

Add researchers and stir: *observations on the challenges and opportunities of post disciplinary research*

Joseph Lindley
HighWire DTC
Lancaster University, UK
j.lindley@lancaster.ac.uk

PREFACE

This report, along with the accompanying film, is the outcome of a research project conducted at the HighWire Doctoral Training Centre (I will abbreviate this to DTC, CDT is a frequently used alternative) as part of the HighWire Masters of Research (MRes) programme. The MRes is compulsory for all HighWire students, and is completed prior to embarking upon their PhD studies at the centre. This work is a ‘summer project’ contribution, a project that runs for around 3 months and is equivalent to the thesis for the MRes course.

The project has two outcomes, a film and this written report. The film includes a narrated story describing the emergence that culminated with these outcomes. Through the story told in the film, two research tracks are introduced. Firstly there is a ‘meta narrative’ track, that makes quite general observations about post disciplinary centres such as the HighWire DTC. This track serves a dual purpose. First it describes a number of research findings in their own right, and secondly also it lays the foundations for the ‘infra narrative’ track. The infra narrative hypothesizes that academic research, especially that which is conducted in venues such as the HighWire DTC, may benefit from encouraging the incorporation of elements of subjectivity, lived experiences and intuition, into research projects and outputs.

The suppositions in the film, of both narrative tracks, are supported and extended by the rhetoric in the written report.

The film element of the project is accessible online at <http://bit.ly/add-researchers-and-stir>.

ABSTRACT

This study provides a unique analysis of the challenges and opportunities that face HighWire. The study uses research methods and communication modes that are intended to embrace the concepts and ethos of post disciplinarianism. Analysis is based upon a ‘method assemblage’. The conclusions of the report, drawn from this analysis, focus on two areas, correlating to the two narrative tracks in the film. The film element of the project and the written report, bear equal significance in terms of disseminating the research’s conclusions and are mutually reinforcing.

INTRODUCTION

The HighWire DTC is one of a number of research centres funded by the Research Council UK’s (RCUK) Digital Economy (DE) programme, bringing “together a

unique community of researchers (from diverse disciplines including social science, engineering, computer science, the arts and medical research) and users (people, business, government) to study, understand and find solutions to real problems” [1]. Among those funded by the DE programme, one of the factors unique to the HighWire DTC is its status as a ‘post disciplinary’ centre.

Because of its intention to embody the ‘spirit’ of post disciplinary research, this project’s outputs are quite unusual in terms of Masters theses. This introduction aims to ‘set the scene’ and provide guidance for how to interpret the written and film elements of the project.

Design iterations, prototyping, and emergence are all substantive features, of this work. The emergent properties of the project, in particular, are referred to on multiple occasions so as to provide sign posting for the reader, and to reduce ambiguity wherever possible.

The comprehensive review of *interdisciplinary* working (emphasis to highlight distinction from *post* disciplinary working) - *Creating value across boundaries* [2] – was a constant reference point from which to view the intricacies and benefits of interdisciplinarity, and provides a high resolution critical lens with which to view HighWire. Aggregate approaches to project management for innovation, such as *Speedplay* [3] and pragmatic approaches to flexible research design such as those described by Colin Robson [4] underpinned a constantly evolving and organic structure to the project. The extremely flexible approach is necessary, and is directly related to the intangibility and breadth of the subject matter. The flexibility is also in part due to the realisation that “It is notoriously difficult for practitioners to communicate how they do things since much is learned through practice, intuition and overflows” [3]. A variety of design techniques were highly influential in the conception of the project, and are equally valuable as different ways of viewing the findings, providing different lenses of analysis. Among these techniques are: value sensitive design [5][6][7]; participatory design [8]; design documentaries, prototyping and lo-fi approaches [9][10][11][12][13][14]; experience (based) design [15][16]; design for sustainability [17][18][19]. After the core findings of the project are presented a subsequent section, titled ‘Ways of Seeing’, elaborates on how some of these techniques may be used as critical lenses for the findings presented.

Assessment Requirements

This project is an assessed piece of work, contributing to the HighWire MRes, and as such needs to meet the requirements of the assignment. The minutiae details of the assessment criteria aren't necessary to include here, but it is worth noting the broad assumptions and directions. The following notes are extracts from the course guidance [20]:

- “focus on digital futures of the digital economy or society more generally”
- “be cross-disciplinary in nature building on multi-disciplinary skills and knowledge”
- “implement emerging capabilities, interests, understandings and experiences”

In addition, the project should have a stakeholder (usually an organisation or company) with an interest in the digital economy. The required outputs are a research paper, associated digital artefact(s), and a document reflecting on the process.

For this project the stakeholder is the HighWire DTC itself. *This* is the research paper and the digital artefact is the accompanying film.

The realisation of how this work could address the assessment requirements emerged throughout the lifetime of the project. The film explains the circumstances and reasons for the emergence.

Methods

Given the subject matter of the report – a research centre – and the fact that it is part of the thesis for an MRes (Masters of *research*) course, it has a natural tendency to consider methods. There isn't a substantial body of work that formally describes how research methods and methodologies are applied in post disciplinary research settings. A later section of the report deals exclusively with research methods and how they relate to this project (in terms of methods used and how those methods relate to the findings of the research). I have elected to refer to methods here as well in order to make it clear from the outset that there is no single, easy to quantify, or unambiguous research method utilised in this project, and thus readers should not look for one!

As a matter of clarification, in the report a method is meant as a set of steps to go through in order to collect data, within a given methodological framework. The distinction between method and methodology is that the method simply describes what actions need to take place for a given methodology to make sense, whereas a methodology contains elements of theory and philosophy [21].

Pattern Languages

The concept of ‘Patterns’ as originally described by Christopher Alexander [22] and built upon by, among others, Douglas Schuler in *A Pattern Language for Communication Revolution* [23] has directly influenced how the findings, and ‘Ways of Seeing’, of this research have been presented.

Report Structure

The written and filmic elements of the project have a substantive and two-way interplay between them. It is because of the nuance of this two-way relationship that I've placed great importance of clarity in the written report. The structure of the written report is provided explicitly below.

Section	Purpose
Curatorial remarks	Guidelines to help viewers interpret the film.
What's the significance of <i>post</i> disciplinarity?	Discussion to disambiguate post disciplinarity (inversely, to expose the inherent ambiguities of post disciplinarity) and introduces the ‘professor paradox’.
Methods & Methodology	Discussion around relevant research methods and methodologies. Touches upon the epistemology of the project and describes how the actual methods used to conduct the research, and methodologies used to interpret it emerged.
Findings	Building from the methodological stance, the findings of the research are presented. This shows how each finding relates to sections in the film, and whether they pertain to the meta narrative, infra narrative, or both.
Ways of seeing	A series of short, but diverse, analyses offering up different lenses to interrogate the findings through.
Conclusions and next steps	Discussion reviewing the whole project and considering ways to further these lines of enquiry.
Acknowledgements	Thanking and paying respect to those who helped formulate, conduct, and finish this project.
References	List of references used throughout the report (IEEE referencing convention is used).
Appendices	Referenced from the main body of the report, where relevant.

CURATORIAL REMARKS

The audio-visual accompaniment to this report is referred to as a film, however ‘film’ is a very broad category including feature length theatrical films, documentary films, art films and so on. *This* film has elements of each, but if a genre had to be chosen, *Research Communication* (in the sense of Science Communication [24]) would probably be the most fitting.

The soundtrack to the film is almost entirely a spoken narrative. The narrative tells my story, and includes questions and suppositions that are elaborated upon in the written report.

The visual part of the film is more abstract than the audio, but is filled with information: as the level of visual abstraction increases, so does the density of semiotic meaning.

Where the visual content came from

The visual content was all recorded within the time period that the research was being conducted in. The content is a mixture of material that directly relates to the subject matter of the project (i.e. photographs and videos of tangible outputs of work done related to the MRes programme including brainstorming exercises, ideation exercises, networking exercises, et cetera) as well as less directly related content, contributing visually in a more abstracted way. The vast majority of the content was recorded on a smartphone. The approach to gathering and generating content was done so while embracing the ideological perspective of lo-fi [10] and prototyping [11].

Notes on the editing of the film

The film was cut entirely in Adobe Premiere. Basic techniques were used (such as digital zooming) to add extra dynamism and visual interest to the still photographs used. Video compositing (blending multiple images together) is used frequently in order to combine and juxtapose multiple pieces of content together. The high ‘density of semiotic meaning’ is largely derived from the use of compositing.

