

On the same day I had the most challenging moments with this autopoiesis dilemma, I received a DVD in the mail from Amazon.com that I had ordered weeks earlier. The DVD was a film called *Monte Grande*,¹⁷⁴ a profile on the late Francisco Varela and his life's work as the scientist who came up with the concept of autopoiesis with the colleague Maturana, as well on his later work as a practicing Buddhist. I obviously didn't have time to watch the DVD, given the amount of writing I was working on at the time, so it stayed wrapped up while I continued to struggle away at a computer monitor. While in the process of reviewing feedback on the work and cutting out material from draft copies as suggested by my supervisor, I realized I had removed most of the mentions of autopoiesis in the text. While doing so, I reflected on the irony of a video version of Varela showing up at my door – or *at my work*, so to speak – while I was in the process of removing him *from my work*.

However, Varela video or not, I still needed to replace this discussion of autopoiesis and complexity with something else that could cover the topic. I had also cut or moved Moggridge's "hierarchy of complexity" in several other earlier versions of the work, since there were other sections that discussed the complex adaptive systems and design. When I looked at the visual representation of this hierarchy again,¹⁷⁵ instead of seeing the six activities that form the hierarchy, I saw three groups of two activities (as discussed in section "Patterns of mediation and coordinated lenses"). These three groups – i.e. the three levels of *body*, *mind*, and culturally-mediated *context* – matched up eerily well with the other three-level systems and their coordinated lenses.

As a result, I was able to remove Maturana and Varela's first, second, and third order systems from the representations of the coordinated lenses model (see Figure 18) and replace them with Christensen's RPV framework. On the other side I was able to add Moggridge's hierarchy of complexity, which

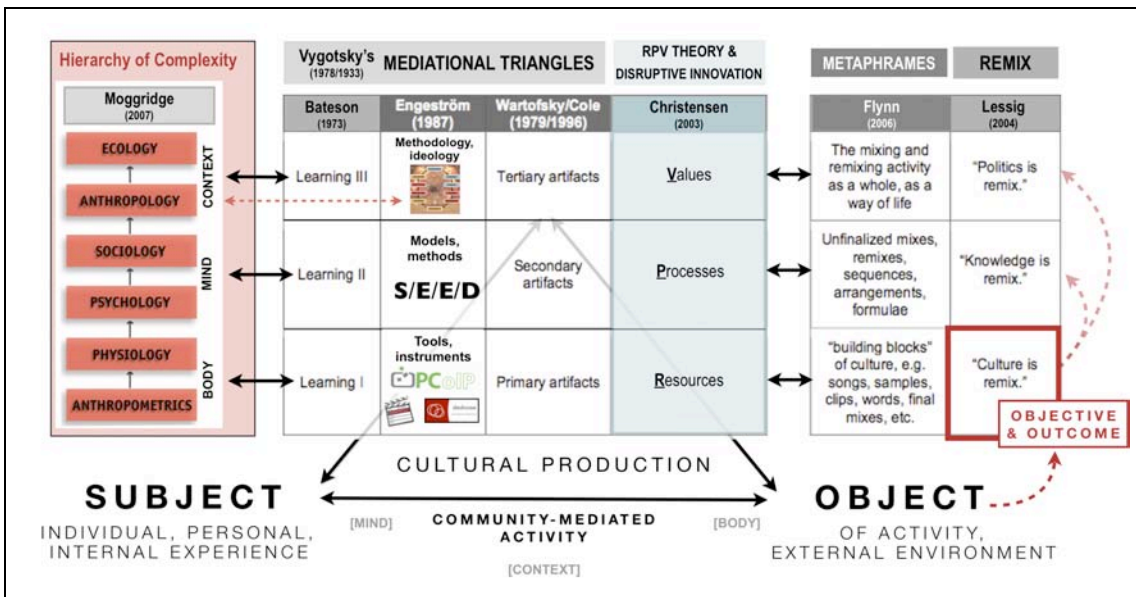
¹⁷⁴ Franz Reichel, *Monte Grande: What is Life?*, DVD (Icarus Films, 2005), <http://www.montegrande.ch>.

¹⁷⁵ Bill Moggridge, *Designing interactions* (Cambridge Mass.: MIT Press, 2007), 652.

unexpectedly but very appropriately tied in with Bateson’s levels of learning.¹⁷⁶ Suddenly, the promising model of coordinated three-level systems had, on the one hand, lost a very complex set of lenses in the three orders of autopoiesis (see Figure 18), but had gained two others sets of lenses that I felt made the model even stronger.

I was able to compile the added and removed models into a “meta-model” concept map that I’ll refer to as “VPS”, or, the “Vygotky Positioning System”. It is fundamentally based on the meditational triangle first developed by Vygotky in the early 1930s and later expanded by Engeström in the 1980s to better reflect the community-situated nature of mediated activity. Just as Engeström’s expansion of the mediation triangle is widely regarded in activity theory discussions as a major step in the model’s development, I maintain the interdisciplinary expansion of the theory by recognizing a pattern of three-level systems, shown in Figure 39, is just as significant a development.

Figure 39 Reframing coordinated lenses in the Vygotky Positioning System (VPS)



¹⁷⁶ Gregory Bateson, *Steps to an ecology of mind*.

A complete discussion of this model and argumentation for its importance in the development of cultural psychology and cultural-historical activity theory is beyond the scope of this MBA project. In fact, it would be a much more appropriate object of research for a PhD dissertation, if an appropriate time and place to do such work were to come about. However, that it was produced out of the tensions taking place between business and design perspectives in the activity system of this MBA project should be noted. As a road map of culturally-mediated activity, this coordinated set of lenses can even show how to reintegrate Moggridge's IxD methodology in order to see its role in the bigger picture, as well as the roles of tools and potentially disruptive technologies (e.g. dedoose, PCoIP™) when combined with archives of digital media. These all act as valuable *resources* and "building blocks" of new activities in an ecosystem.

Finally, reflecting on this process revealed one aspect of it that I found particularly *enlightening*, to borrow a term that Varela might have used as a practicing Buddhist. For quite some time, I had all these theoretical lenses for building the methodology pictured above (in Figure 39), including Maturana and Varela's lenses of autopoietic orders which are no longer pictured but still considered foundational to this interdisciplinary perspective. Yet, despite having all the pieces, the entire "big picture" perspective wasn't put together in this way, and the only reason it did come together was by pulling out the vital components of Maturana and Varela's system. Once that happened, it was as though all the other pieces just fell into place. Again, I couldn't help notice the irony of how vitally important the autopoietic elements are to the overall system, even though the overall system no longer explicitly contained these elements, as I had switched them out for more appropriate pieces (at least for now).

6.4 DESIGN: Marketing a digital video ecosystem with jobs-to-be-done

The final conclusion to be drawn here moves decidedly away from the theoretical, and instead moves towards some practical outcomes that are appropriate for an MBA project. The **S/E/E/D** method and the digital ecosystem

of concert video recordings that have been used in this work were able to reveal areas of *marketing value* in the overall digital ecosystem, that is, very real opportunities for business development that need to be considered at this time. These opportunities can be seen by coordinating Christensen's concept of *jobs-to-be-done*¹⁷⁷ in overlapping digital ecosystems of education and entertainment, then positioning digital video *resources*, and the *processes* that PCoIP™ affords as a way to *frame value* in this space.

Figure 40 Potential partners for a current seedfeed™ digital ecosystem



In reflecting on **seedfeed**™ and the use of the **S/E/E/D** method, one thing that is clear to me is how I've had to re-evaluate and *reframe* the design and development of this project on several occasions during its course of study. This can be attributed to new dimensions in the problem space being revealed through ongoing exploration activities. These activities include *ideation* and *envisioning* through brainstorming and experimental recording processes while on the road with The National, then *selecting* excerpts from these recordings in order to create *visualizations* and *prototypes* that helped to refine the **seedfeed**™ concept as well as help communicate the concept to others. The *evaluation* of these explorations eventually revealed new issues and

¹⁷⁷ Christensen, *The Innovator's Solution*, 74-80.

opportunities for the research, and at times led to radical *reframing* of this very MBA project.

However, the ability to locate the reframing activity in the IxD system, as discussed in the second conclusion, allows for a somewhat systematic approach to reframing. One of these approaches, which was discussed as part of Christensen's disruptive innovation theories, is to use the *jobs-to-be-done* concept. This approach allows for opportunities to be identified through what types of jobs people are trying to accomplish, but are unable to do satisfactorily. The gaps in what people are *motivated* to do and what they have the *ability* to do are opportunities that can be capitalized on, whether by existing industry players ("incumbents") or by new entrants who have a better mix of *values*, *processes*, and *resources* for making the most of the opportunity.

The extensive research that has gone into **seedfeed™** has revealed just such an opportunity, one that perhaps could only have been seen by way of the **S/E/E/D** method, as devised and developed here:

STUDY the problem:

This stage doesn't need any more discussion as it has been clearly established that significant theoretical background has been done. Repeated consideration of the constraints of the design problem and/or the business opportunity have been synthesized into practice and have reframed **seedfeed™**'s development where needed. Some of this study has come through exploration, but is always synthesized through "background processing of information [that is] happening all the time."¹⁷⁸

EXPLORE the possibilities:

Numerous possibilities have been explored for how best to apply PCoIP™ technology to a digital archive of video content, while also having considered

¹⁷⁸ Moggridge, "People and Prototypes," 729-731.

how different kinds of digital video archives could replace (where appropriate), the live concert filming content currently in development. Exploration here has attempted to understand how these resources can be used for educational purposes and for finding value in existing media collections in the entertainment industry.

EVALUATE the alternatives:

Alternatives were produced and explored for the application of: (1) the **seedfeed**™ digital video content, (2) PCoIP™ remote video and collaboration technology, and (3) the **S/E/E/D** method itself. From these concerns, the leading base-level application throughout the study has been to use PCoIP™ to set up collaborative learning spaces for developing video editing and production skills. This is the use that emerged from the Commodore Co-Op initiative and will be the example used by the **seedfeed**™ prototype in demonstrating interested parties in higher education and the entertainment industry of the value of such archives and collaborative spaces. An additional alternative, which is more of an extension of this idea, is to add the live concert recording process into the mix.

The **seedfeed**™ project for that matter has usually been considered as both activities, e.g. the recording and the production activities in the Commodore Co-Op initiative, though they are actually as separate activities. For example, students may have had no part in creating the archive of digital video content, but can get access to it for working in remote collaborative spaces. This is a different activity than having a role in actually creating the archive by filming the content. They are complimentary activities, to be sure, but can be approached separately.

For both cases, a web-based interface for these collaborative spaces would need to be designed as part of the upcoming prototype, as the PCoIP™ technology isn't interface-based but rather produces a visual representation of a desktop environment running any operating system that is then transmitted

over IP to the end user. The key for **seedfeed**™ in terms of PCoIP™'s integration is simply a matter of where the raw video files are being stored and accessed from. These files may be located in servers at the University, or may be located directly in the Venue where they were recorded, or sent to another set of servers, such as in the case of the Commodore, to Live Nation Studios in Los Angeles. Wherever the content is located technically, there are additional questions of legal and policy concerns that would need to be addressed, but would take place “behind the scenes” and therefore shouldn't interfere with the end user experience. The interface to this content could then be designed as a web-based application or as a plug-in to editing software such as Final Cut Pro.

However, a third alternative emerged while attempting to perform an application of the **S/E/E/D** method in previous sections, one that incorporates the use of the **S/E/E/D** method itself. While the other alternatives can also make direct use of this method, this newly emerging opportunity would combine the **S/E/E/D** method, PCoIP™, and **seedfeed**™'s digital video archives to address a growing need in higher education. Particularly, in terms of the *jobs-to-be-done* in academic research, the previous application of **S/E/E/D** showed the limitations of working directly with video content and incorporating qualitative data analysis software in coding (or “tagging”).

Put into practice, the **S/E/E/D** method revealed that the existing qualitative data analysis software had significant *constraints* related to: (1) whether it was cross platform, i.e. Mac/PC/Linux, (2) whether it could handle more than just text-based data, e.g. images, audio, video, (3) whether it could also work with quantitative data analysis as well, i.e. “mixed” methods, (4) where the data ultimately resided, e.g. local machines versus geographical and legal constraints of data being stored on servers outside the country, and finally, (5) the kinds of *visualization* capabilities for the data in analysing it and presenting the results of analysis.

In synthesizing these constraints while I was doing some preliminary testing of the method and using video-based data, as was discussed earlier, I came across the very new “Dedoose” web-based mixed-method (i.e. qualitative and quantitative) research application.¹⁷⁹ I then incorporated this research tool into the analysis of my existing data, and in doing so, looked at the *jobs-to-be-done*, *resources*, and *processes* that were all taking place in these researching activities. A radical reframing of the problem space followed.