Speed of narration

The narration is fast-paced, reflecting how events happened in reality, and also offering some sympathy to the denseness of the visual aspect of the film. Due to the speed of the speech, hearing and comprehending all of the detail could be difficult. If it does appear to be a problem then repeat viewing is recommended as the best way to mitigate the issue.

Explaining visual metaphors

Curating work is an art form in its own right. Criticisms aimed at curators often report that the thing being curated is either over or under explained, getting the balance right is a challenge, and the curatorial challenges for this film are no exception. For some it may feel like a step too far, but a table of metaphors (see appendix 1) gives brief descriptions of the purpose of *some* metaphors in the film. The list is not exhaustive, but it exists to give

viewers an optional impression of the types of metaphorical devices employed.

It is advised that if you have not watched the film at this point, you watch it *prior* to consulting the table of metaphors and then *after* initial viewing consult the explanations, and then re-watch the film. Proceeding in this manner should support the mutually reinforcing structure of the project’s two outputs. Test viewers/readers responded positively to this structure. Repeated viewing will simultaneously mitigate any issues arising from the speed of the narration.

WHAT’S THE SIGNIFICANCE OF POST DISCIPLINARITY?

Alan Blackwell [2], briefly discusses the distinction between the connotations held in the prefixes *cross*, *inter*, *multi*, and *trans* (disciplinary), concluding that “We believe that the word interdisciplinarity is sufficient, and have found subtle and important features that the simple tripartite classification does not capture”. Although arguably true, and this perspective is a perfectly acceptable one within the bounds of the report that is quoted, for the purposes of communication clarity some distinction is undoubtedly necessary. Blackwell’s report [2] will serve as a good reference point for any reader seeking clarity on definition of inter disciplinarity.

One common issue with discussing the nature of post disciplinarity is terminology. For example mixed terms are present in the extracts from the course guidance for the module that this work is for “be cross-disciplinary in nature building on multi-disciplinary skills and knowledge” [20]. A thorough discussion of the intricacies of meaning held within the different terms is beyond the scope of this report, and broadly speaking a similar position to that of Blackwell should be assumed: in terms of the various prefixes (cross/inter/multi/trans) – we can assume that interdisciplinarity is sufficient to describe the phenomenon that is being discussed. The Wikipedia article on academic disciplines provides various interpretations of the intricacies held within these terms, and also explores further terms, including *intra-disciplinary*, *pluridisciplinary*, *hyperdisciplinary*, and *meta-disciplinary*, all under the heading “Buzzwords” [25]. Having established that associated terminology is somewhat murky, attention needs to be given to the construct of interest here, *post disciplinarianism*.

Although you *could* assume that the prefix *post* infers that disciplines are no longer useful, that would be an incorrect assumption. In their paper *Designing Cultures: Post-Disciplinary Practices*, Busher and Cruickshank [26] discuss the value of disciplinary boundaries, and how they are, in fact, essential to engendering value in post disciplinary working. This is echoed in the title of the Blackwell’s report on interdisciplinarity - *Creating value across boundaries*. The choice of wording suggests that the differences, the nuanced contrasts between individuals, is where the *additional* value of blurring disciplinary boundaries lies. However, Blackwell goes on to explain how it isn’t just disciplinary boundaries that

need to be crossed or broken in order to capitalise on the tacit value that exists in the space between disciplines:

“But our study has underlined that effective interdisciplinary innovation also crosses other boundaries. Whilst small innovations might optimise an existing structure or process, larger-scale innovations – scientific breakthroughs, or completely new business models – usually involve crossing organisational boundaries, creating new processes or defining new organisational structures” [2].

This finding is fundamental to the challenges and opportunities (of post disciplinary research) that this project is exploring. We have a plethora of knowledge from different disciplines, but more interestingly, more importantly, and most significantly, different *types* of knowledge. Different types of knowledge require different practical frameworks to fully make sense, to be operationalised. Appreciating this factor is key to defining what post disciplinarity actually is, how to leverage its potential, and also to understanding any barriers *to* that potential.

An interesting factor to bear in mind when considering a definition of post disciplinarianism, its importance, and why this study has a meaningful contribution to make, is that almost without exception the scholars discussing the issue are very much rooted in their respective disciplines:

“Without exception, they [contributors to the research] saw themselves as coming from a particular discipline, sometimes describing it as a ‘home’ or ‘native’ discipline. Early educational and professional experiences clearly shape individual values and intellectual styles, in a way that is preserved even as a person moves between sectors, organisations or disciplines (as most of them did)” [2].

As such the perspectives presented are symbiotically tied to the authors’ home disciplines.

I’ll briefly explain two examples, both coming out of Lancaster University. Busher and Cruickshank’s paper on post-disciplinary practices exemplifies this with its preoccupation with design “we locate our own position within this growing field, and then turn to a review of a set of examples from completed and ongoing projects of socio-technical innovation. This is followed by reflections on new boundaries and practices of boundary making in and through collaborative design” [26]. In their paper on the subject of *Pre-disciplinary and post-disciplinary Perspectives* Jessop and Sum draw conclusions that *appear* to be contradictory to their initial positioning. Initially they “reject the discursive and organisational construction (and, worse, the fetishisation) of disciplinary boundaries” [27]. However, reading the text it is clear that there are discipline-influenced tendencies throughout (in this case synergies to sociology, philosophy and politics are obvious) and the rhetoric, argumentation, and conclusions are all explained in terms of the political economy.

By concluding this section, I’ll attempt to define the problem space that this project addresses.

I believe there exists a dichotomy between being an established academic, and therefore being ‘an authority’, and the notion of established academics being considered authorities on post disciplinary research. There are of course exceptions to this, but it is generally true. The observation that *all* the contributors in *Creating value across boundaries* felt they had a home discipline appears to demonstrate this, as do the two examples of research papers discussing post disciplinary research. Once ingrained, disciplinary tendencies are difficult to shed. Within this dichotomy there lies the ‘Professor paradox’: in order to be an academic authority, one *must* be rooted in a discipline (or at least disciplines that are *traditionally closely related*). But in order to give traction to a movement like post disciplinarity, you need authority figures to promote it. You could say it is a chicken and egg issue.

The associated difficulties resulting from the paradox are confounded by some other factors as well. First the assertion [2] that in order to benefit from the value created across boundaries, more often than not new organisational structures and processes must be created. Second is the issue of experience and career prospects. Being in this position myself, I can vouch for the fear of positioning oneself in an academic wilderness. By concentrating on a mixture (or absence) of disciplines as opposed to concentrating on one or two traditionally related areas, the chances of gaining employment either in teaching or research are reduced.

“These problems are particularly pertinent to younger researchers who are yet to be strongly established in their discipline. Without a firm disciplinary base they risk being known as a jack of all trades” [2].

The HighWire DTC aims to capitalise on the proven potential of inter/cross/trans/multi or post disciplinarity, to facilitate innovation. HighWire has taken an approach that embraces post disciplinary working as a means to an end, with the end being significant, tangible impact upon the digital economy and real world problems. The choice of the prefix *post*, as opposed to the other options, is representative of an ethos that not only encourages the transcendence of disciplinary boundaries in the inter disciplinary sense, but embodies a wider ethos that places innovation at its core. This project will explore, based upon my own first-hand experiences, what challenges and barriers exist to this ethos, and suggest possible mitigating actions appropriate for those problems.

METHODS AND METHODOLOGY

Having established some concept of the meaning and significance of post disciplinary working, here I will discuss the relevance of different methods and methodologies to this project. As I alluded to in the introduction, a more developed context provided by the rhetoric describing the paradoxical nature of post disciplinarianism, it remains the case that the data generated by the project was *not* generated by any distinct method. Similarly the project does not conveniently fit into any established methodological framework. In this section I’ll review some stances that could go some way

towards providing methodological foundations for this work, before drawing a conclusion that describes that *actual* method assemblage that this work is built around.