This radical reframing can best be explained in terms of a potential design outcome for the **seedfeed**™ prototype that is slightly different than the original direction of the Commodore Co-Op model.

DESIGN an outcome:

In thinking about *jobs-to-be-done* in qualitative and quantitative research (for both industry and academia), the main activity on the qualitative side is the “tagging” or “coding” of raw qualitative data such as interviews, stories, transcripts and other mostly text-based sources of information. It is a tedious process that requires, at some level, human subjectivity and interpretation, i.e. doing an automatic search for key words doesn’t necessarily provide the insight that human readers can. Performing this job with text-based data alone takes time and effort that, at least using the current data analysis applications, keeps the researcher tied to a desktop or laptop computer. The data from these analyses ordinarily are stored and updated locally, then uploaded to a remote site when necessary or as is increasingly common with information moving to cloud-based storage. Depending on the nature of the data being analysed, security concerns for its privacy and protection must also be considered.

With the analysis of different kinds of qualitative data – ones that aren’t immediately text-based such as images, audio files, and video – the dimensions of the problem space can change. Images require the ability to frame and select

¹⁷⁹ Mark Piller et al., “Dedoose Case Study,” *The Midnight Coders*, n.d., <http://www.themidnightcoders.com/company/case-studies/dedoose-case-study.html>.

relevant details from the larger image, analysing audio content doesn't require sitting in front of a computer screen but can be done while in motion, video files bring up issues of storage and data transfer, in addition to playback formats and operating system compatibility, e.g a QuickTime movie versus a Windows Media movie. With video files in particular, the size of these raw files also creates questions of selection, i.e. what files should be stored, whether there is the capability to store all or enough of the raw video, where does the archive of raw video data file go and who has access to it, etc.

In considering these affordances and constraints when engaged in multimedia-based qualitative research, particularly using video vs. text-based analysis, I had to make a fundamental set of assumptions based on my practical experience and theoretical knowledge of design, research, and media technologies: (1) video is very rich and very valuable as a source of data, (2) the amount of video available for analysis is growing significantly, (3) motivation to use video sources for data analysis will increase, (4) data integrity, security and access will require some level of centralization, and (5) the file sizes of raw, video-based content increase the need for centralization if data integrity, security, and access are the driving values of research. While these are assumptions, they clearly show a rationale for Teradici's virtualization approach to centralized data and processing using PCoIP remote connectivity.

The **seedfeed**™ project therefore can be fundamentally reframed around creating PCoIP™-powered collaborative research spaces for video-related qualitative data analysis. In fact, this reframing took place while using the Dedoose web-based application. With Dedoose, the data was being stored remotely (in "the cloud") by logging into a cross-platform Flash-based interface that features significant qualitative and quantitative data analysis capabilities. While the product is new and not far removed from beta (late prototyping) stages, its capabilities and user interface far outweigh competitors such as Atlas.ti and HyperRESEARCH. What I also noticed was its use of the more contemporary term "tags" interchangeably with the academic research

language of “codes”. This suggested to me that the developing company, SocioCultural Research Consultants, sees Dedoose as potentially marketable beyond limited academic contexts.

The one thing lacking in the available version of Dedoose is identified in its “Resources” section of the product’s user guide:¹⁸⁰

In Dedoose, documents, images, video, audio, PDFs, and other media are the core qualitative data resources in your project.

NOTE: The initial release of Dedoose will only accommodate documents—including text and in-line images/pictures, so this section will focus only on creating document type resources within the system...support for other media isn’t far behind so stay tuned for news on upcoming releases.

So SocioCultural Research’s intent for Dedoose is to eventually have the ability to work with the rich multimedia data – including video – which we now have available in vast quantities even just on sites such as YouTube. For right now though, the company must figure out the best approaches to dealing with text-based content and in working out its user interface design and back end processes. However, SocioCultural Research’s plans to integrate video-based data into its cloud-based Dedoose application suggests:

1. A potential use for the digital video content and PColP™-based **seedfeed™** prototype;
2. A way to incorporate the S/E/E/D method and its tagging system in testing out a PColP™-powered prototype of Dedoose for working with remote digital video content;
3. A pre-built and flexible interface for managing the existing seedfeed™ archive of digital video content, and
4. A highly scalable new business opportunity for Teradici to apply its PColP™ in higher education contexts, where security, integrity, and access to the data are important parts of the jobs-to-be-done for academic researchers across institutions.

¹⁸⁰ SocioCultural Research Consultants, LLC., “Dedoose User Guide,” 2010, <http://www.dedoose.com/Support/UserGuide.aspx>.

With this opportunity, the **seedfeed**™ project finds itself right back at the research question where it began...

IxD as Business Strategy: *“How can interaction design methods be used to create a business case for Teradici’s PCoIP as a disruptive innovation in higher education, specifically, through the development of sustainable digital video ecosystems for high tech learning?”*

In conclusion, as much as this work has frustrated me to the extreme in attempting to, as my supervisor says, “close the loop” and “lock it down”. Yet I will also claim that no other projects of this sort have attempted to build an interdisciplinary bridge between interaction design and business, as has been done here, never mind doing so through the overlap of higher education and entertainment industry contexts. This may not be a traditional MBA project but it certainly speaks to both *management* and *technology* in the attempt to earn an MBA degree in Management of Technology.

The ultimate proof of what has been argued here will come in the next step, building the **seedfeed**™ prototype using PCoIP™ technology and concert footage content from The National. From this investigation, we can also “Dedoose” valuable roles for other potential stakeholders, which should probably be started with a follow-up phone calls to some contacts made while on the road and reopen some earlier discussions around PCoIP™. In this regard I believe I have again found “an activity system where you can be both participant and analyst [and then] enter into the process of helping things grow.”¹⁸¹ There is value in this way by bringing my skills, efforts, and archived output in digital video editing into an activity system – or digital ecosystem – that includes Teradici and its PCoIP™ technology, the Dedoose application as a starting point to an interface for this work, as well as other potential players in this collaborative and innovative space.

¹⁸¹ *Cultural psychology*, 349-350.

And so...

A good place to start as any may be to look up contacts from recent and past journeys in “following the problem”, and then place some calls. There’s at the very least one band I need to reconnect with regarding their digital content, not to mention the digital content management experts at IOKO in Solana Beach, California, and the open-source video initiative of New York’s Kaltura, who have both expressed interest in the project. There are the aptly named interaction designers at Seed Labs in Austin (live music capital of the world), who have been interested in applying their music industry and event-related interfaces for educational uses. Then there are the higher education interests at CANARIE (Canada’s Advance Research and Innovation Network) in Ottawa, as well as well as a certain group of SocioCultural Research Consultants at UCLA. Right now, anyway, that’s the best I can “dedoose”.

When framed properly, it’s certainly not a bad-sized fish to find at the end of the line... or at the start of a reel. Take your pick.



7: BIBLIOGRAPHY

- Anthony, S. D, M. W Johnson, J. V Sinfield, and E. J Altman. "Foreward: Reflections on Disruption." In *The innovator's guide to growth: putting disruptive innovation to work*, 1-8. Harvard Business School Pr, 2008.
- Bartholomew, David. "Reviews: The Last Waltz." *Film Quarterly* 33, no. 2 (1979): 56-60.
- Bateson, Gregory. *Steps to an ecology of mind*. New York: Ballantine Books, 1973.
- Bateson, Mary. *Peripheral visions: learning along the way*. New York: HarperCollins Publishers, 1994.
- Beer, Stafford. *Decision and Control: The Meaning of Operational Research and Management Cybernetics*, 1966.
- Benjamin, Walter. "The Work of Art in the Age of Mechanical Reproduction." In *Illuminations*, 217-251. New York: Harcourt Brace and World, 1935.
<http://www.marxists.org/reference/subject/philosophy/works/ge/benjamin.htm>.
- Berger, John. "Reproductions." *Ways of Seeing*. London: British Broadcasting Corporation, 1972.
<http://uk.youtube.com/watch?v=LnfB-pUm3eI>.
- — —. "The language of advertising." *Ways of Seeing*. London: British Broadcasting Corporation, 1972. <http://www.youtube.com/watch?v=BCDzPeQhCGE&feature=related>.
- — —. "Ways of Seeing (book excerpt)," 1972.
<http://jan.ucc.nau.edu/~jsa3/hum355/readings/berger.htm>.
- Berninger, Matt. "The National - The Better Propaganda interview." Interview by Alan Williamson. Webpage, 2005. <http://betterpropaganda.com/content.aspx?id=359>.
- Berninger, Matt, and Scott Devendorf. "The National." *Americanmary.com*, 2010.
<http://www.americanmary.com/index.php>.
- Bott, Ed. "The 2010 OS scorecard: Microsoft loses a little, Apple wins a lot." Ed Bott's Microsoft Report, January 2, 2011. <http://www.zdnet.com/blog/bott/the-2010-os-scorecard-microsoft-loses-a-little-apple-wins-a-lot/2818>.
- Brown, J. S. "How to connect technology and passion in the service of learning." *The Chronicle of Higher Education* 55, no. 8 (2008).
- Brown, John Seely. "User-centered design." In *New thinking in design: conversations on theory and practice*, by C. Thomas Mitchell, 100-110. New York: J. Wiley, 1996.
- Carroll, John. *Scenario-based design: envisioning work and technology in system development*. New York: Wiley, 1995.
- Christensen, Clayton. "Foreword: Reflections on disruption." In *The innovator's guide to growth: putting disruptive innovation to work*, by Scott Anthony, Joseph Sinfield, Mark Johnson, and Elizabeth Altman, 1-8. Boston Mass.: Harvard Business Press, 2008.
- — —. *Seeing what's next: using the theories of innovation to predict industry change*. Boston, Mass: Harvard Business School Press, 2004.
- — —. *The innovator's dilemma: when new technologies cause great firms to fail*. Boston, Mass: Harvard Business School Press, 1997.
- — —. *The innovator's solution: creating and sustaining successful growth*. Boston, Mass: Harvard Business School Press, 2003.

- Cole, Michael. *Cultural psychology: a once and future discipline*. Cambridge, Mass. ; London, England: Belknap Press of Harvard University Press, 1996.
- Cordingley, Dan. "About Teradici." Corporate website. PC-over-IP remote display technology: true zero client desktop virtualization, December 30, 2010.
<http://www.teradici.com/teradici/about-teradici.php>.
- Csikszentmihalyi, Mihaly. *Flow : the psychology of optimal experience*. New York: HarperPerennial, 1991.
- Dawson, Nick. "The Director Interviews: Catherine Owens, U23D." *Filmmaker Magazine*, January 23, 2008. <http://filmmakermagazine.com/directorinterviews/2008/01/catherine-owens-u2-3d.html>.
- digitalmedia.net. "3ality Uses SCRATCH for Stereoscopic 3D Digital Workflow." Project profiles, April 14, 2007.
<http://postproduction.digitalmedianet.com/articles/viewarticle.jsp?id=127734&afterinter=true>.
- Dini, P., G. Lombardo, R. Mansell, A. R Razavi, S. Moschoyiannis, P. Krause, A. Nicolai, and L. Len. "Beyond interoperability to digital ecosystems: regional innovation and socio-economic development led by SMEs." *International Journal of Technological Learning, Innovation and Development* 1, no. 3 (2008): 410–426.
- Dixon, Guy. "Indie goes 3-D." *The Globe and Mail*, February 19, 2010.
<http://www.theglobeandmail.com/news/arts/indie-goes-3-d/article1474451/>.
- Engeström, Yrjö. "From design experiments to formative interventions." In *Proceedings*, 1:3–24. Utrecht, Netherlands: International Society of the Learning Sciences, Inc., 2008.
- — —. *Learning by expanding*, 1987.
- Firouzabadi, B. N. "Cooperative proxy caching for peer-to-peer traffic." Simon Fraser University, 2007.
- Flynn, Joel. "Metaphrames and Interaction." In *Proceedings of OURMedia 6th International Conference: Sydney April 9-13, 2007*. Sydney, Australia, 2007.
http://www.karmafia.com/papers/jflynn_metaphrames_feb07.pdf.
- — —. *The National - Under Construction at the Commodore Ballroom*. Standard definition (SD). Vancouver, BC: The Commodore Ballroom, 2007.
- Flynn, Joel, A. "Travels in Intertextuality: the autopoetic identity of remix culture." Project, Surrey, British Columbia, Canada: Simon Fraser University, 2006.
<http://www.siat.sfu.ca/grad/theses/jflynn/>.
- Gaver, Bill, Tony Dunne, and Elena Pacenti. "Design: Cultural probes." *interactions* 6, no. 1 (January 1999): 21-29.
- Geist, Michael. "Copyright fees take schools to tech tipping point." *The Ottawa Citizen*, December 21, 2010.
<http://www.canada.com/Copyright+fees+take+schools+tech+tipping+point/4008701/story.html>.
- Gibson, James. *The ecological approach to visual perception*. Hillsdale N.J.: Lawrence Erlbaum Associates, 1986.
- Gladwell, Malcolm. *The tipping point: how little things can make a big difference*. 1st ed. Boston: Little Brown, 2000.
- Graham, Phil. "Monopoly, Monopsony, and the Value of Culture in a Knowledge Economy: An axiology of two multimedia resource repositories.." In *Cybraries: Literacies, Economies, Pedagogies*. Lawrence Erlbaum. <http://www.philgraham.net/monoposony.pdf>.
- Haig-Brown, Roderick. *A river never sleeps*. New York NY: Skyhorse Pub., 2010.