The battle of the ‘tatives, and fixed or flexible research designs

The ‘tatives referred to are the concepts of quantitative and qualitative data, research design, and methods. Although where qualitative research was once stigmatised, in a way it no longer is, a tension still exists between researchers using methods from contrasting schools of thought. Robson characterises this saying “the positivist ‘standard view’ of science has been comprehensively demolished, although its ghostly presence lingers on in the views and practices of many quantitatively inclined social researchers” [4]. There is an obvious futility in bickering about the intricacies of specific methods [28], particularly when both quantitative and qualitative approaches have obvious merit (and, indeed, can be quite happily mixed together). There is of course a further complication in that a quantitative analysis technique, maybe analysing qualitative data, and, to some degree the inverse could be true. Rather than fixating on the two ‘tatives, the terms fixed and flexible are more useful ways to consider research projects. Avoiding unnecessary detail, the following definitions should suffice to explain what fixed/flexible is referring to in this context.

Fixed design research projects typically:

- Involve the collection of quantitative data
- Have an emphasis on statistical generalizability
- Carefully consider validity and reliability to engender ‘trustworthiness’
- Are typically based on some kind of experiment

Flexible design research projects typically:

- Involves methods such as ethnography, action research, case study, or grounded theory
- Hybridisation or a number of methods is commonplace
- Generate qualitative data (although not necessarily *exclusively* qualitative data)
- Reply on a researchers’ ability to interpret information
- Can be adapted during the course of a project, if necessary

This project is certainly outside of the scope of a fixed design, but it could *also* be stretching the boundaries of flexible designs paradigms. The following discussions of various methodologies aims to illuminate this uncertainty, and provide grounding from which readers/viewers may confidently interrogate the rigorosity of the project’s conclusions in terms of methods, methodology and epistemology.

Case studies

Aspects of case study approaches seem particularly pertinent to the nature of this work. For example, this

project is concerned with a very specific case (the HighWire DTC) and case studies tend to collect their data in situ, studying the phenomenon in context [4][24]. Both characteristics exist in this project. However the fact that, with this project, the characteristics *emerged* (as opposed to being planned) is incongruent with the norms of case study design. One further factor is the consideration that “in one sense, all projects are case studies” [4]. As such this project *is* a case study, but given the substantive emergence of this project one could hardly say that the method or methodology adopted is case study methodology, at least not without considerable qualification.

Ethnography

In a similar vein to case study approaches, some aspects of the ethnographic tradition seem to have a good fit for this piece of research. Ethnographies tend to: gain an insider perspective to understand shared cultural/social meanings; feature interaction with the context; and the use of narrative to communicate findings [4]. Another point of interest is the generally accepted principle that ethnographies are timeless, without a specific end point, and usually do not have a rigid structure at the outset [30]. These points are pertinent in that they *do* exist in this project, and are in fact quite definitional features of how this project emerged. However, where this project clearly delineates itself as *not* being an ethnographic, is in the absence of any systematic data collection or record keeping: factors that are necessary for most ethnographic studies.

Although it appears clear cut that this study isn’t an ethnographic one, there is a crucial parallel between some elements of theories of ethnography, and the emergence of this project. Ethnographic studies can be explained in terms of ‘subtle realism’ as described by Hammersley [31] in *What’s wrong with ethnography?* The assumption is that knowledge can be explained in terms of uncertain beliefs. Validity, through confidence, is *likely* and does not depend on the demonstrability of empirics. The *aim* of research can, perfectly legitimately, be to represent an understanding of reality from a singular perspective. Precisely the same epistemic foundation underpins *this* project’s conclusions.

One final addition to the notes on ethnography, and that is the concept of auto-ethnography, which itself is very much related to narrative research (see below). Although elements of this project are auto-ethnographic, for the same reasons described vis-à-vis note taking and record keeping, this isn’t a purely auto-ethnographic study [32].

Grounded theory and action research

Both grounded theory (GT) and action research (AR) share a key similarity with the method employed for this project, they both take into account details as they emerge. Where AR demands that these emergent details inform ‘action’ (an intervention), GT instead leans towards a systematic approach to coding of data in order to arrive at a theory. Given the absence of quantifiable or codifiable data, GT isn’t an appropriate method for this

project. Similarly, because it would be far outside the scope of this project to even attempt an appropriate intervention, AR is not an appropriate method.

However, the acceptance and realisation of the value/benefits that can be garnered by changing a project's direction should not be underestimated. Accepting a degree of flux, and trusting that usable detail will emerge, takes a degree of trust. GT and AR are good examples that in practice these usable details invariably *do* emerge. This is an understanding that was embraced when allowing the details of this project to emerge.

Phenomenology

For some research designs, this project included, phenomenology is extremely attractive as it embraces the inseparability of researcher from their preconceptions, and therefore bias. By seeking to understand how the researcher views and experiences the world around them – witnessing the phenomena that occur and *experiencing it* – phenomenology attempts to incorporate this information into the research findings. However, taking a phenomenological approach is not an easy undertaking, the philosophies that underwrite the method are complex. Because of this researchers can easily misrepresent the theory [33] (as cited in [34]).

In healthcare research, researchers using flexible designs have a particularly difficult time as fixed/quantitative research designs are (particularly with medical trials) considered a 'gold standard'. Writing with respect to qualitative research in healthcare Sam Porter notes that "it is possible to jettison the baroque intricacies of high phenomenology and just use its simple basic assumptions, without any significant compromise to the integrity of research" and that "its essence is about trying to uncover, and possibly explain, people's experiences" [34]. It is that 'essence' of phenomenology, an acceptance of *subjective* experience, which will contribute to the methodological approach of this project.

Narrative research

We, researchers, inevitably end up narrating our own research, telling the 'story'. This is an assumption that narrative research leverages. The way in which this is done changes from discipline to discipline, and from project to project. Statistically centred projects will need to tell the story in terms of internal validity and chi-squared [35] (for example). Similarly, the data that informants, collaborators and interviewees contribute to a project that generates qualitative data are *their* stories. Narrative analysis ignores assumptions and aspirations of objectivity, but rather focuses on the opposite. Narrative analysis techniques focus on understanding *why* events or perceptions are connected, in order to arrive at a meaningful conclusion [36]. Although diametrically opposed to positivist schools of thought, this focus on and acceptance of subjectivity is precisely how narrative research derives its value [37].

Narrative plays a strong part in this project, although not in terms of narrative analysis per se. Use of narrative in this project is particularly helpful, by turning the findings

of the project into a story, it allows the reader/viewer to understand *why* those findings have merit and are rigorously researched. Given the way in which information was collected and data gathered – by living the experience - narrativising the project provides a window for what the moments described were really like to experience, and how/why they're significant to the findings.

What a mess

Thus far we have established that none of the methods touched upon above can, alone, be used to define this project's methodological stance. At the same time however elements of each *do* appear to make sense. The nature of this project, the fact it is attempting to comment on the challenges and opportunities of post disciplinary research, and attempting to do that with a post disciplinary approach, leads to a natural preoccupation with methods. This is not really surprising when you consider the disciplines that pervade academia, the methods associated with the disciplines, and even the publishing culture of the disciplines are all part of a complex eco-system. They are all related, thus by discussing the nature of post disciplinarity, you are also implicitly obliged to have some kind of opinion on these interrelated phenomena. In the film I refer to these factors as 'self-preserving giants', a choice of words that is intended to infer the deep-rootedness of the interrelations. In *Making a mess with method*, John Law eloquently describes this phenomenon quite succinctly. The paper takes a journey through empirical mess, goes into off-piste realism, takes a post-structuralist detour, while finally arriving at some quite tangible conclusions [38] – which I'll return to later.

In his book on the subject, *After Method: Mess in Social Science Research*, Law refers to 'method assemblages' in an attempt to connect the diversity of methods used (in social science research) to the theoretical complexities of interpreting the meanings of findings arrived at by using these methods. In other words how does practice, doing something, relate to understanding whether or not that practice is contributing to knowledge – Law argues that the suite of methods traditionally used by social science researchers aren't actually fit-for-purpose, but that his idea of method assemblages provide an alternative way of seeing methods. "They detect, resonate with, and amplify particular patterns of relations in the excessive and overwhelming fluxes of the real. This, then, is a definition of method assemblage: it is a combination of reality detector and reality amplifier" [39].

Assembling the 'method-menagerie'

The method employed for this project is an assemblage, in Law's terms. It takes elements of each of the methods reviewed above and puts them to work in order to detect and amplify the reality being studied, and it is within that reality that useful and interesting research observations emerge.

In order for the method assemblage used to really make sense, it will be essential to watch the film, and pay

particular attention to the changes in trajectory that this project went through to arrive at this destination.