- — — . Fisherman's summer. Toronto: William Collins Sons, 1959.
- Haig-Brown, Roderick, and Beaverdam Press. Excerpts from the diaries of Roderick Haig-Brown, 1927-1929 & 1932-1933. Salem Or.: Beaverdam Press, 1992.
- Haig-Brown, Roderick, Robert Nichol, and Peter Jones. Fisherman's fall, 1967.
<http://www.nfb.ca/trouverunfilm/fichefilm.php?id=11398&v=h&lg=en&exp=>.
- Hargadon, Steve. "John Seely Brown on Web 2.0 and the Culture of Learning." K-12 Educational Technology: Web 2.0, Educational Social Networking, Free and Open Source Software, and the Future of Education, January 20, 2007. <http://www.stevhargadon.com/2007/01/john-seely-brown-on-web-20-and-culture.html>.
- Helm, Levon. This Wheel's on Fire: Levon Helm and the story of the Band. 2nd ed. Chicago: A Cappella, 2000.
- Horowitz, Ben. "Meet the New Enterprise Customer, He's a Lot Like the Old Enterprise Customer." ben's blog, November 15, 2010. <http://bhorowitz.com/2010/11/15/meet-the-new-enterprise-customer-he%e2%80%99s-a-lot-like-the-old-enterprise-customer/>.
- Hustwit, Gary. Objectified: A documentary film about industrial design. Documentary. PlexiFilm, 2009. <http://www.objectifiedfilm.com/>.
- Iacucci, Giulio, Carlo Iacucci, and Kari Kuutti. "Imagining and experiencing in design, the role of performances." In The proceedings of NORDchi, The Second Nordic Conference on Human-Computer Interaction, 167-179. Aarhus, Denmark., 2002. <http://portal.acm.org/citation.cfm?id=572040>.
- Kirkpatrick, Marshall. "StashSpace to Take Full-length Online Video Editing to the Masses." TechCrunch, October 2, 2006. <http://techcrunch.com/2006/10/02/stashspace-to-take-full-length-online-video-editing-to-the-masses/>.
- Kirsner, Scott. Fans, friends and followers. 1st ed. [Cambridge Mass.]: Scott Kirsner, 2009.
- Kline, Stephen. Digital play : the interaction of technology, culture, and marketing. Montréal ;;London: McGill-Queen's University Press, 2003.
- Kline, Stephen, Nick Dyer-Witheford, and Greig De Peuter. Digital play: the interaction of technology, culture, and marketing. Montréal: McGill-Queen's University Press, 2003.
- Kory, Robert. Letter. "followup regarding video from Vancouver show," December 11, 2010.
- Kuutti, Kari. "The concept of activity as a basic unit of analysis for CSCW research." In Proceedings of the second conference on European Conference on Computer-Supported Cooperative Work, 249-264, 1991.
- Lambert, Craig. "The Marketplace of Perceptions." Harvard Magazine, 2006. <http://harvardmagazine.com/2006/03/the-marketplace-of-perce.html>.
- Lessig, Lawrence. "The Research, Review, and Remix of Scholarship in the Digital Age" presented at the Scholarship in the Digital Age, Annenberg Center for Communication, University of Southern California, December 11, 2004. <http://www.iml.annenberg.edu/html/research/summits/summitsVideoPublic.htm>.
- Lessig, Lawrence, and Paul, D. Miller. "Know Your Digital Rights." Panel discussion presented at the Vimeo Festival and Awards, New York, NY, October 8, 2010.
- Lieber, Eli. "Omni qualitative analysis software?." The Omni Group Forums, June 23, 2010. <http://forums.omnigroup.com/showthread.php?t=9358>.
- Margolin, Victor, and Richard Buchanan. The idea of design. Cambridge Mass: MIT Press, 1995.
- Maturana, Humberto R., and Francisco J. Varela. Autopoiesis and cognition: the realization of the living. Dordrecht, Holland; Boston: D. Reidel Publishing, 1980.

- McDonough, William. *Cradle to cradle: remaking the way we make things*. 1st ed. New York: North Point Press, 2002.
- McLuhan, Marshall. *Understanding media: the extensions of man*. New York: New American Library, 1964.
- Mitchell, C. Thomas. *New thinking in design: conversations on theory and practice*. New York: John Wiley & Sons, 1996.
- Moggridge, Bill. "Adopting Technology." In *Designing interactions*, 237-317. Cambridge Mass.: MIT Press, 2007. http://www.designinginteractions.com/downloads/DesigningInteractions_4.pdf.
- — —. *Designing interactions*. Cambridge Mass.: MIT Press, 2007.
- — —. "People and Prototypes." In *Designing interactions*, 237-317. Cambridge Mass.: MIT Press, 2007. http://www.designinginteractions.com/downloads/DesigningInteractions_10.pdf.
- Moore, Geoffrey. *Crossing the chasm : marketing and selling disruptive products to mainstream customers*. Rev. ed. New York NY: HarperBusiness Essentials, 2002.
- Neuhart, John. *Eames Design: the work of the Office of Charles and Ray Eames*. New York: H.N. Abrams, 1989.
- Norman, Donald A. *The design of everyday things*. New York: Doubleday, 1990.
- OPAALS Organization. "Our Research," 2010. <http://www.opaals.org/research.php>.
- Paritosh, P. K, and K. D Forbus. "Analysis of strategic knowledge in back of the envelope reasoning." In *PROCEEDINGS OF THE NATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE*, 20:651, 2005.
- Piller, Mark, Bruce Sundquist, Kathleen Erickson, and Charles Gay. "Dedoose Case Study." *The Midnight Coders*, n.d. <http://www.themidnightcoders.com/company/case-studies/dedoose-case-study.html>.
- Pruitt, John, and Tamara Adlin. *The persona lifecycle: keeping people in mind throughout product design*. Amsterdam ; Boston: Elsevier ; Morgan Kaufmann Publishers an imprint of Elsevier, 2006.
- Reichel, Franz. *Monte Grande: What is Life? DVD*. Icarus Films, 2005. <http://www.montegrande.ch>.
- ResearchWare Inc. "HyperRESEARCH Quick Tour." Corporate website. *Researchware Simply Powerful Tools for Qualitative Analysis*, December 26, 2010. <http://www.researchware.com/products/hyperresearch/quick-tour.html>.
- Revisiting the Last Waltz. MGM/United Artists, 2002. <http://www.imdb.com/title/tt0077838/>.
- Rittel, H. W, and M. M. Webber. "Dilemmas in a general theory of planning." *Policy Sciences* 4 (1973): 155-169.
- Rogers, Everett. *Diffusion of innovations*. 1st ed. New York ; London: Glencoe: Free Press, 1962.
- Schieffelin, Edward. "Problematizing Performance." In *Ritual, performance, media*, edited by Felicia Hughes-Freeland by Association of Social Anthropologists of the Commonwealth., 199-212. London; New York: Routledge, 1998.
- Schön, Donald A. *The Reflective Practitioner: how professionals think in action*. New York: Basic Books, 1983.
- Severn, Stephen. "Robbie Robertson's Big Break: A Reevaluation of Martin Scorsese's *The Last Waltz*." *Film Quarterly* 56, no. 2 (December 2002): 25-31.
- Shilovitsky, Oleg. "Does Folksonomy Work for PLM?." *The Daily Think Tank Blog*, March 3, 2009. <http://plmtwine.com/2009/03/03/does-folksonomy-work-for-plm/>.
- Shirky, Clay. *Cognitive surplus: creativity and generosity in a connected age*. New York: Penguin

- Press, 2010.
- Simmons, Bill. "Not so Stern after all." *ESPN The Magazine*, February 27, 2006.
<http://sports.espn.go.com/espn/page2/story?page=simmons/060216>.
- SocioCultural Research Consultants, LLC. "Dedoose User Guide," 2010.
<http://www.dedoose.com/Support/UserGuide.aspx>.
- Stark, Clinton. "Best of 2010: Canon EOS Rebel T2i DSLR camera." Online magazine. *Stark Insider*, December 29, 2010. <http://www.starkinsider.com/2010/12/best-of-2010-canon-eos-rebelt2i-dslr-camera.html>.
- sturgess66, and b4real. "CONCERT REPORT: Vancouver, B.C., Canada, December 2, 2010." leonardcohenforum.com, December 9, 2010.
<http://www.leonardcohenforum.com/viewtopic.php?f=44&t=23972&start=60>.
- Taylor, Mark. *Crisis on campus: a bold plan for reforming our colleges and universities*. 1st ed. New York: Alfred A. Knopf, 2010.
- Taylor, Mark C. *The moment of complexity: emerging network culture*. Chicago: University of Chicago Press, 2001.
- Teradici Corporation. "PC-over-IP technology." Corporate website. PC-over-IP remote display technology: true zero client desktop virtualization, December 31, 2010.
<http://www.teradici.com/pcoip/pcoip-technology.php>.
- — —. "PCoIP markets." Corporate website. PC-over-IP remote display technology: true zero client desktop virtualization, 2009. <http://www.teradici.com/pcoip/pcoip-markets.php>.
- Tosey, Paul. "Bateson's Levels Of Learning: a Framework For Transformative Learning?." University of Tilburg, May 2006, 2006. www.NLPresearch.org.
- Vertov, Dziga, and Michael Nyman. *Man with a movie camera*, 2003.
- Volk, Tyler, Jeffrey W. Bloom, and John Richards. "Toward a science of metapatterns: building upon Bateson's foundation." *Kybernetes* 36, no. 7 (2007): 1070-1080.
- Vygotsky, L. S., and Michael Cole. *Mind in society: the development of higher psychological processes*. Cambridge: Harvard University Press, 1978.
- Wakkary, Ron. "Framing complexity, design and experience: a reflective analysis." *Digital Creativity* 16 (2005): 65-78.
- Wartofsky, Marx W. *Models: representation and the scientific understanding*. Dordrecht, Holland ; Boston: D. Reidel Pub. Co., 1979.
- Whitehand, D. "Patterns That Connect." *Leonardo* 42, no. 1 (2009): 10-15.
- Williams, Raymond. *Television : technology and cultural form*. Hanover, NH: Wesleyan University Press ; University Press of New England, 1992.
- Wortham, Jenna. "App Store Is a Game Changer for Apple and Cellphone Industry." *The New York Times*, December 5, 2009, sec. Technology.
http://www.nytimes.com/2009/12/06/technology/06apps.html?_r=2&pagewanted=1&partner=rss&emc=rss.
- YouTube LLC. "How to upload: Getting Started." Corporate website. YouTube Help, December 30, 2010. <http://www.google.com/support/youtube/bin/answer.py?hl=en&answer=57924>.
- Zink, Michael, Kyongwon Suh, Yu Gu, and Jim Kurose. "Characteristics of YouTube network traffic at a campus network-Measurements, models, and implications." *Computer Networks* 53, no. 4 (2009): 501-514.

APPENDIX 1: Moggridge's IxD method explained

STUDY THE PROBLEM

Moggridge identifies the *constraints*, *synthesis*, and *framing* activities in his design methodology as being of similar type.¹⁸² He colour coded these, which I've labelled as part of an overall set of "study the problem" activities, with the blue boxes, as shown below:

Elements of "STUDY": constraints, synthesis, and framing



Overall these would seem to be internal mental processes, that is, the production of mental models and frameworks that help guide the more practical activities later on. However, there are three important considerations to note:

- **TACIT KNOWLEDGE:** Processes categorized here as "study" are internalized individually, often informally. That is, in the sense of learning-by-doing, or, activity-based experiential learning. Ideally, a practical and experiential result of "study" becomes an individual's tacit knowledge. For designers, tacit knowledge leads to fluidity with their skills to the point where they can recognize what needs to be done without necessarily being able to explain how they know it, i.e. the idea of "flow" in psychology and design.¹⁸³
- **GETTING EXPLICIT, BEYOND "FLOW":** The "flow" that comes from having adequate tacit knowledge to perform a task without really thinking

¹⁸² Moggridge, "People and Prototypes," 730.