This project uses a flexible research design. In practice the design of the project, including methods, methodology and even *aims*, was so flexible I prefer to refer to the design of this project as ‘extensible’ (as opposed to fixed, or flexible). In the case of this extensible design, it is also a retrospective design. This is the case because the realisation that I could use my own personal lived experiences as the basis of my research only became apparent in the midst of the actual experiences themselves (see film 10:01-11:00).

The design of this project is similar to that of a case study where the case is the HighWire DTC. The aim of the study is to expose the detail of challenges and opportunities of post disciplinary research at HighWire by conducting research in situ, at the centre. The adaptive and reflective features of action research and grounded theory were employed throughout in order to reassess both what and how the project could deliver. The focus on adaptation and reflection is a substantive feature of this method, and is best communicated by the meta narrative track in the film. Researcher immersion in the context is central to how meaning and rigour are derived; these elements are very much taken from the ethnographic tradition. The emphasis on *personal* immersion and experience in fact goes beyond the primarily observational paradigm generally utilised by ethnographers. It is because of the personal immersion that an appreciation of the value of phenomenology needs to be incorporated in the method assemblage constructed here.

Finally, narrative research has been employed to meet two purposes. Firstly as an efficient communication tool to convey both the sense of the method employed and also to provide an overview of the findings. The second use of narrative element was to inform my self, the researcher, as to what the *essence* of my argument is. By writing, recording, and then setting my narrative to visuals I gained a much deeper understanding of what the core of the message is, and how best to communicate it in more traditionally academic terms (i.e. for this written report) as well as through the film.

The method is an assemblage, made up from a set of reality detection devices, and reality amplification devices. This particular assemblage was emergent and unplanned. That emergence has tailored it towards its aim, to explore the challenges and opportunities of post disciplinary research at the HighWire DTC.

FINDINGS

The film element of the project is the primary method of communicating findings. However, because of the narrativised structure of those findings it is necessary to further elaborate on and in some cases link these conclusions to theory. This process adds an element of triangulation to the findings. As referred to previously the film conveys a duo of narratives, each of which addresses a distinct area of research. The meta narrative discusses

the barriers to, and opportunities of, post disciplinarity in general terms, while also laying the foundations for the infra narrative. The infra narrative argues for more acceptance (or indeed promotion) of subjectivity, ‘researcher as instrument’, and experience-led research, in post disciplinary contexts. Although the meta narrative certainly provides foundations for the infra narrative, the infra narrative also adds further depth to the arguments of the meta narrative: both tracks are mutually reinforcing.

Here I will present a list of findings. The findings will be discussed in this section to some degree, with further elaboration in the ‘Ways of Seeing’ section. The codes MN and IN signify which narrative track(s) the findings relate to (**Meta/Infra Narrative**). The time codes indicate which sections of the film argue or present each finding.

Disciplines are alive, well, and post disciplinarity actually makes them stronger (MN) (00:38-01:30)

Does the notion of post disciplinarity insinuate that disciplines are dead? It does not. In fact HighWire quite apart from being *beyond* disciplines is indelibly bound to three – computing, management, design. Every member of staff at HighWire is from one of these disciplines. Likewise every potential supervisor is from one of these disciplines. As such you could argue that HighWire is therefore ‘just another’ interdisciplinary school, but I do not think that is the case either. I use a metaphor in the film to say that HighWire fits inside the ‘negative spaces’ that surround the affiliated disciplines. I use negative space as a descriptor because it implies that HighWire students may well be interested in subjects on the periphery of the affiliated disciplines, and indeed may use those influential (but peripheral) sources of knowledge to inform their studies, and this is valuable. However that does not represent the entirety of post disciplinarity as HighWire intends it. For example, if you consider a more traditional, discipline-bound, research centre it would be absurd to assume that the scholars would totally ignore any thinking that was outside of their discipline. It might be the case they do not need it, but they would not deliberately ignore it because it was ‘foreign’. So how does HighWire differ?

I characterise it as being ‘super disciplinary’. HighWire is affiliated with these three disciplines, and every student is – by way of the MRes programme – is forced into being exposed to some of the traditions of each (of these three) disciplines. I believe that this is where the substantive difference lies: HighWire actively encourages its students to be exposed to the traditions of disciplines that are different from each student’s ‘home’ discipline. But why be restricted to these three disciplines? Although it is not an entirely clear-cut issue, *apparently* the main reason is to do with the accepted norms of both bids for funding from bodies like the RCUK and also to do with the bureaucratic and financial structures of universities. To give a practical example, an academic in a faculty that is *not* affiliated with HighWire may be the perfect person to supervise a particular PhD. However, they’re effectively barred from doing so, because they can’t access any of

the financial frameworks that support HighWire in the university.

In this way, on a very practical basis, HighWire does not transcend disciplinary boundaries. And although these constraints can be a hindrance, simultaneously it is true that the *spirit* of discipline transcendence does exist in HighWire.

Blackwell observed that the larger innovations, resulting from interdisciplinary working, usually require redefinition of organisational boundaries, and will rely on the creation of new processes [2].

Everybody plays to win (MN) (02:02-05:03)

Through my interest in research impacts [34][35], and the abortive attempt to construct *this* project around extending those ideas, I became acutely aware of common goals and patterns harboured by students and researchers in universities. My experiences came firstly through my paper-based studies for ‘Special Topics’ and secondly through first-hand experience while formulating the first version of this project. I refer to the structures that encourage and sustain these priorities as ‘self-preserving giants’ as they’re so entrenched and so powerful, that it seems the majority (of those involved in them) cannot imagine them changing, even if they’re aware of less-than-ideal situations that they believe *should* change.

The priorities that I’m concerned with are not exclusive to academics, but are in fact quite general to society as a whole. Most people want stability, job security, and to – by some measure at least – be successful. Throughout this research I’ve spoken with a very wide range of people, all referring to the ‘academic game’. It is a game steeped in tradition, and one where players need to tick the boxes allowing the establishment to accept you (‘accept’ could mean into a department, a journal, a conference, or a research group, et cetera). Occasionally rule-breakers do well (e.g. Mario Capecchi [42]) but the majority aren’t so brave, or are risk averse to the extent where playing by the rules is the best approach, logically. The game itself creates a few problems, one of the most pertinent ones is the fact that if in order to do well at the game – as the rules currently stand – you have to leave ideas of post disciplinarity and the associated (required) organisational change behind and elect instead to target a home discipline.

If the PhD students leaving centres like HighWire are to succeed while also embracing post disciplinary ethos of the centre, then the rules of the game need to change. A paradigm shift of sorts needs to occur, new organisational structures along with their supporting processes need to be implemented, and thus the rules of the game will change. It seems unlikely that the majority will turn, decide to stop playing to win. So in order to catalyse change the other approach is to change the rules of the game. However, until the ties between ‘success’ and disciplines are broken, the existing paradigm will prevail, and the *full* benefits of post disciplinarianism will remain elusive.

Academic research projects rarely state their values (MN, IN) (05:04-05:38)

It was necessary to include a brief mention of the detour into the realm of spirituality, religion and values, in the *film* for narrative purposes (despite the fact it is only *tentatively* related to the findings). The tentative relationship deserves recognition here too however, as it not only provided the tools necessary to conceive the final project design, but is also an interesting analysis device

For an introduction to the specific approach to values used refer to [34][35][36][46]. The impact of ‘values’ on the conception of the project design is primarily dealt with in the film, however I’ll address how values can be useful to interrogation tools here.

If we consider the previous finding, *Everybody plays to win*, then imagine trying to understand *why* people play the academic game that way is an extremely challenging task. I mentioned job security, stability, and ‘success’. These seem relatively simple constructs initially, although if you deconstruct them in terms of values, then a richer, more complex, picture is likely to emerge. Similarly if you consider the first finding *Disciplines are alive, well, and post disciplinarity actually makes them stronger* then it may prove enlightening to analyse how the actors involved in keeping disciplines alive formulate their actions, in terms of values.

I posit that the vast majority of academic endeavours aren’t explicit about their value positioning. This not only creates a degree of ambiguity in terms of the motivation behind a particular research project, but that it also plays a part in obscuring the value-action gaps that exude from entrenched disciplinary positions. These value-action gaps, specifically allowing them to remain unchallenged, contribute to factors that stifle the effectiveness of post disciplinary centres like HighWire.