¹⁸³ Mihaly Csikszentmihalyi, *Flow : the psychology of optimal experience* (New York: HarperPerennial, 1991).

about it, as is the case with highly trained athletes and musicians who can “see” the game or the song intuitively, it a valuable result of practice and training, but doesn’t produce explicit communications. The process of developing the models and frameworks might involve an explicit task of producing hard deliverables – e.g. in academia where peer review requires explicit communication of methods and results – even if they came about intuitively rather than in a scientific or highly procedural fashion. In fact, part of the difficulty that the field of design is establishing itself in academia is in grappling with intuitive, implicit, and tacit procedures and knowledge that are in contrast to academic norms.

- **THE REFLECTIVE AND PRACTICING GROUP:** Following from (1) and (2) is the understanding that internalization doesn’t have to be a purely individual process. Not only would these processes of be influenced by other individuals and groups, there is measured contribution to the socially produced and defined “body of knowledge” that makes up a peer-reviewed field of inquiry. It’s questionable that internalization in this sense can actually be a purely individual process, i.e. we are all social beings and therefore influenced by others on levels we’re not necessarily aware of.

In light of or despite these considerations that imply the lack of an absolute starting point, there’s an infinite loop of potential external influences, even when involved in individual internalizing; the process has to start somewhere. In his methodology, Moggridge suggests that the activity of determining *constraints* is what gets the ball rolling, so to speak.

Constraints

At the top of the Moggridge’s design process are constraints, perhaps the most fundamental of design concepts. Celebrated American designer Charles Eames

claimed that “design depends largely on constraints”, if not “the sum of all constraints.”¹⁸⁴

Here is one of the few effective keys to the design problem—the ability of the designer to recognize as many of the constraints as possible—his willingness and enthusiasm for working within these constraints—the constraints of price, of size, of strength, balance, of surface, of time etc.; each problem has its own peculiar list.

Therefore, constraints vary between design situations, even though we may be able to discern patterns occurring across similar situations. While Eames doesn’t rule out there being more scientific and generalizable laws in design, he asks rhetorically: “Aren’t constraints enough?”¹⁸⁵ Moggridge discusses constraints not only in terms of those found in the problem itself, but also in terms of the constraints the designer brings into the problem:

Designers are both enabled and controlled by the constraints that they learn about and come to understand; they are fluent with their tacit knowledge, in their own media, and in the contexts that they are familiar with and understand.¹⁸⁶

The first stage in a design process therefore usually involves figuring out what some of these constraints are – with some certainty – before moving on to other phases, i.e. aiming the ball for the top of the table and letting it fall back down towards uncertainty.

SYNTHESIS

The process of internalization of relevant issues, such as the constraints of a design problem, as tacit knowledge is what Moggridge refers to as the “essential skill” of *synthesis*, not just for the individual but also for the “shared

¹⁸⁴ Charles Eames, in Neuhart, *Eames Design: the work of the Office of Charles and Ray Eames*, 14.

¹⁸⁵ Ibid.

¹⁸⁶ Moggridge, “People and Prototypes,” 651.

mind” of the design team ¹⁸⁷. Its importance, he argues, is in the ability for “subconscious background processing of information to be happening all the time,”¹⁸⁸ thereby allowing non-workable solutions to be put aside because of a tacit understanding of constraints. It can also work the other way, that is, when an idea that shouldn’t work on paper, has some possibilities that a designer recognizes tacitly as promising:

This background synthesis explains why people who work in design teams often come up with significant ideas without knowing where they come from. They say, “I had this idea last night,” or “I suddenly realized as we were talking...”. Because it is subconscious, the element of synthesis is not usually mentioned in explicit descriptions of the creative design process.¹⁸⁹

Even though synthesis activities are not usually made explicitly, Moggridge stresses that it still needs to be “appreciated, planned, and enabled”¹⁹⁰ since stressful environments can get in the way of groups that would otherwise be synthesizing well.

FRAMING

Framing is kind of synthesis, a way of seeing a problem that is tacitly embedded in a person’s perspectives. It can work in both positive and negative ways for a designer, i.e. getting to a solution more efficiently when it’s the appropriate frame, or producing “blindness” when other needed perspectives are instead disregarded. In behavioural economics, “there are subtle things about framing choices that are deceptive, though not inaccurate,”¹⁹¹ e.g. having the ability to price discriminate, and set different prices that reveal how the price setters have framed the market situation.

¹⁸⁷ Ibid., 729-730.

¹⁸⁸ Ibid., 651.

¹⁸⁹ Ibid.

¹⁹⁰ Ibid.

¹⁹¹ Craig Lambert, “The Marketplace of Perceptions,” *Harvard Magazine*, 2006, <http://harvardmagazine.com/2006/03/the-marketplace-of-perce.html>.

As a coordination of lenses, creating an appropriate framework or methodology, can be a valid outcome of design process. This is research where “method is simultaneously prerequisite and product, the tool and the result of the study,”¹⁹² the ability to come up with the right framework can become a critical part of the design process.

[Framing] forms a way of thinking about and evaluating possible design ideas. Coming up with the right framework for a particular project is also a design process, involving many of the other elements described here. One project may be best framed by a journey through the experience, another by a four-quadrant analysis of people’s attitudes, and another by a nested hierarchy of attributes.¹⁹³

Moggridge properly points out that his IxD methodology is in itself “an attempt to frame the design process” that coordinates a generalized cyclical and iterative pattern with much more randomized and chaotic instances. I will demonstrate the how this coordinated framework plays out with respect to my on design process and supported by the digital media it has produced.

In terms of the *constraints*, *synthesis*, and *framing* activities that I’ve filed under “S” of the “Study the Problem” category, their place at the earlier stages of Moggridge’s iterative framework needs to be considered along with my own situation as an academic whose job it is to teach students about theoretical aspects of design practice. It therefore shouldn’t come as a surprise that the work here leans heavily towards this earlier “Study the Problem” category and away from the later “Evaluate the Results” stage. However, in methodologically moving towards evaluation, we first need to “Explore the Possibilities”.

¹⁹² Vygotsky and Cole, *Mind in society*, 65.

¹⁹³ Moggridge, *Designing interactions*, 731.

EXPLORE THE POSSIBILITIES

After taking time to “Study the Problem”, the second group of activities in Moggridge’s design framework is what I’ve labelled “Explore the Possibilities”. It consists of the *ideation*, *envisioning*, *visualization*, and *prototyping* activities that have been colour coded in red boxes in Figure 41:

Figure 41 Elements of “EXPLORE”: ideation, envisioning, visualization, prototyping



Ideation

Ideation is the term commonly used by Moggridge and others at IDEO to include such activities as informal brainstorming by sketching business model ideas on a napkin or concept maps and calculations on the mythical “back of an envelope.”¹⁹⁴ These ideation activities, as Moggridge describes, can also consist of more formalized brainstorming sessions involving particular numbers of participants, often called *participatory design workshops* in design fields.

A typical brainstorm at IDEO has eight to ten participants, with one or two experienced recorders, dubbed scribes, who record the ideas as they flow from the group. Each session lasts about an hour, and 50 to 100 ideas are recorded. The conference rooms have the rules of brainstorming printed along the top of white boards, to remind everyone to defer judgement, encourage wild ideas, build on the ideas of others, stay focused on the topic, and to keep to one conversation at a time.¹⁹⁵

Essentially, Moggridge describes a systematic framework in place at IDEO for dealing with new ideas, though of course there are many possible approaches

¹⁹⁴ P. K Paritosh and K. D Forbus, “Analysis of strategic knowledge in back of the envelope reasoning,” in *PROCEEDINGS OF THE NATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE*, vol. 20, 2005, 651.

¹⁹⁵ Moggridge, “People and Prototypes,” 733.

that could be employed. While having a good framework in place from previous “Study the Problem” stages helps to position ideas, he also argues that having one doesn’t mean that ideation isn’t already taking place earlier in the design process. Nor does ideation stop at later stages: “Ideas can come at any time, often from unexpected directions. The cycle is often interrupted by a great idea, triggered by another element in the process.”¹⁹⁶ The key is to have some way to value an idea, implicitly or more formally, that can indicate whether the idea merits “stepping back from the process and going back to first principles to help decide what to do next [since] a good idea can cause a process reset”

ENVISIONING

Moggridge describes the envisioning activity as “a glimpse into the nature of an idea,”¹⁹⁷ and brings it out of being more like a dream to becoming something more concrete. Envisioning involves some sort of representation of the idea, which can be “any sort of description of the design, whether visual or behavioural, or a combination.”¹⁹⁸ It can involve shortcuts in communicating the idea, depending on the audience, or representations that involve more clarity. However, because much of the idea is still being dealt internally, it is innovation taking place “in the head,”¹⁹⁹ there can be difficulties when the innovation moves out of the head and into the world:

The journey from “head in the clouds” to “feet on the earth” can be sudden and traumatic, as it is the envisioning process that helps you immediately see what the idea is really like. Self-delusion is no longer easy.²⁰⁰

What distinguished envisioning from the later stages of visualization and prototyping is that it adequately communicates what the idea is *in theory*,

¹⁹⁶ Ibid.

¹⁹⁷ Ibid., 734.

¹⁹⁸ Ibid., 733.

¹⁹⁹ John Seely Brown, “User-centered design.”

²⁰⁰ Moggridge, “People and Prototypes,” 733.

whereas visualization and prototyping, as we'll see, more closely represent the idea *in practice*.

VISUALIZATION

As just mentioned, *visualization* is closely related to *envisioning's* "glimpse into the nature of an idea", but takes this glimpse into a more complete representation that "communicates the potential reality of the concept."²⁰¹ As with prototyping, it becomes a more *practical* representation rather than a *theoretical* understanding of an idea. The term *visualization* is broadly implied, according to Moggridge, as the representation can involve "more possibilities than the merely visual."²⁰²

For example, while the visualization of screen-based experiences can involve visual representations such as sketches, the "visualization" of behaviours might make use of scripts and storyboards to communicate the concept. Visualization can involve just a small step forward from envisioning, or may be taken a lot further. However, it works beyond just the communication of the idea or concept by communicating through "a representation that is perceived by the viewer as realistic but may at the same time be dysfunctional."²⁰³

PROTOTYPING

Again, while *visualization* is closely related to *prototyping*, it involves more than simply showing enough practical aspects of the concept so that the viewer understands it is not a *complete* representation (ibid.). Moggridge makes the distinction that a prototype "always looks to test some aspect of functionality" (ibid.), therefore lies closer to the upcoming "Evaluate the Possibilities" group of activities.

²⁰¹ Ibid., 734.

²⁰² Ibid.

²⁰³ Ibid.

As such, Moggridge provides a bare level definition of prototype that he borrows from the American Heritage Dictionary in an earlier part of 2007's *Designing Interactions*:

Pro-to-type *n.* 1. An original type, form, or instance that serves as a model on which later stages are based or judged.²⁰⁴

With the help of IDEO's interaction design lead, Duane Bray, Moggridge analyzes prototyping techniques for "for understanding existing experiences, investigating design ideas, and communicating design concepts."²⁰⁵ Through this analysis, they hope to predict how advancements in prototyping technologies will change the process of design in the future, though recognizing the increasing complexity of design problems beyond simply concerns of people and prototypes.

Moggridge and Bray also take a larger perspective of the roles of different kinds of prototypes that can be used for different kinds of design situations. These can involve more established forms such as prototyping (or "versioning") of screen-based experiences,²⁰⁶ to the more complex nature of prototyping for interactive products that require physical manipulation.²⁰⁷ Even further, and more typical of commonly encountered "wicked problems" problems in today's design contexts, prototyping is now even used in designing *services*.²⁰⁸

- **Screen-based experience:** The earliest to emerge was screen graphics, or pixel-based experiences, where the designer manipulates pixels to express software interactions. This is similar to the more recent skill needed to design for the Internet, as Web sites are also designed as screen graphics.

²⁰⁴ Moggridge, *Designing interactions*, 685.

²⁰⁵ *Ibid.*, 701.

²⁰⁶ *Ibid.*, 703-714.

²⁰⁷ *Ibid.*, 715-718.

²⁰⁸ *Ibid.*, 719-723.

- **Interactive products:** The second version is where the physical object is integrated with the electronic hardware and software. If a screen is embedded, the designer must consider the relationship to physical controls and the overall form factor. If there is no screen, the design relies on ambient feedback, using light, sound, or movement.
- **Services:** The third is in the design of services, where the interactivity occurs between a company and the broader relationship with the customer, blending time-based interactions with multiple channels—spaces, products, the Web, and so on. This blurs the boundaries between interaction design and organizational psychology.

Once again, prototyping tends towards the evaluation stages of the design process, as evaluative decisions need to be made in simply creating a working prototype in the first place.

While not there yet, a working prototype of the **seedfeed™** concept is the goal for this project in terms of the internship work with Teradici. As will be shown, the building blocks and process for this working prototype are all in place; the step that needs to be taken is to implement the prototype so as to evaluate what works and what doesn't.