Professors do not always know best (MN, IN) (06:15-09:55)

This finding is really a reverse-angle view of the *Everybody plays to win* finding. It is particularly useful however, because it is a ‘live’ example. At the Ubiquitous Computing Summer School (UBISS) I was placed into a group with four other post-graduate students, within a specific workshop, the workshop was run by Professors Kaisa Väänänen-Vainio-Mattila and Jonna Häkkinen. What became apparent very quickly was that (1) I was in a team whose members tended to defer to their seniors; (2) the majority of the team were accustomed to working in traditional and discipline-centric modes; and (3) the style the workshop was delivered in was deeply contrasted to the ‘sandpit’ and ‘deep-dive’ style facilitation [40][41] that I am accustomed to. The delivery felt one dimensional and didactic.

To be entirely clear, I should add at this point that all the members of my team at the workshop, and both of the professors running the work, are people I have the utmost respect for and enjoyed working with throughout. Any negative sentiment (either in this report or in the film) is

not personal, but is an artefact of the requirement to communicate these research findings transparently.

The observations that lead to the conclusion *Professors do not always know best* derive from noting how the three factors changed in relation to each other through the course of the workshop. Over the course of the week long project, the team collectively began to question how to interpret the didactic instructions. Deference to the professors reduced as the week went on, simultaneously the team became more creative, and more emotionally invested in the concept. As creativity and emotional investment grew, the quality of insight that the project delivered grew as well. The end result was that, in part by disregarding the professors “do not take it so seriously” sentiment (see film 08:30-09:55), the team submitted, and had accepted, a research paper for the UBIComp 2013 conference [49]. You could consider this finding, and this example of the finding, a manifestation of the ‘Professor paradox’ (see *What’s the significant of post disciplinarity?*).

Preoccupation with publication pervades (MN, IN) (10:55-12:20)

The ‘publish-or-perish’ culture of academia is no secret [45][46][47] and isn’t necessarily a bad thing in its own right. The observation I want to make to contribute to the findings of this project however, is that this preoccupation with publishing actually upholds the very organisational and institutional boundaries that appear to hinder attempts to capitalise on the value within post disciplinarity. Publishing culture is one of the ‘self-preserving giants’.

Publishing material, whether it is in a book, journal, at a conference or similar, is a useful and commendable endeavour. It has served the academy extremely well, and continues to do so. The nature of the question my observations illuminate however, is whether the omnipotent qualities of publishing paradigms should remain? By aggregating the findings of my meta narrative, the logical conclusion suggests that we should at least explore whether other modes of dissemination/communication could provide extra value, in terms of societal and economic impact. My conclusions are drawn from first hand observations, but you can also take a more theoretical perspective.

John Law postulates, “Can the ephemeral or the elusive be translated into and made present in textual form? Well, possibly so, but possibly not. It is a matter for debate, isn’t it? And the answer is bound to be: it depends”. Law then cites an example where he and his colleague Vicky Singleton made use of allegory to make sense of the inherently ‘messy’ situation they found themselves analysing. The point is that publication, in its traditional sense, is not always fit for purpose. Unsurprisingly this is particularly true for post disciplinary research. Law concludes:

“Realities are not flat. They are not consistent, coherent and definite. Our research methods necessarily fail. Aporias are definite and singular. But it is time to move

on from the long rear-guard action which insists that reality is definite and singular. The long rear-guard action conducted in many locations including what counts as good social science method. ‘There is more in heaven and earth, Horatio, than is dreamed of in your philosophy.’ We need new philosophies new disciplines of research.” [38]

Although Law is speaking in terms of method, rather than publication paradigms, precisely the same theory and logic *can* be applied to critique publication-centric culture.

In my own work on impact metrics I provide an analysis of how problematic the role impact metrics is [40]. I then develop that work to argue that the inability of traditional metrics to take account of the value in resultant Communities of Practice, exemplifies flawed aspects to publication paradigms, and how those aspects may inhibit innovation [41].

To recapitulate the core points of this finding, within the self-preserving power structures in the academic ecosystem, a preoccupation with publishing pervades. The evidence suggests that in general, and in particular as it relates to post disciplinary research, this is not a useful position to be in.

Stories are powerful and under represented in academic venues (IN) (12:25-14:01)

The fact that post disciplinary research inherently relies on communicating across boundaries, whether those boundaries exist within a research group, institution, or in the academy per se, means that effective communication stratagem are critical.

Of the ~50m academic publications in existence [53] *very few* exhibit any element of story telling for story telling’s sake, where the person telling the story is the researcher deliberately embracing narrative. This may, in part, be related to the “ghostly” lingering of positivist traditions [4]. Stories however are extremely powerful tools, a point that exemplified by using stories to understand issues and to produce better designs in the, extremely positivist-centric, discipline that is healthcare [49][50].

The ‘narrative paradigm’, as described by Walter Fisher, argues the importance of stories so far as that it suggests all forms of communication are, in some way narrativised [51][52]. There is no better example of the power of narrative than looking at religions. Allain du Botton argues that our secular society can almost certainly benefit from studying how religious movements have successfully maintained themselves for many hundreds of years [58] by using, in the form of religious texts, *stories*.

Multi-media communication is an underutilised resource (IN) (13:24-14:30)

Although there *are* examples of academic venues that ask for submissions that include, for example, video [59][60] – the primary method of disseminating academic findings is still text. Also if you consider the importance of publishing in venues that have high impact factors, those at the top of the ranking invariably *only* accept textual

submissions [40]. This finding builds from these assumptions, and when considered alongside the previous finding, concludes that multi-media communication modes are underutilised in general, and tools for communicating stories.

You might liken the near absence of multi-media communications in the majority of academic venues to the contrast between Web 1.0 and Web 2.0. Theoretically you can represent all of the information and knowledge held within the dynamic ecosystem of the modern, media rich, web, through text. However in reality it is far more efficient and more practical to embrace and utilise the richness of modern technology and impart knowledge through all the media that are available, whether that be sound, text, imagery, metaphor, poetry, sculpture, et cetera. N.B. the question of whether holding information describing publications semantically is an interesting question in its own right, but beyond the scope of this report [39][60].

Between *Preoccupation with publication pervades, Stores are powerful and under represented in academic venues,* and *Multi-media communication is an underutilised resource* – the three findings form a multi-dimensional commentary on the way the academy communicates with itself, and with those outside its shifting boundaries.

Always ask yourself why not be like water, why not embrace subjectivity? (MN, IN) (16:00-17:50)

This finding is somewhat paradoxical, and is the conclusion of this section of the report. The paradox stems from the fact that this project itself is the primary basis for positing these findings. This particular finding is derived from reflection on the process of arriving at, and the actual content of the other findings. The related section of the film is the concluding passage (16:00-20:00).

All aspects of this project have emerged, and at the outset of the summer project there would have been no way of predicting this end point. In spite of this apparently chaotic structure I believe the conclusions and methods used to arrive at them are enlightening, rigorous, and valuable. It is however difficult to persuade oneself to ‘be like water’ (famously said by Bruce Lee) and allow subjective intuition to direct one’s enquiry. It is even harder to persuade mentors, team members or other stakeholders that this is a good idea. I’ve been fortunate that HighWire is such a venue, and my supervisor Dr. Lynne Blair is such an academic, that working in this way has been acceptable. The concept of flow may well describe this phenomenon. Csikszentmihalyi describes how flow can focus and energise individuals, harnessing an emotional state [56][57], this is something that I capitalised on after stumbling across it serendipitously, and in this case it appeared as if sleep deprivation was a factor in experiencing it (described in the film at 10:00-10:38).

Blackwell’s study into interdisciplinary working describes a feature of successful interdisciplinary

working being the culture “organised surprise”, agreeing to “plan for something one is not expecting” and concludes, “This is a central finding of our research, and one that has not been emphasised sufficiently in previous research” [2].

A further complication, and relevant to the findings of this project, is that if you do embrace the concept of ‘being like water’ then you’re being inherently subjective. You do what you want to do, at any given time, because that specific action *feels* like the right thing to do. Furthermore if you do this, you will inherently become so close to the research that you may be *too* close, close enough to bias it in some way. Of course doing ‘what you feel like’ and getting so intimately involved such that you bias findings, would be an absurd manifesto to present for *all* research *all* of the time, and my argument is not so blunt. If you recognise the benefits in planning for the unexpected, and in utilising (or intentionally incorporating) constructs like flow, then it is impossible to escape the subjectivity of emotionally informed decisions. The methodological stance that this project adopts, goes some way to presenting an argument for legitimising this unavoidable subjective element.