EVALUATE THE ALTERNATIVES

Furthest away from **seedfeed™**'s development at this point is the ability to fully "Evaluate the Alternatives". While the problem space has been studied and explored extensively, a set of alternatives for *selection* and *evaluation* of an application of **seedfeed™** based on Teradici's PcoIP™ platform still needs to happen. This PcoIP™-based prototype will follow the submission of this MBA project as the completion of the internship with Teradici that I'm currently working on, but until then, there is still a good deal of *uncertainty* still are inherent in the design process.

That said *selection*, *uncertainty*, and *evaluation* all are prevalent throughout the design process, and indeed can be found at many points in **seedfeed™** 's development.

Figure 42 Elements of "EVALUATE": uncertainty, selection, evaluation



In contrast to the more formal evaluation needed for the proposed PCoIP™-based **seedfeed™** prototype of a digital video ecosystem, in the meantime, I've informally had to "Evaluate the Alternatives" a number of times already. In these earlier iterations, Moggridge suggests, the choices can be made quickly by the team members themselves, or the captive "clients" who are assigned to the process."²⁰⁹ For example, I've had to informally make numerous design decisions involving the selection of different editing styles as well as distribution methods for this work.

In the case of digital video examples of concert footage I've captured and edited, the selection and evaluation can come from people who post comments, stars, and "likes/dislikes" on the YouTube or Vimeo pages where the content can be viewed. In some cases, viewers sent direct messages asking for more of the work. This kind of feedback can obviously be used in evaluation, and involves its own evaluation of whether to publish the work on disc, mobile format, or online, and if online, what video service to use, etc. These questions are part of the design's maturation, as Moggridge suggests:

As the design matures, more complete prototypes are likely to be relevant, like the experience prototypes or the live prototypes that we have talked about, in

²⁰⁹ Moggridge, "People and Prototypes," 735.

which case a more thorough and structured user evaluation will be worthwhile.²¹⁰

Developing frameworks and selecting from the actual content that has accumulated in my existing digital archive has led to *visualizations* and early-stage *prototyping*. From the archives, I've had to select from different artists that I've recorded, different shows that I feel best capture a performance, and from different songs or groups of songs from these performances. Often these decisions are made by going back to addressing *constraints* such as time and budget (if any!), or access to the artists I'm working with and their travel schedules. Regardless, there are ongoing choices to be made, even if the PColP™ prototype has yet to be implemented. Of course, choice implies uncertainty.

UNCERTAINTY

The design process, as laid out in Moggridge's framework, is good at "generating alternatives and making them realistic enough to evaluate in some way."²¹¹ Moggridge suggests that when uncertainties are encountered, the process can jump back to synthesizing unanswered questions:

The subconscious "shared mind" (or individual mind) is now busy synthesizing unanswered questions about the validity of each of the alternative ideas. Is it simple enough to understand? Is it consistent with what came before? Can it be made to work quickly? There are always plenty of uncertainties that are worth trying out.²¹²

In relating to Donald Schön's notion of the *reflective practitioner*,²¹³ uncertainties can be seen as the subconscious or explicit questions by a designer or team in the form of a metaphorical "conversation" with the design.

²¹⁰ Ibid.

²¹¹ Ibid., 733-734.

²¹² Ibid., 729.

²¹³ Schön, *The Reflective Practitioner: how professionals think in action*, 79-79.

As the potential for a design solution emerges from studying the problem and exploring possibilities, “deep uncertainties are likely to follow [and are] a necessary factor as a precursor to selection.”²¹⁴

SELECTION

As more refined visualizations and prototypes are developed and move closer and closer towards actual finished design, the activity of *selection* begins to gain importance, as it will set up an eventual evaluation.

It is time to choose. A manageable number of alternatives must be chosen to take forward to the next step.²¹⁵

In order to properly evaluate a design, it needs to be evaluated against another alternative. Selecting the right set of alternatives to make the task of evaluation manageable is therefore as important as making the evaluation. As Moggridge suggests, a creative designer or team that is working well can come up with too many good ideas to reasonably evaluate. Many will need to be rejected, perhaps without any relation to how good the idea might be, but rather because of the idea’s similarity to other alternatives.

The practical limitations of evaluating every idea means there will necessarily be a level of uncertainty entered into the both the selection and evaluation processes, i.e. first wondering if the alternatives selected will lead to the appropriate evaluation, and, later on, wondering the evaluation that was made was based on faulty alternatives. In addition, when this process involves group decision-making, what Moggridge politely calls “lively differences of opinion and discussion”²¹⁶ can add further uncertainties to the selection process. In other words, it can get subjective and political, as value judgments and

²¹⁴ Moggridge, “People and Prototypes,” 733-734.

²¹⁵ Ibid., 734.

²¹⁶ Ibid.

conflicting perspectives can lead back to, once again, the framing problems that behavioural economists have turned into a discipline.²¹⁷

EVALUATION

The paradoxical final phase in this non-linear methodology is *evaluation*, as Moggridge recommends: “A good motto for designing interactions is to evaluate early, often, and as late as possible.”²¹⁸ He suggests that evaluation can lead to a new form or state of the art design, or can produce the motivation and ability for another attempt at the design, though now with a new “package of constraints” that can trigger a new development cycle.²¹⁹

Depending on how close the design is to a final version will, only minor adjustments may result from evaluation, at which point, “it is too late to go back to first principles, but evaluation still helps the design team avoid the pitfalls of narcissism.”²²⁰ Part of this “narcissism” can be a fixation on evaluation methods themselves, e.g. a list of checkbox requirements or quantitative measures that hit all the targets, but fail to see the “big picture” such as a wealth of measurable and well-designed functions and features in a VCR that nobody bothers to use. The obvious flaw shown in examples such as the VCR is that *more* functions and features can easily be *measured*, but *more* does not necessarily equal *better* when it comes to design.

Regardless of how clear or simple the measurement, if the method or framework used to produce it is a problem or used incorrectly, then we’re back to a framing problem. Again, it’s back to the start of the design process, looking for the right constraints to work with.

²¹⁷ Lambert, “The Marketplace of Perceptions.”

²¹⁸ Moggridge, “People and Prototypes,” 735.

²¹⁹ Ibid.

²²⁰ Ibid.

DESIGN An Outcome:

This final stage of “Design an Outcome” is not represented by a set of coloured boxes in Moggridge’s IxD methodology. Rather, it can be seen as the green lines of the metaphorical bouncing ball as it moves in an iterative and mostly unpredictable non-linear fashion through the process. I had originally named this piece “Design/Develop a Solution”, but thought better it, given all the previous discussion of uncertainties, iterations, accidental discoveries, and emergent autopoietic systems that resist outside control and seem to define themselves. The more applicable name could be “Design an Outcome (and Hope for a Solution!).

So instead the “Design an Outcome” phase should be seen as the initiation of the entire process, with the motivation to get to a final outcome, though not necessarily the ability to get there on the first attempt (or second, or third, etc.). In fact, with the complexities inherent in today’s design problems, getting it just right on the first attempt should probably few questions of evaluation!

What started out as a potential final design outcome – i.e. a solution - may end up being evaluated as just an exploration or experiment that leads to an iteration, i.e. a preliminary design as a visualization or prototype. Ultimately, the prototypes, visualizations, and other iterative results from these preliminary stages feed back into the design framework as constraints to be synthesized.

The velocity of the this iterative process unfolding in real time leads to the idea of *live prototyping*, i.e. rapid prototyping that is taking place at such a high level that its results are evaluated and synthesized back into the design in what seems like real time to the designer. It is a design concept that perhaps plays into the future design of a PColP™-powered application of **seedfeed™** as a “complete service”, though at the same time “intrinsically complex”:

When you are designing a complete service, your contexts and constraints are intrinsically complex. They are formed by the combination of all the

individual interactions, whether technology-based or human-to-human, which make up the various touch-points within the service. This makes the use of live prototyping even more valuable, as the results of testing the prototypes are much more likely to be realistic.²²¹

In terms of the “design outcome” for this MBA project, as mentioned, it is ultimately a working prototype based on the accumulated digital video works in the archive I’ve created. However, completion of this prototype is beyond the scope of this part of the project. The outcome in this case, quite simply, is finding a way to “operationalize”, or put into practice, the IxD methodology.

²²¹ Ibid., 720.

APPENDIX 2: Chronological event listing

While the following analysis is presented in a chronological fashion, it is not designed to simply be a “laundry list” of cool shows I’ve happened to have seen and are now organized by date. The reason they are organized chronologically is because of the underlying premise of cultural historical activity theory (CHAT) that came out of the work of Cole and Engeström in extending Vygotsky’s and his mediation model from his early 20th century research.²²² In a CHAT analysis, it is important to understand cultural development as it takes place over time in order to see how patterns of cultural mediation may or may not lead to what Engeström metaphorically describes as a “spiral” of *expansive learning*.²²³

With respect to this new and untested IxD methodology, Moggridge describes it as having “general tendency toward a cyclical process.”²²⁴ He also implies a similarly expansive process of learning as part of design activity, that is, as a cyclical process that begins with studying the problem and will eventually expand to take on exploration and evaluation as it produces design outcomes that approach a solution, or at least what appears to be a solution.

To attempt further tests of Moggridge’s methodology than have been performed in this project, the following *historical development*²²⁵ covers the development of a digital video archive that was created from the fall 2007 through the end of 2010. A sample from this archive was used for limited analysis in the APPLICATION & RESULTS, but due to the limitation of this selections, the historical development of the project wasn’t able to be fully discussed. Future analysis will aim to address these limitations.

²²² Engeström, *Learning by expanding*; Vygotsky and Cole, *Mind in society*.

²²³ Engeström, *Learning by expanding*.

²²⁴ (2007b, p. 730)

²²⁵ Kuutti, “The concept of activity as a basic unit of analysis for CSCW research.”

Table 2: Key 2007 events for SEED analysis

Date	Location	Artist or band	Event/Venue	Notes/Description	[tags]
2007-10-02	Vancouver BC	Built to Spill,	Commodore Ballroom	Single camera test recoding of BTS who played the night before the National, no additional audio?	
2007-10-03	Vancouver BC	The National	Commodore Ballroom	6 camera + audio experiment that will be used as the primary content in the prototype	
2007-10-10	Globally released (internet download from the band's website)	Radiohead	In Rainbows album release	Revolutionary (?) model releasing a new album through "pay what you will"	
2007-11-24	Vancouver BC	Town Pants	Commodore Ballroom	High quality capture of a Commodore event using in-house equipment	
2007-12-31	Globally released (internet webcast via Current.tv)	Radiohead	Scotch Mist premiere	Low quality experimental video recording and webcast of live performance, in house with no audience	

Table 3: Key 2008 events for analysis

Date	Location	Key person or group: artists, bands, other	Event/Venue	Description	[tags]
2008-02-21	Vancouver, BC	Corb Lund & the Hurtin' Albertans	Commodore Ballroom	Six camera recording in SD using lower quality SFU library cameras, demo densely edited	
2008-04-08	Cupertino, CA	Apple®	Release of Final Cut Server	Potential technical solution to the emerging seedfeed™ idea	
2008-05-03	North America	Radiohead	Live from the Basement	Multi-camera high quality recording, broadcast to VH1, later downloadable on iTunes	

Date	Location	Key person or group: artists, bands, other	Event/Venue	Description	[tags]
2008-05-24	George, WA	The National	Sasquatch Yeti Stage	Canon HG10 used to record first HD show, with audio added via iPod 5G with belkin mic & audience additional audience recording. Unexpected show	
2008-05-24	George, WA	R.E.M.	Sasquatch Mainstage	Canon HG10 used to record (supposedly) the 3-song encore but would be shut down during first song.	
2008-07-24	Vancouver, BC	Joseph Arthur	Media Club	Multi-camera recording of a difficult show to film, need to get camera specs again. 1 HD camera and 2 SD cams	
2008-08-08	Liberty State Park, NJ	Radiohead	All Points West	Ipod 5G with belkin mic used as an experiment to record and mix with other audience recordings. Mic lost in the mud	
2008-08-09					
2008-09-20	Seattle, WA	The National	Moore Theatre	Canon Powershot clips only as ipod mic was lost in NJ	
2008-10-24	New Orleans, LA	NIN	Voodoo Experience	Canon Powershot clips only as ipod mic was lost in NJ	
2008-10-24		R.E.M.			
2008-12-05	Victoria, BC	NIN	Memorial Arena	6 camera HD recording of this show was released to bittorrent (125 GB)	

Table 4: Key 2010 events for analysis, with [tags] column added

Date	Location	Artist, band or, key person	Event/Venue	Description	[tags]
2009-02-04	Vancouver, BC	Dan Cordingley	BUS 764 – FINANCE guest speaker	Presentation by Dan Cordingley on Teradici's PCoIP™ innovation, i.e. remote video protocol	
2009-03-17	Vancouver, BC	Mafia Ties	Media Club	Experimental DIY recording of my band lost in hard drive crash	
2009-07-14	Vancouver, BC	Mafia Ties	Media Club	Experimental DIY recording of my band, lost in hard drive crash	
2009-07-31	Liberty State Park, NJ	The National	All Points West	HD recording in rain, downpour, mix with youtube clip, lost in hard drive crash	
2009-08-01	Liberty State Park, NJ	Tool	All Points West	Recording of entire show, to be mixed with another audience recording via torrent	
2009-08-28	San Francisco, CA	The National	Outside Lands	HD recording lost in hard drive crash	
2009-09-06	Seattle, WA	DJ Spooky	Bumbershoot	Recording of Paul D. Miller's interactive art exhibit and DJ Set, using Flip video camera	

Table 5: Key 2010 events for analysis, with <link> column added for online media

Date	Location	Artist, band or, key person	Event/Venue	Description of data	[tags]	<link>
2010-01-16	Seattle, WA	Joseph Arthur	Triple Door	Recording using iPod nano with Belkin mic to sync with soundboard recordings that J. Arthur sells after each show		
2010-03-12	Austin, TX	DJ Spooky	South by South West (SXSW)	Ian is Songkick's CEO, met with him after seeing his presentation, saw interconnection with seedfeed™		
2010-03-12		The Walkmen				
2010-03-12		Sophia Talvik				

Date	Location	Artist, band or, key person	Event/Venue	Description of data	[tags]	<link>
2010-03-21		Ian Hoggart				
2010-05-24	Solana Beach, San Diego, CA	Nada Surf	Belly Up Tavern	Recorded show using Canon HG10 high def camera + ipod nano		
2010-05-25	Hollywood, CA	Ramy Katrib	Digital Film Tree Studios	Interview with founder and CEO of the film studio that is pushing PCoIP™ in entertainment		
2010-05-27	Oakland, CA	The National	Fox Theater	Recorded show using Canon HG10 high def camera + ipod nano, posted on YouTube		
2010-08-20	Vancouver, BC	Dave McClure, Jeff Clavier (VC investors)	Grow 2010 Conference	Introduced to McClure's platform sustainability model, met with Jeff who is a VC or songkick		
2010-09-09	Vancouver, BC	The National & The Walkmen	Malkin Bowl at Stanley Park	First recording using newly purchased Canon HV30 digital camera		
2010-09-09						
2010-10-01	Markham, ON	Jim Roche CEO, CANARIE	IBM Innovation Research Summit	Meet with Jim Roche		
2010-10-04	New York, NY	Mark C. Taylor	Columbia University	Informal interview		
2010-10-06		John Griffin	DCM 2010	Ioko meeting		
2010-10-06		Roger Waters	Madison Square Garden	The Wall performance, recorded by on torrent		
2010-10-08		Larry Lessig, DJ Spooky	Vimeo Festival	Panel presentation		
2010-10-09	Dallas, TX	The National w/Owen Pallet	House of Blues	No recording, watched show only to prep		
2010-10-10	Austin, TX	The National	Austin Cit Limits Festival	HD recording using HV30, audio recording with added iPod nano w/ Belkin mic		
2010-10-11		The National	Austin Cit Limits (PBS TV)	TV studio recording, but only selected songs will be shown. What happens to the rest?		

Date	Location	Artist, band or, key person	Event/Venue	Description of data	[tags]	<link>
2010-10-13	Tucson, AZ	The National w/Owen Pallet	Rialto Theater	HD recording, but only parts of the show, with tape error and battery failure causing problems, Olympic voice into soundboard		
2010-10-14	Tempe, AZ	The National w/Owen Pallet	Marquee Theater	HD recording using HV30, audio recording with Olympus voice notes recorder, iPod nano w/ Belkin mic and the Alesis ProTrack, m		
2010-10-16	Pomona, CA	The National w/Owen Pallet	Fox Theater	HD recording using HV30, audio recording with Olympus voice notes recorder, iPod nano w/ Belkin mic and the Alesis ProTrack, st		
2010-12-02	Vancouver, BC	Leonard Cohen	Rogers Arena	HD recording using HV30 with no monopod, audio recording with Olympus voice recorder		

APPENDIX 3: The National - Under Construction

The National: Under Construction at the Commodore Ballroom, Oct. 2007

On October 3rd, 2007, New York indie band The National were set to play Vancouver's famous Commodore Ballroom for their first time, and on this occasion I had a sizable crew assembled for the event through SFU's Post-Traditional Media Lab, i.e. the <PTML>. I has worked on some experimental video with the band on three previous meetings after first meeting them in New York in September of 2005²²⁶. Unlike the previous times where there were three cameras filming at most, we were ready this time with an unprecedented six cameras and direct soundboard feed. However, a last minute disagreement with the Commodore's owners, the multinational concert promoters Live Nation, nearly prevented the recording from taking place.

It turned out that Live Nation had just invested a significant amount of money in order to install a sophisticated audio and video recording infrastructure that connected the Commodore to the company's Los Angeles studio, as had been done with several other Live Nation venues in North America. Not wanting other filming activities coming in and undermining this investment, Live Nation informed me only several days before the show that an unexpected (to me) "origination fee" of \$8500 would need to be paid. This overwhelming origination fee was obviously well beyond the resources of an experimental media lab such as the <PTML>. We were on very limited research funding, if any, and basically working as amateurs out of a passion for live music, rather than as professionals getting paid for the work. This tension from the origination fee situation was something I had not encountered in the seven previous years of recording live music events, except very marginally for a \$100 camera fee at the Troubadour in Hollywood in 2004 (it ended up being paid for by the manager of the artists I was filming that night and was mostly an insurance fee).

The disagreement that ensued over Live Nations now standard \$8500 fee would actually have an unintended positive consequence, as it soon led to the idea for setting

²²⁶ Joel, A. Flynn, "Travels in Intertextuality," 40.

up a paid co-op initiative between Simon Fraser University and the Commodore Ballroom. Discussions that quickly followed with the Commodore's management leading up to the October 3rd show would reveal some aspects of a larger, multi-dimensional problem with multiple stakeholders. As it turned out, there weren't enough trained camera operators, directors, and post-production editors to allow the Commodore to do the kind of regular filming it wanted in order to justify the cost of Live Nation's investment in the high end recording equipment. Because Vancouver has a strong film community, there were obviously capable students and professionals available for such work. However, only a few professionals had worked with the venue's brand new equipment, and they were rightfully paid a premium for their experience.

Yet filming a live performance is can be a very straightforward job, and doesn't have to require the expertise that the more experienced camera operators provided. Furthermore, these camera operators weren't always available, especially on short notice, given other jobs they might be working and the irregular hours of the film industry in Vancouver. Of course, it was also questionable as to how many of these experience operators would want to work a night shift at a music venue if they didn't really care for the music or the performer that night. What the Commodore needed instead was a constant and deep pool of talent who were eager to get experience and pay for working in an iconic live music environment, and who were regularly available for evenings on short notice to potentially work late, i.e. students.

SFU on the other hand, at least from my perspective, had plenty of students stuck in lecture halls only learning indirectly about the hands on skills needed for professional work in the field. As a lecturer for many of these students, I would stand and talk on and on in front of the class with slide presentations about the need to learn such practical skills, though always wondering who was actually listening and who was watching random YouTube hijinks, who was scrambling to finish homework for another (Russell's) course, and who was playing whom in the class in the latest version of Halo, which had to be running on at least a few of the laptops in front of me. Given the way classes are traditionally structured and the sheer number of students that need to be taught and moved through the system every semester, the opportunity for mentoring small teams of students isn't feasible in the curriculum. The lecture format is really the only practical way to deal with the situation, and as a result I only had limited opportunities in-class

for helping develop the kind of technical skills that require a mentoring role rather than a lecturing role.

When I did get to work with students and ex-students in such situations, it was outside of class through informal multimedia research projects like the one slated for the Commodore and could hopefully still be salvaged. So in seeing room for common interest between the venue and the school, I was able to convince the Commodore of the potential for this to work out for all parties involved. After some insurance paperwork was attended to, the venue was able to convince the parent company at Live Nation that the recording should take place. An understanding was reached around setting up a future co-op program, with the idea that it would take place formally through an industry partnership between Live Nation and Simon Fraser University, and administratively through SFU's existing co-op programs. This co-op initiative would also be pushed to the media with the needed publicity – locally, in the entertainment industry, and in academia – not only to generate student interest, but also to keep both sets of “parents” happy.

After this discussion took place, The National's October 3rd performance was allowed to go ahead. I recruited a mix of camera savvy friends and ex-school mates (Nolan March and Jesse Toso) along with some current and former students (Ryan Betts, Jayme Cochrane, and Brady Whitteker) to hop on the cameras, which consisted of a set of six Standard Definition (SD) Sony DCR-VX2000s, all borrowed from the SFU Surrey library. We had a camera on the balcony and at either sides of the room (one above the lighting booth, the other beside the soundboard), two cameras roaming freely, and my camera getting the drum shot on stage right. There was no use of communication devices between camera operators, and no script to shoot with other than telling the two roaming cameras they were free to switch off with any other camera, but to at least make sure they didn't end up in the same location, e.g. both on stage, along with my stage right camera. While I actually communicated this explicitly, it almost felt unnecessary, as all the members of the crew had enough experience with cameras, at live music shows, as well as in watching concert recordings to get a sense of the dynamics at play and the kinds of shots that would be useful later for editing.

Taking a moment to reflect on the event in the bigger picture, the actual recording of a live performance is only one activity of many in this digital ecosystem. Its tasks require

different skills than managing and editing the content after it is captured to tape, film, or hard drive. Again, from my own personal experience of long hours of individually managing extensive archives of digital video, I realized that, in general, content would essentially lay dormant unless it could be opened up and have a reason for it to be used. I personally had a significant amount of content that I could find uses for, but technically wasn't able to get at because it was stuck on tape or a packed away in a hard drive that wasn't easy to get at and would take time to set up. Other content was easily accessible and ready to use, but lacked any purpose.

With the Commodore Co-op initiative, the idea for it long-term was always look for a way to make the content accessible to those who (a) were able to take responsibility for it, in other words, weren't anonymous but were identifiable members of the community, AND (b) also had a reason for wanting to take on this responsibility in the first place, whether it be for course credit, for a pay check, or for social/cultural capital of having special access, i.e. cult value.²²⁷ With these intentions, and given the potential audience reach that could be achieved by opening the content up to students through remote access, the co-op idea seemed at least worthy of some exploration.

As had been my approach for many of the concert video efforts I had worked on prior to the October 3rd performance by The National, I wanted to quickly turn around an edit that would give me a sense of the quality of the material that had been captured. This involved more than just looking at the footage, as getting a sense of what was caught on tape also required getting hearing the potential sound mix's quality and how it might come across with the footage. For me, this part was just as critical, as the sound mix often differentiated it from other random recordings. As I had learned from having done this work many times before, it was easier to deal with the audio by working through the video than it was to spend basically the same set up time in creating an audio mix.

After the recording took place on October 3rd, I immediately and intuitively went to work in setting up the content for first viewing and listening. The results, on first glance, were extremely promising. Unlike the previous recordings with the band in 2005 and 2006, this time, it seemed like all the pieces were there with the extra camera angles and

²²⁷ Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction," in *Illuminations* (New York: Harcourt Brace and World, 1935), 217-251, <http://www.marxists.org/reference/subject/philosophy/works/ge/benjamin.htm>.

soundboard audio. The downside of this, at least for me, was that I didn't have the time to dedicate all the attention I wanted to this content due to my teaching schedule and having just started my MBA program. This was especially the case since there were twice as many camera angles to work with and I didn't want to use the same quick and easy 3-panel demo setup I had used in the previous recordings of The National in Vancouver. I felt that whatever I could do with the content personally at that time would be far too limited and was not going to do justice to the work of the whole team that was involved that evening.

I decide very quickly what to do with the content, or, more accurately, what *not to do* with the content. Instead of getting swallowed up by what I was sure would be a fairly laborious process of creating an edited version of the entire show, I decided to take a radically different approach instead. It involved picking a small part of the show for a quick and intentionally un-edited edit, which I called a prototype in its title before later changing the name to the slightly more subtle *Under Construction*. The rest of the content would essentially be put away, or as I liked to think, bottled up like fine wine to ferment and revisit another day. In fact, the ideas for the co-op program would be based around having this archive of content sitting around waiting to be work with.

Furthermore, inspired by one of the cameramen moving to Europe for school, and another moving to Ottawa, the idea was to find a way to open this content up to remote collaborative or individual video projects by media students around the world, e.g. college students who were fans of The National and wanted their own personalized version. With this working idea in mind, I proceeded to take the first five songs from the show and create as simple an edit I could think of using the six camera. This edit could be used to demonstrate the Commodore Co-op concept as well as communicate very basic video editing techniques. Again, the *Under Construction* edit that was created as a prototype version for communicating a much larger concept.