This finding is central to the argument presented in the infra narrative, but should also be considered in terms of the meta narrative. If we assume that there is value in incorporating experience, emotions, flow and all things subjective into *some* research *some* of the time, it is certainly worth considering what the barriers to that are. It seems likely that the ‘self-preserving giants’ would present similar challenges to that of a post disciplinary shift. As such these two tracks of narrated argumentation converge at this point.

WAYS OF SEEING

The title of this section is with reference to John Berger’s 1972 four part television series and book, of the same name [64]. In it Berger discusses the many different ways we see the world through art, I would like to achieve the same thing with this section, and discuss different ways of seeing the findings of this project, in terms of other fields of interest.

Berger begins the first in the series of programmes by introducing a concept that is more hidden than you might imagine: our ways of seeing aren’t as spontaneous as they feel, but are largely based on habitual behaviour, and tradition. The same is true for how academics and researchers view research, whether looking at research that is from their home discipline, or outside of it. Secondly Berger discusses the prevalence of perspective as a tool for representing reality in European art from the 15th to 19th centuries. The vast majority of artists used their notion of perspective as the primary means of conveying reality. This seems consonant with the traditions of academia, seeing primarily textual (and formerly positivist) ways of conveying research as ‘the way to do it’. In the case of 19th century art, these ideas were dramatically challenged by the advent of the camera. Suddenly reality could be ‘captured’ without needing an artist to interpret perspective, this caused a

sudden readdressing of how people see the world. You could abstract this process as it happened to painting, and apply it to the academic world in terms of the information revolution. A sea change of interpretative method was required to comprehend how the camera influenced the way people see the world, so maybe a sea change of interpretative method is required for academia too.

A final note on Berger pertains to the distortion of reproduction. It is true that reproducing *anything* with *any* medium will undoubtedly distort it somehow (I'll refrain from going down the Heisenberg rabbit hole, although it is almost certainly relevant). But how does this relate to this study of post disciplinarity? I suggest that this could be yet another way of arguing for the inclusion of subjective accounts in academia. If any reproduction distorts, and what we are looking for is the purest form of meaning, then maybe we should tailor our reproduction (or publishing) methods such that they distort the least. To what extent writing in traditionally academic language, and publishing in traditionally academic ways, distorts the 'reality' of research is not clear, but maybe it is worth asking the question.

The analogies between Berger's discussion on art itself, and this project's study are quite abstract; this is deliberate, and it is within that abstraction that additional enlightening insights could emerge.

Value sensitive and participatory design

Pommeranz et al. discuss the use of value sensitive design (VSD) as a means to incorporate elements of situated values – that is values pertaining to the circumstance they're describing – in order to arrive at better informed design decisions [5]. In terms of my supposition that research projects rarely consider their own situated values, VSD frameworks may be a useful means with which to introduce these through using VSD techniques to design research projects themselves.

Borning and Muller consider the voice of the participants and the voice of the researcher, and argue the importance of both voices. One pitfall they discuss is the risk that "everyone is capable of unintentional, well-meaning ventriloquism", an idea that resonates with my finding that a preoccupation with publication pervades, in part because everybody plays to win. In the same paper Borning and Muller also observe that "In many instances it may be useful for the reader if the researcher is more visible in the writing – what is his or her background, relation to the participants in the study, and perhaps even relevant personal values?" [6]. This second observation seems to support my finding that a subjective turn may in fact provide more insight, rather than less. As I refer to in the film (13:55-14:00), can a decrease in objectivity foster an increase in tangibility?

The ethos of participatory design (PD) may provide some further insights into how to understand the nature of post disciplinarianism. In *Participatory Design: The Third Space in HCI*, Muller and Druin work on the assumption that "third space, is a fertile environment in which participants can combine diverse knowledge into new

insights and plans for action" and that "Important attributes of third space experiences include challenging assumptions, learning reciprocally, and creating new ideas, which emerge through negotiation and co-creation of identities, working languages, understandings, and relationships" [8]. PD aims to act against a mutual ignorance between designers and users, you could extrapolate this concept to describe post disciplinary researchers and their relationships with more established academics. Having done so it would then be feasible to look to the PD frameworks, usually employed for design projects, as a way to subvert academia so as to promote a move towards the more fluid organisational boundaries required to fertilise post disciplinary research. "One of us wrote about the need for translation among the co-equal worlds of users and of software professionals, and the need to foster a polyvocal polity in which these various interested parties could co-construct new concepts, meanings, and alliances" [8].

Incidentally the title of this project, *Add Researchers and Stir*, is related to the introductory passage from *Participatory Design: The third space in HCI*. The authors are referring to a discussion on feminism. In that scenario the idea was that you can't simply 'add women and stir'. In PD you cannot simply 'add users and stir'. I argue that post disciplinarity goes far beyond simply deciding to 'add researchers and stir'.

In my view PD and VSD offer excellent lenses through which the challenges facing post disciplinary success can be strategically assessed, and addressed.

Design documentaries, prototyping and lo-fi approaches

Raijmakers et al., explore the application of documentary film making to user-study based interaction design. They discuss a range of approaches, and observe some interesting characteristics of the technique. For instance, they note that the fact that the rich reality embodied in the films come together to form a distinct dialectic, and subsequently highlight the contrasts between the reality being filmed and the perspective of the film maker [9]. This phenomenon is employed by this project, partly as a communications device but primarily as a self-reflection tool while conducting the research and producing the outputs. Raijmakers also notes that an important quality of (design) documentaries is their ability to "preserve the ambiguous and paradoxical qualities of everyday life" and therefore help to sustain the "idiosyncratic, inconsistent behaviour of people in everyday life" in design processes. I suggest that this same quality can be applied to the use of documentary film in both the design and dissemination of academic research. The interest in preserving the ephemerality of the messy world we live in also resonates with Law's conjecture on messy methods [31][32].

The concept of lo-fi prototyping has been around for some time now, originally emerging in the 1990s as a technique to design computer 'desktops' and user interfaces [58][59]. Lo-fi has become increasingly common, particularly for projects working with ideas of

user centricity and participation [10][60], but is quite focussed to HCI studies, in particular interaction and user-experience design.

Prototyping itself is a powerful concept. Former general manager of IDEO, Tom Kelley, details many examples of how prototyping has transformed different design challenges. He says you can prototype for any situation, designing products to services, and anything in between. An interesting analogy is used that describes a rising water level, “if you do not act soon, you – or your project – will be underwater. There probably isn’t time to do things the regular way” [11]. Kelley talks about how Amazon founder Jeff Bezos embraced the spirit of prototyping, including “making on-the-fly decisions in parallel” – very much as I did with this project, and why it was so emergent. Prototyping was key to Watson and Crick understanding the structure of DNA for the first time, in Kelley’s terms they ‘made their luck’, by trying out lots of different things. Prototyping is useful not only for ‘engineering’ a good solution, but is also a key communication tool to get others to understand the value of an idea, “at IDEO, we’ve found that a good prototype is worth a thousand pictures. Somehow, you up the data rate” [11]. Prototyping allows for an on-going incremental review of progress, making sure that ideas do not go too far down dead-ends. A final factor that Kelley talks about the ability to use prototypes for large projects, even at the level of the federal government (with respect to renaming the Golden Gate National Recreational Area). Kelley explains that how, in order to access the benefits of prototyping, even governments can break the rules, upset traditions, and when they have, they reap the rewards.

I have brought these three distinct, yet possibly complimentary, areas of interest together as I think they have some cross over, and have a common ability to address some of the challenges to post disciplinarity that this project has uncovered. Using documentaries and film adds richness to communication, it allows a reality that is hard to express to be conveyed, and can also be an invaluable tool for researcher introspection and reflection. Although low in fidelity, lo-fi isn’t low in usefulness. Lo-fi allows for rapid prototyping to happen, and means that boundary objects can be developed extremely quickly, these objects can be used for communicating ideas, and also for further developing ideas. Finally the breadth in the value of prototyping is immense, and that those benefits can be garnered in virtually any situation for any discipline. I believe that these techniques should be spread and accepted into all corners of academia, and that post disciplinary research is the way to tell the story of how that could, and why it should, happen. Flexible management approaches, such as *Speedplay*, go some way to exploring organisational structures that could support this kind of approach to research [3]. Documentaries, film, lo-fi approaches, and prototyping are perfect tools for ‘seeing’ and *communicating* this landscape.

Experience (based) design

Here I want to consider two approaches to constructing designs. One approach - PLEX - uses playful experiences as a tool for generating ideas and communicating them [16], the other considers building prototypes but only being concerned with how the prototype manifests itself in terms of *experience* [15]. I’m not particularly concerned with the specifics of the PLEX method or the concrete ideas of experience design, rather with the fact that both approaches accept the intangibility of ‘experience’ and attempt to leverage it.

With respect to experience prototyping, Buchenau and Suri conclude “Experience Prototyping can provide inspiration, confirmation or rejection of ideas based upon the quality of experience they engender” and that “In communication of issues and ideas: by enabling others to engage directly in a proposed new experience it provides a common ground for establishing a shared point of view” [15]. These findings appear to legitimise the use of the intangible essence of ‘an experience’ in order to enhance communication, and provide insight. Could this be used as a tool for viewing the challenges facing post disciplinary research, for communicating those challenges, and finding solutions? PLEX cards use similar principles to provide a succinct method for capitalising on just these characteristics of experience prototyping, so may provide a framework with which to explore the question.

Design for sustainability

Writing on designing for sustainability, Stuart Walker discusses how an awareness of the inner self is essential to make well informed design decisions:

“If inner development and spiritual growth are key to deeper understandings of sustainability, these aspects simply cannot be effectively addressed or expressed via techniques that rely solely on intellectual argument, data acquisition, and analysis. Outer knowledge that is concerned with utilitarian needs and acting in the world has to be complemented with inner knowledge, and being rather than doing or having” [17]

This sentiment is echoed in Bran Knowles’ paper *Re-Imagining Persuasion: Designing for Self-Transcendence*, where she presents a value-based analysis of green computing initiatives. The paper argues that despite *saying* they are ‘green’ projects, the values analysis suggests otherwise [65].

These value aware, and even spiritually aware, approaches provide insightful lenses for seeing the challenges to post disciplinarianism, and also provide an alternate perspective on how to integrate subjectivity, through an ‘inner knowledge’, into academic work. By interrogating each of the findings presented in this paper, through the value aware frameworks, it may be possible to arrive at a post disciplinary analysis of ‘super disciplinary’ problems.

CONCLUSIONS AND NEXT STEPS

This report and the accompanying film have provided a unique insight into the challenges and opportunities facing post disciplinary research centres, such as the HighWire DTC. The communication media, style, and methodology aim to embrace the post disciplinary ethos that the research itself is describing. Because of this, yet another paradoxical feature creeps into the conclusions: the conclusions themselves, are in fact attempting to test the hypothesis that they're positing.

The rhetoric within this report asks as many questions as it presents concrete conclusions; however, the report has been structured around this fact deliberately. The discussion of methods should provoke thought around how to assemble methods, which are virtually all products of traditional disciplines, so that they're fit for purpose in post disciplinary contexts. The findings themselves, plus the way they're conveyed through a duality of this textual report, and the accompanying metaphor-laden film, are intentionally provocative, and build from the 'retrospective extensible design' described in the methods section. Finally the 'Ways of Seeing' section is intended to inspire different perspectives on the findings, as well as acknowledging their limitations.

Next steps

Deciding how to progress this line of enquiry, given the breadth of the subject matter, is a challenge. Complicating this is the consideration that HighWire itself probably has a limited lifetime, and has not received a second round of funding – as things stand it appears that HighWire will support five cohorts of students through four years of study each, but after that the future for HighWire is uncertain. Finally, finding people motivated to pursue this line of enquiry, particularly doing it using post disciplinary approaches, may be a challenge: for career minded researchers it would be hard to justify.

There are two different trajectories for continuing work, which relate to the two narrative tracks used throughout the project. Firstly the meta narrative, the broader, high level findings concerned with the nature of post disciplinaryity. For this track, the most practical step to progress the research is probably in validation and triangulation. The theories and epistemology on which the emergent and subjective nature of my conclusions are built appears sound; however, it would take a naive mind to assume that because they *appear* sound, that they actually *are* sound. Conducting systematic analyses of the individual findings within this paper, informing the design of empirical studies to support or disprove them, would be good next steps and embraces a traditional approach to furthering knowledge. An alternative approach could explore using these findings to lobby for greater autonomy from power structures based upon these arguments, and to try to establish the foundations of an even more radical post disciplinary movement.

The second trajectory, following the infra narrative track, is more manageable and could, conceivably, become the subject for further study at Masters or PhD level. Once again, in order to make the suppositions and arguments

presented by this project more palatable to the majority, traditional approaches to validating and triangulating the arguments are necessary. There remains available the contrasting approach here too: as opposed to evidence for evidence's sake, it is conceivable to take the 'proof by doing' approach that has been somewhat embraced by this work, and is a viable approach in a few research venues, for instance HighWire.

Across the whole spectrum of conclusions presented here, and for the potential next steps, a substantive issue appears to be the 'Professor paradox' problem. You can't, convincingly, argue the case for post disciplinaryity from the perspective of any given discipline. At the same time, due to the 'jack of all trades' problem it seems few young researchers would be motivated to make this the subject of their research. Research that could begin to uncover solutions to those considerable barriers would be invaluable.

Concluding remarks

To echo the sentiment of the film's closing words, the finest examples of culture are all born from their creators' emotions, and derive value by affecting their audience. My research, detailed in this report, and the accompanying film, concludes that if the same were true in centres like HighWire then outcomes would improve, and the value of post disciplinaryity would blossom. I hope that I've affected you such that you'll consider these suppositions. And I hope that as a national and global society we can deliver HighWire's promise of creating innovative people for radical change. It seems to me that there is an appetite for finding more efficient, more radical, and more impactful ways to capitalise on research. What is of utmost importance is finding ways of communicating how to do that.

The film concludes with a set of quotes, and I'll finish this report with the same set of quotes. I have provided some annotation to explain the relevance of each quote, and why it was included in the film/report.

***"A fool thinks himself wise, but a wise man knows himself to be a fool"* – William Shakespeare.**

Shakespeare's sentiment I interpret as a constant reminder to reflect, anyone considered an expert in his or her field should heed this quote.

***"The answer my friend, is blowing in the wind"* – Bob Dylan.**

A reminder that answers aren't always in obvious places. Putting faith in the natural rules of chaos is, in fact, the best path to furthering knowledge, and understanding. Although it is impossible to predict, chaos is one of few certainties.

***"I'm right and you're wrong, I'm big and you're small, and there's nothing you can do about it"* – Roald Dahl.**

This speech is delivered from the wayward father of Dahl's character, Matilda. It is a reminder that those in powerful situations, in this case Matilda's father, are not

always correct just because they wield the power. Power structures should be challenged and questioned.

“I’m a gay pastry. And a racist cappuccino” – Chilly Gonzales.

Gonzales is a musician, combining rap, hip-hop, virtuosic piano skills, and dance music. This quote is taken from a song describing Europe in terms of a series of nonsensical and absurd metaphors. Gonzales is, in fact, a Euro-phile (despite being a US citizen). This quote is a reminder that metaphor, abstraction, and that which may appear absurd, can in fact harbour a greater meaning than first thought.

“The path of the righteous man is beset on all sides by the inequities of the selfish and the tyranny of evil men” – Pulp Fiction / The Bible

This quote, famously used in the Tarantino film Pulp Fiction but taken from Ezekiel 25:17, serves two purposes. Firstly as a reminder that appropriations, taking one concept and applying it elsewhere, is an invaluable tool for discovering and communicating. Secondly, that we do not live in a perfect world, that ‘right thinking’ is in a constant battle with other factors. To achieve ‘right’ action, consideration needs to be given to the other side of the coin.

“So long, and thanks for all the fish” – Douglas Adams.

This quote refers to the last ever message from dolphins to man, when they left the Earth shortly before it was destroyed to make way for an interstellar bypass (see [66]). The reason for including it, is that it not only embodies the notion of ending, but also that in the novel it had been the case that dolphins *knew* the earth was about to be destroyed for some time. Unfortunately man – the human race – wasn’t intelligent enough to interpret the dolphins’ apparently playful squeaks and jumps as a message at all. I used this as a way of describing the entrenched traditions of academia, and the deeper meanings that post disciplinarity and experience-based subjectivity can bring to into focus. It might be that traditional academia (‘the human race’) just needs to listen to dolphins (‘post disciplinarity with subjectivity’) in order to understand how to deal with the world’s wickedly pervasive problems.