To communicate what could be done at a very minimum with recorded content from the Commodore, the quick and simplified edit of The National's performance was produced using three different video editing techniques. A total of six songs were selected, their first six played that night: (1) "Brainy", (2) "Secret Meeting", (3) "Mistaken for Strangers", (4) "Baby, We'll Be Fine", (5) "Slow Show", and (6) "Squalor Victoria". The first song used all six camera angles, but with only hard cuts in moving from shot to shot. Songs

(2), (3), and (4) had no cuts at all, simply staying off to the side of drummer Bryan Devendorf. For song (5), additional angles were slowly added back one at a time and like song (1), still only used hard cuts. For the final song, all camera angles were back in the mix, but along with the hard cuts, the standard technique of a cross-fade was added for the first time in the entire 25-minute clip.

Figure 43 Screenshots from *The National - Under Construction at the Commodore*



One of the purposes of a single shot perspective that lasted three continuous songs was to demonstrate the “first person shooter” approach that I used in previous live concert recordings, i.e. a response to what I saw as a design questions of “What if there were only one camera running? Would it still be enough?” This sequence was also designed to communicate the “stage right” perspective that I argue as being a valuable *static* camera position to have at any event with a right-handed drummer (switch sides for a lefty), especially with a drummer playing complex and/or what can be described as “hypnotic” rhythms. Also, this three song sequence also had another purpose that wasn’t realized: it was intended to make the viewer want access to the other angles, given that he or she has already seen them and know they exist.

A secondary version of the prototype was intended with the other 5 angles being available through user interactivity. This DVD-format version was supposed to be part of an interaction design experiment once the co-op program was off and running, specifically, to test tactile user interactions in switching between camera angles. It was to complement another experiment using eye-tracking equipment at SFU used for interface design where and would use the 3-camera, 3-panel recording of The National’s 2005 show at Vancouver’s Sonar Lounge as data to investigate. However, since the co-op program hasn’t formally materialized yet, neither experiment has been “put to the test”, so to speak.

Some other points to note regarding this production: In terms of future collaborative efforts with the footage, I also wanted this *Under Construction* edit to be intentionally

left open for future development. No titling was added, no colour or gamma correction performed, no effects added, while edits and transitions were all kept to the bare minimum. The “*Under Construction*” edit was exported only as an MPEG-4 for mobile media players such as the iPod or iPhone, but not as a DVD, since that was to be used in one of the previously mentioned interactivity experiments and I wanted to keep these versions separate. I also did take a moment to export an early version audio mix of the entire show, which was actually more challenging than expected do to having to mix together a spot where not all the audio sources were available at one time. All the cameras had to change tapes around the one-hour mark, since we were still on tape-based media only, and the soundboard mix was fed straight to one of the cameras.

This was the extent of the results, at least in terms of media output, from The National’s October 3rd 2007 show, but not the last time I would work with the band. I’d film them next at the Sasquatch Festival in May 2008, again with a slightly different experimental approach, and again with the stage-right reverse shot, but using a high-definition (HD) camera for the first time. There’d be more with The National in following years and in following the problem, but not at the Commodore, nor as part of a co-op program.

Unfortunately, the co-op initiative was “parked” after 2008’s financial market and housing sector meltdown resulted in Live Nation pulling back on any project that didn’t fit with its core competencies, including the use of the high-end recording equipment. The co-op program was too small to get much attention, and no investment had been put into it yet, unless the \$500,000 of high-end recording equipment is considered, which we only ended up trying out a couple of times. While the Commodore Co-Op project was used in a project in one of my MBA courses, which produced several schematics and visualizations of the concept, there was only one other filming experiment at the venue, an under-the-radar, experimental and “lo-fi” 6-camera recording using SFU equipment that was even more challenging because it the better cameras - in much higher demand now - had been signed out by other students at the time. With this literally “shaky” recording gear, an event was filmed on February 2008, this time featuring Corb Lund and the Hurtin’ Albertans, and a slightly different camera crew. By then, however, the Commodore Co-op and the seeds of the **seedfeed™** had already been pulled over to the side of the road. But at least it was parked, not in the ditch, and lived to tell another tale.

APPENDIX 4: Analyzing The Last Waltz

The Band were a five-piece roots, blues, and rock n' roll group that started out as The Hawks, a supporting band for Ronnie Hawkins' rockabilly act the late 1950s and early 1960s. Consisting of four Canadians – Robbie Robertson, Rick Danko, Richard Manuel, and Garth Hudson – as well as Levon Helm who Hawkins brought with him from Arkansas, The Band came to prominence as Bob Dylan's backing group during his switch from a folk acoustic sound to electric guitar in 1965. Since they were often simply called "the band" by the singers and musicians they supported, they ended up using this unspecific name when it came time for their own output. While The Band was notable for its connections to other more popular artists, they did have a critically acclaimed body of work, which includes a number of legendary songs such as "The Weight", "Up on Cripple Creek", "The Night They Drove Ol' Dixie Down", "Ophelia", and "Chest Fever". Perhaps reflecting their Canadian roots, The Band managed to keep some distance from the spotlight, but was really never *too far away*, eventually deciding to call it quits in 1976.

When it was announced that The Band would be performing a final concert at San Francisco's Winterland Theater on Thanksgiving Day, 1976, the event gathered steam and became something much larger than originally intended. There were regular additions of high profile artists to an expanding line up, who all wanted to play and pay their respects to their friends, and to the group as a whole. In the meantime extra cameras were added to the production, as were ideas for even more extravagant - though ultimately shelved - stage designs. What was supposed to be a celebration of an era, in retrospect, and even noticed at the time, was the feeling that the event – known as "The Last Waltz" – seemed to signal an end of an era, bringing a finality to it that made it more than just the last time the original group would play together. And of course, it also became the site, the set, or the "problem space", for director Martin

Scorsese, resulting in a film that is still one of the most unique and critically acclaimed of its genre.

Yet the film, also titled *The Last Waltz*, came with its own spotlight of controversy. Scorsese's 1978 documentary, or "rockumentary", started out just as an idea to archive The Band's final show, but eventually became a massive spectacle (for The Band's standards anyway) of set design and guest performers including Bob Dylan, Neil Young, Joni Mitchell, Van Morrison, Eric Clapton, Ringo Starr, Muddy Waters, and even Neil Diamond. As it grew in scope and stature, and once Scorsese got involved, it would end up as the first in the genre of concert films to be shot using 35mm film stock.

Figure 44 Poster and screenshots from Martin Scorsese's "The Last Waltz" (1978).



Despite its continued acclaim over thirty years later, there has always been an underlying tension, particularly from Helm's repudiation of the film²²⁸ with respect to the prominence of Robbie Robertson's role in its construction in close friendship Scorsese, and then in post-Band working relationship as the composer for numerous Scorsese films. For their part, the rest of The Band also have mixed feelings on the film, which they felt brought the group to a premature end on account of Robertson's Hollywood goals.²²⁹ A major criticism of the film is that Scorsese and Robertson managed to marginalize the vital roles of the other band members in what was a truly collective effort, in the

²²⁸ Helm, *This Wheel's on Fire: Levon Helm and the story of the Band*.

²²⁹ Severn, "Robbie Robertson's Big Break:."

process turning what was supposed to be a celebration of a sixteen-year career, into more of a wake for a band that wasn't ready to quit.

Despite this still unresolved tension, unavoidable bias that can be seen in *Revisiting The Last Waltz*,²³⁰ the bonus feature that was also produced by Scorsese and Robertson, and features no participation from the remaining members. The insights into the making of this concert film are compelling if only in terms of filmmaking process and techniques, never mind the music that it represents. Yet with respect to **seedfeed**™, *The Last Waltz* also produces an even more compelling argument for Moggridge's IxD methodology, despite the fact that the concert event didn't take place in what can be considered the digital age, nor can it be considered to have involved any field called interaction design. The S/E/E/D method, as an extension of Moggridge's work, will be applied to this concert/film event in order to help pull out some of these insights.

REVISITING THE LAST WALTZ (2002)

Transcribed by J. Flynn

- Robbie Robertson: The Band has been together sixteen years. We gave our final concert. The Band's final concert. We called it "The Last Waltz".
- RR: When "The Last Waltz" idea came up, we were just talking about the concert. As we got started with this thing, something was happening, you could feel something going on. And then the idea came up of: "Well, if we're going to do this thing, we should document this in some kind of way". I talked with Martin Scorsese about helping us.
- Martin Scorsese: I didn't know him at all, I just knew his music. I admired him from afar, there's no doubt, the music really meant a great deal to me, so...
- RR: I could see he was really hooked by the idea
- MS: It's more of a compulsion and obsession with the music. What I realized was that this is signalling the end of an era.
- RR: He was right in the middle of shooting a movie as well. It couldn't have probably been a worse time
- MS: I couldn't let the opportunity pass. It was this kind of crazy desire to get it on film, to be a

²³⁰ *Revisiting the Last Waltz*.

part of it.

CUE TITLE: REVISITING THE LAST WALTZ

- RR: We didn't have very much time to put it together. It was literally a few weeks before this was all going to happen.
- MS: The least we could do is just to record it on film, and that was the first thought we had: 16 millimetre, record it on film, and that's how we proceeded really.
- RR: We were doing this by the seat of our pants, we didn't have any budget really. We hadn't made a deal for a film.
- MS: There was no contract, nobody got paid or anything, for me the joy was in making the movie.
- RR: And it was just rumbling and getting bigger and bigger, day by day.
- MS: And then I thought, you know, it might be really interesting to get a little extra money, and for the first time if you set the cameras in certain positions and they're locked in, we could also create the lighting: Which gels would be used, the that would be used, where the light would change on which line or lyric of the song. This was something I would ultimately design completely on paper.
- MS: I said, "You know if we have that much control, why don't we try something that was never done before?" And I said, "That is, to actually to shoot this documentary in 35 millimetre."
- RR: And it just snowballed. And [concert promoter] Bill Graham and his people, they did a pretty wonderful job. They spiffed up Winterland a little bit and tried to make it look nicer.
- MS: The issue of Winterland. How could we transform it for the event itself?
- RR: We've got no money to do elaborate things.
- MS: Forget budget. Forget production possibilities. Let's go for the ideal. Let's write the ideal down, let's think of the ideal.
- MS: Boris Leven was one of the great Hollywood production designers, but I had known Boris' work through earlier films, particularly West Side Story, and Sound of Music, and um... that's interesting. He did "Sound of Music" and "The Last Waltz". I had met Boris through Irwin Winkler and "New York New York" and while he was hanging around I said, "You know Boris, come with us, we're going to do this rock picture and if it's going to be more than just archival, it might be nice to have a real set designed, in a way, transform Winterland." And when Boris walked into Winterland he said, "I see it!" He said, "The entire ceiling covered with chandeliers!" I said, "Brilliant!" And he made some wonderful paintings, about five or six of them, just to get an idea of what it could be like. So it really was Boris' eye and his thought that we wanted to used to inspire us.

- RR: So Boris, with his kind of imagination, he was thinking, "What can we do to make this look unique, like we haven't see this before, and something special. So he thought, "San Francisco... what have we got?" And he said, "the Opera!"
- MS: And so we acquired the set of La Traviata from the San Francisco Opera. And added footlights, too, which gave another kind of effect, a low angle lighting that was very theatrical. And three chandeliers on stage. That's what we came to because we just couldn't afford the whole place being filled with chandeliers... it was a great idea, but...
- RR: Marty talked to Michael Chapman, who had been his DP (Director of Photography) on Taxi Driver and Raging Bull
- MS: He was the main Director of Photography on the whole thing because he had to supervise the lighting for all of it.
- RR: And we went from the most minimal idea to, obviously, where it went went.
- MS: And so it was a whole different approach, I was really interested in the music, how the music is performed, that is, the relationship of the performers on the stage. The idea was to keep the cameras on the stage, on the performers.
- RR: We don't want to resort to cutaways of people in the audience going crazy or chewing gum or stoned out of their mind. That's not what this is about.
- MS: If anything the reverse shots would reveal the audience. I love those reverse shots in any film I ever see them. When you have a reverse on the stage behind the performer, and you see the audience out there it's quite something. You'll see the connection between the performer and the audience very clearly, and that kind of makes you feel the electricity.
- RR: Everybody wanted to do this with respect for "the event".
- MS: He also didn't want us to interfere too much with the actual performance, and that was important too. You couldn't have cameramen all over the place, with cranes coming down, and that sort of thing.
- RR: You had to have respect for the audience, for the people that where there.
- MS: [Robertson's] right, otherwise there'd be cameras all over the place and the people who had come to see the concert, there wouldn't be that communication between the audience and the performers. It would be something done for some movie.
- RR: I went through all of the songs and all of the things with him, and telling him like some of the events happen: "Okay right here this guy does that, over here the horn section comes in, here's where this vocalist comes in with that vocalist, then the instrumental happens there... just giving him some of the things that he wanted to get.
- RR: He's taken all the lyrics to every song that we're going to do that night, and written beside the lyrics in the margins, drawn little pictures of where the cameras should go, what the mood should be and what kind of lighting and what kind of shots and what kind of

angles. This elaborate script that he wrote, a musical script.

- MS: Setting up the storyboards had to do with reading the lyrics, seeing which instrument came in played by whom, and knowing the song and getting images in my head from the song itself, or reading the lyrics and getting images from the lyrics. And we had columns, main column on the left had lyrics and the chorus and that sort of thing, and then literally [columns for] who's doing what, where, and when in the song.
- RR: So I thought, "Wow this guy's serious! He's going in here like Alfred Hitchcock, you know. He's prepared!"
- RR: I was very nervous about this. We're back there thinking we have to play with all these different artists and we have to remember all these songs. You wanted to take care of them, you want them to do a really good job for them. So we went in the concert thing, like, that's all we're thinking about. Hope it works out, but we've gotta deal with this right now.

["UP ON CRIPPLE CREEK" STARTS PLAYING TO BEGIN THE CONCERT]

- MS: When the music started on "Cripple Creek", I had butterflies in my stomach, but, we were there. We were ready.
- MS: When I first heard the downbeat, I hadn't realized the level of sound. There was a moment there where I was like, "How am I going to communicate?" And so I was basically on the stage right, I believe, dressed in black to fade away in the background there, [but I] wasn't really talking to each, more yelling to each cameraman because the sound was so strong.
- MS: The music made me feel like I was a participant, but I knew damn well I was an observer. So I had to be very careful because I had to remain cool-headed – as much as possible – to get a sense of where we were, what was happening, what we were picking up, and what we weren't. And certain songs had to be just right, I mean "Cripple Creek" had to be just right.
- MS: I knew I had this plan to fall back on. It was extremely difficult because it was such a big... lot of paper, so I had to break it into about five songs each or so, and I kept turning it over, and there was no light backstage either, it was like a little flashlight that we had to use, just in case, to remember if a camera if so and so's getting a closeup of him or her, or whatever. And therefore, I knew that for Camera #2 for, let's say "The Night They Drove Ol' Dixie Down", had to have a medium shot at least at the beginning to cover Robbie and Rick. But if it started with a guitar riff, then I worked it out on paper to be tighter on that, and then leave it up to them (to) move in and out.
- MS: If we lost half a song, I knew in the next song if all the cameras were down, as soon as you load up: Camera #4, you're on Levon; Camera # 5 you are on Neil Young, you hold on him and Robbie and Rick; Camera # 3 you're on a closeup of Neil, just pan with him whatever he does. If two or three of the cameras ran out of film, that song would have to be a casualty.

- MS: I think it was well done the first number. The cameramen were just great on that first number, "Cripple Creek", it was a beauty... the energy of Cripple Creek, the energy of the song...the energy... They hit it. The yodelling, I think, in that number. That's where it hit it, and the whole audience was caught. The authority of the performance was such that after that was over we could anything, we thought, "Let's just keep going!" We got crazy, we just loved it.
- RR: It was off to quite a lovely start, when one artist would come out to another one, it was almost like going into shock treatment it was so jolting. After two or three, you found yourself getting a little more comfortable in these trenches, and we hit some kind of a groove, and it went into one of those places of magic where it was beyond trying to remember, you just did. I can't even describe in words.. it just took you to the zone and you just rode it out through the whole thing.
- MS: For me, I think what I felt on the stage was as if each song was a round... I've always said this was a round in a prize fight. And you'd see the fighters then go into their corners, with heavy breathing, throw some water in their faces, cover up the wounds and the cuts, and "Get him out there, you're doin' fine, let's go into the next one..." Bang. And then they're all looking at each other, "Okay, we're going to end somehow," and who's coming out, and where's he going to stand, and where's she going to stand...
- MS: What you have to understand is that no matter how prepared you are, this is a live concert. And in any live event you're going to be subject to something happening on stage that you don't expect. You're going to be subject to chance, to luck, to fate. There's bound to be moments that you're not going to be able to control. I did all I could to prepare so that if a problem came up i could get back in sync, I could fall right back on the preparation I had done on paper. And this was the case on a couple of numbers with the band, that we ran down our cameras,that a lot of our cameras when down. The of course they would run out of film, or, the sync 35 millimetre motors of the cameras would burn out. We were constantly seeing sync motors being carried out like bodies... There were certain songs we really wanted to get, and we tried out best.. A couple of songs we didn't get, we just had to stop at times people had to take a break.
- MS: "Mannish Boy". In this instance there was a miscommunication that went through the whole crew to take a much needed break. Because when I heard it, the refrain "I'm a man", I said, "Wait a minute, we've got to get this, get the message out to every one of the cameramen, get rolling, get started. I'm screaming into (my mic) and it was like my heat dropped. It was insane, it was like, "how could we have made this error?" And then somebody ran back and said, "Wasn't anybody running?" and he said, "Lazlo (Kovacs) was". "Thank God!" I said.
- MS: When we finally got the people out to the other cameramen, they started shooting and of course it was the very tail end of it. On the beat everybody pounded their feet into the floor, and the whole place shook to "Mannish Boy". It was amazing, it was like being in some sort of religious ceremony in some wild cathedral. It was a constant hardworking situation for seven hours straight. And it's just luck that performance was finally captured on film.
- RR: The evening had been going on for a long time. It had gone on through the dinner, and then the Waltz Orchestra, and then the concert, and then the Poets of San Francisco,

and then the finale. It was one of those things that you felt like, "If I can just get through this alive, this will be a great moment". We were really looking at the finish line on this.

- RR: It was like everybody must be exhausted. Everybody must have had their fill, and more, by now. And everybody left the stage. So I went backstage, changed clothes, was relaxing (thinking) it's over. Then Bill Graham comes back and says, "Not one person has left, out there. You have to go out there and play some more." I don't know if we know any more songs, you know? I couldn't believe it when I walked out there and saw all these people still there, and he was right. And you could feel something in that last song, of The Last Waltz, knowing this is the last song.
- MS: I don't know, we just felt a very strong... a great deal of satisfaction.
- RR: So after the concert, Marty was exhausted, but he was also incredibly exhilarated.
- MS: It was one of the best times I had in my life, I remember. We just hoped that we caught as many of the songs as we had gotten. We just hoped we had gotten all the best... of the best.
- RR: He said, "You know, I don't want to like jinx anything but I got a feeling we got something here."
- MS: We still didn't know what it would look like on film though.

POST-PRODUCTION

- MS: The next day, or two days later or whatever it was, they put up three rolls up, three rolls of film up, three of the cameras. And when they pressed start, the clarity, the beauty of it was kind of shocking to me. I said, "It's a movie! This is something very special." It wasn't "flash", it wasn't phoney theatrics. It was people expressing themselves with music.
- MS: What we caught on film, I do think we caught pretty much what I felt on the stage. The cameramen were able to get the electricity, presence, the excitement, and the extraordinary physical achievement of creating the music on the stage.
- RR: Then Maryy said, "This is all glorious and great, and beautiful and all that, but we have to make this a movie. This can't just be cameras in front of music. We have to figure this out."
- MS: Now, naturally in the beginning, to lay out the scene, to show some of San Francisco, to show some of the people lining up, to show the Waltz itself, that sort of business, that was just the beginning to set the context and the exposition as to where we were and why.
- MS: When we started to talk about a structure, [there were] two things that occurred: One was that, certain numbers - "The Weight", particularly, "Evangeline", and of course, "The Last Waltz" theme - those should be done separately in a studio.

- RR: I didn't have the opportunity to get this prepared for the concert, but i had written this last waltz suite. And the Staple singers had been a great influence of ours, the gospel influence of ours.
- MS: In the case of "The Weight", being such and important song in their body of work, that we wanted to give it a better presentation. But the philosophy, the religious sentiment of it, that represents who they are, I think. The lyrics of "The Weight" always moved me. Also, I had never heard a sound like that before.
- RR: And also at the concert we didn't represent any of the country influence. Besides wanting to round out the music, one of Marty's great talents is the way he moves the camera. He had the opportunity with three songs to do what he does.
- MS: We did it for five nights, again that was somewhat designed by Boris Levan to a certain extent. There were no multiple cameras, there was one camera on a crane. If the shot was to go for the first four lyrics, that was it. For the first four bars of music, that was it. There was no other shot covering it. I drew little storyboards myself. That was design by, again through the lyrics and through the piece of music itself. That has to do with movement, color, sensation, texture... Movement!
- MS: If the music communicates to you, invariably you're going to make the right moves with the camera, I think. And no one really knows what the right choice is at this point, and that kind of thing. But you're going to make a good choice, you're going to make the best choice you can if the music is communicating to you and you're feeling really good about that.
- MS: Once we understood that The Weight, and Evangeline, and The Last Waltz Theme were to be filmed in a special way, like an old MGM musical, so to speak, the film was taking on another tone. This whole thing goes to the next step that ws the evolution of the structure, which Robbie suggested, which were interviews.
- RR: I told him a lot of stories and things about, over the years, being on the road and he said, "You know when you're telling me these things, that's the kind of way to do it so that it just isn't information.
- MS: They had a purpose, a purpose for again as the link of the history of the music. Therefore the interviews helped us with that.
- -----
- [INTERVIEW OUTTAKES]
- -----
- MS: Because also it was like, in a sense, educating the audience and letting them know that this... those that don't know... there are many that do know... in fact in the film I'm discovering as I go along. And it became a whole process for me of discovering, and then you see this in The Last Waltz as part of it. That's what those interviews were about ultimately.
- MS: But there was the dark element that certainly gave me a grounding and truth, really, in that world. And so I was able to feel that it wasn't simply just people playing instruments nicely on a stage and saying some pretty words. I know the words had meaning for me,

and I'm not talking about nostalgia or anything, it's the actual poetry of it, I think. I was in the process of absorbing it, and I did know it, I did understand what they were talking about by the end of the picture. And that's one one of the reasons why it's that way. It's part of the life that at the end they say could do you in very young.

- RR: A lot of the people in the film are very very young when this was done, and to say this was "the last waltz", and it was talked about as the end of an era, all of these kinds of things at the time. I feel looking back at it like, "Well this wasn't early to be doing anything like this, it was what it was. It was that time period, and I feel good about, you know, wrapping up something so you can unwrap something else.
- MS: And twenty-five years later, I was very surprised, Robbie called me and said, "Marty, it's been twenty-five years since the actual concert." I said, "It can't be, it can't be." Sometimes I don't want to look at the film because it's very moving for me... the music is, the music is.

▪ CREDITS

- Produced by Stephen Altobello
- Edited by Jonah Kaplan
- Camera: David A. Ford, Mark Putnam
- Audio: John Iskander
- Research: Don Romesburg
- Post Production Supervisor: Dante Harper
- Graphics: Marianne Bower, Courtney Powell
- Post Production Facility: Rockville Pictures
- Audio Sweetening: Dave Paterson at Spin Cycle Post
- Office Manager: Kate Ritrovato
- Production Assistants: Chris Sikorowski, Edwin Martinez
- Transcription: David D. Palmer Transcription
- Archival Material Courtesy: MGM Home Entertainment, Inc. Warner Bros. Records
- Last Waltz Concert promotional materials provided by Bill Graham Presents @1976 All Rights Reserved
- "West Side Story" available on DVD from MGM Home Entertainment
- Jam Session Edited by Emily Dennis, Mad River Post, Inc.
- Mixed by Dan Gellert
- Engineered by Patrick Macdougall
- Special thanks to Martin Scorsese, Robbie Robertson Michael Chapman, Jay Cocks, Dr. John, Ronnie Hawkins, Levon Helm, Garth Hudson, Greil Marcus, Mardik Martin, Steven Prince, John Simon, Mavis Staples, Jonathan Taplin, Irwin Winkler /
- Nancy Lefkowitz, Alex Faigen of Cappa Productions /
- Jared Levine
- Jeff Greenberg of The Village
- Paul Altobelli, Bob Andreano, Shelley Batista, Michael De Avila, Shannon Goldman, Jeff Marcello, Patrick Milligan, Joane Morton, Megan O'Byrne, Krystn Wagenberg
- Maggie Adams, Sharon Braun, Matt Donato, Trisha Gum, Susan Marble, Lewis Lagrone, Jana Simmons, Kelly Trollinger, MGM Home Entertainment Inc.
- Executive Producer for Automat Pictures: Jeffrey Schwarz
- an automat pictures presentation
- Scenes from "The Last Waltz" provided courtesy of MGM Home Entertainment ©1978 The Last Waltz Productions, Inc. All Rights Reserved.