ACKNOWLEDGEMENTS

I’m grateful to many acquaintances, friends, peers, mentors and advisors, as I’m acutely aware that the emergence of the project, my investment in it, and my ability to complete it, are all owed to my contact with others. Thank you for your support:

Everybody at the HighWire DTC.

Everybody who appeared in the film.

Everybody from the Ubiquitous Computing Summer School, but especially: Anna Maria, Jonna, Jorge, Kaisa, Matias, Minna, Shruti, Simo, Stella and Timo.

Extra special thanks to: Dhruv Sharma, Gordon Blair, Graham Dean, Louise Mullagh, Maria Angela Ferrario,

Owen Dowset, Patrick Stacey, Paul Ralph, Robert Potts, Satya Savitsky, ‘Pigoletta’, and my family.

And finally, thank you to Dr Lynne Blair, for both having the patience, and goodness of heart to tolerate my indecisiveness and constantly changing direction. Thank you for helping me to understand how to focus my ideas into something that is – hopefully – communicable and insightful. Thank you for being kind, warm, constantly friendly and supporting, and most of all for enlightening me on all kinds of subjects. Gratitude to you, Lynne!

REFERENCES

- [1] “UKRC: Digital Economy Programme.” [Online]. Available: <http://www.rcuk.ac.uk/research/xrcprogrammes/Digital/Pages/home.aspx>. [Accessed: 26-Aug-2013].
- [2] A. Blackwell, L. Wilson, C. Boulton, and J. Knell, “Creating value across boundaries,” 2010.
- [3] M. A. Ferrario, W. Simm, and J. Whittle, “Speedplay , Managing the Other Edge of Innovation,” 2013.
- [4] C. Robson, “Real World Research: Flexible Designs,” 3rd Editio., London: Wiley, 2011, pp. 131–160.
- [5] A. Pommeranz, C. Detweiler, P. Wiggers, and C. Jonker, “Elicitation of situated values: need for tools to help stakeholders and designers to reflect and communicate,” *Ethics and Information Technology*, vol. 14, no. 4, pp. 285–303, Nov. 2011.
- [6] A. Borning and M. Muller, “Next steps for value sensitive design,” *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems - CHI '12*, p. 1125, 2012.
- [7] C. Le Dantec, E. Poole, and S. Wyche, “Values as lived experience: evolving value sensitive design in support of value discovery,” *Proceedings of the SIGCHI ...*, 2009.
- [8] M. J. Muller and A. Druin, *Participatory Design : The Third Space in HCI*, vol. 4235. Cambridge, Massachusetts: IBM Research.
- [9] B. Raijmakers, W. Gaver, and J. Bishay, “Design documentaries: inspiring design research through documentary film,” *Proceedings of the 6th conference on Designing Interactive systems*, pp. 229–238, 2006.
- [10] J. Rick, P. Francois, B. Fields, and R. Fleck, “Lo-fi prototyping to design interactive-tabletop applications for children,” *IDC '10 Proceedings of the 9th International Conference on Interaction Design and Children*, pp. 138–146, 2010.

- [11] T. Kelley, "Prototyping is the shorthand of innovation," *Design Management Journal (Former Series)*, no. 617, 2001.
- [12] J. Rudd, K. Stern, and S. Isensee, "Low vs High-fidelity prototyping debate," *Interactions*, 1996.
- [13] M. Rettig, "Prototyping for tiny fingers," *Communications of the ACM*, 1994.
- [14] D. Svanaes and G. Seland, "Putting the users center stage: role playing and low-fi prototyping enable end users to design mobile systems," *Proceedings of CHI 2004*, vol. 6, no. 1, pp. 479–486, 2004.
- [15] M. Buchenau and J. F. Suri, "Experience prototyping," *Proceedings of the conference on Designing interactive systems processes, practices, methods, and techniques - DIS '00*, pp. 424–433, 2000.
- [16] A. Lucero, "PLEX Cards: A Source of Inspiration When Designing for Playfulness," in *Fun and Games '10 Proceedings of the 3rd International Conference on Fun and Games*, 2010, pp. 28–37.
- [17] S. Walker, "Imagination's Promise: Practice-Based Design, Research for Sustainability," in in *The Handbook for Design Sustainability*, S. Walker and J. Giard, Eds. London & New York: Bloomsbury, 2013, pp. 460–461.
- [18] S. Walker, *The spirit of design: objects, environment and meaning*. London: Earthscan, 2011.
- [19] B. Richards, S. Walker, and L. Blair, "Cyber-sustainability: leaving a lasting legacy of human wellbeing," *Proceedings of the 25th BCS Conference on Human-Computer Interaction*, pp. 1–6, 2011.
- [20] "Course: 12/13: HIGH400: Applied Innovation [1]." [Online]. Available: <https://modules.lancs.ac.uk/course/view.php?id=821>. [Accessed: 27-Aug-2013].
- [21] C. Robson, "Real World Research: Glossary of terms," 3rd Editio., London: Wiley, 2011, p. 528.
- [22] C. Alexander, *A Pattern Language: Towns, Buildings, Construction*. New York: Oxford University Press, 1977.
- [23] D. Schuler, *Liberating Voices: A Pattern Language for Communication Revolution*. Cambridge, Massachusetts and London, England: The MIT Press, 2008.
- [24] M. F. Weigold, "Communicating Science: A Review of the Literature," *Science Communication*, vol. 23, no. 2, pp. 164–193, Dec. 2001.
- [25] "Wikipedia article on academic disciplines ('Variations' section)." [Online]. Available: [http://en.wikipedia.org/wiki/Discipline_\(academia\)#Variations](http://en.wikipedia.org/wiki/Discipline_(academia)#Variations). [Accessed: 27-Aug-2013].
- [26] M. Buscher and L. Cruickshank, "Designing Cultures: Post-disciplinary practices," no. April, pp. 1–5, 2009.
- [27] B. Jessop and N.-L. Sum, "Pre-disciplinary and Post-disciplinary Perspectives," *New Political Economy*, vol. 6, no. 1, pp. 89–101, Mar. 2001.
- [28] T. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*. Chichester, UK: Princeton University Press, 1995.
- [29] R. Yin, *Case Study Research*, 4th Editio. London: Sage, 2009.
- [30] W. Trochim, "Qualitative Approaches." [Online]. Available: <http://www.socialresearchmethods.net/kb/qualapp.php>. [Accessed: 28-Aug-2013].
- [31] M. Hammersley, *What's wrong with ethnography?* New York: Routledge, 1992, pp. 50–54.
- [32] B. Roberts, *Biographical Research*. Buckingham: Open University Press, 2002.
- [33] J. Paley, "Misinterpretive phenomenology: Heidegger, ontology and nursing research.," *Journal of advanced nursing*, vol. 27, no. 4, pp. 817–24, Apr. 1998.
- [34] S. Porter, "Nursing research and the cults of phenomenology," *Journal of Research in Nursing*, vol. 13, no. 4, pp. 267–268, Jul. 2008.
- [35] E. B. Wilson and M. M. Hilferty, "The distribution of chi-squared," *Proc. Natl. Acad. Sci. USA*, vol. 17, no. 12, pp. 684 – 688, 1931.
- [36] C. K. Riessman, "Analysis of Personal Narratives," J. Gubrium and J. Holstein, Eds. London: Sage, 2000.
- [37] Multiple, *Interpreting Women's Lives*. Indian University Press, 1989, p. 263.
- [38] J. Law, "Making a mess with method," *Published online*, 2003.
- [39] J. Law, *After Method: Mess in Social Science Research*. London & New York: Routledge, 2004.
- [40] J. Lindley, "Impact Metrics: There are Lies, damned lies, and statistics," *MRes contribution*, 2013. [Online]. Available: <http://joesart.org/wp-content/uploads/2012/10/JL-High403-Lies-Damned-Lies-Statistics.pdf>. [Accessed: 22-Apr-2013].
- [41] J. Lindley, "Communities of Impact," *MRes contribution*, 2013. [Online]. Available: <http://communitiesofimpact.joesart.org/wp->

- content/uploads/2013/04/JL-HIGH401-Special-Topics-Position-Paper.pdf.
- [42] “‘Hotpants vs Knockout Mouse’ feat. Quad Bumlines (Sustainability Remix) | joesart.org.” [Online]. Available: <http://joesart.org/2013/01/28/hotpants-vs-knockout-mouse-feat-quad-bumlines-sustainability-remix/>. [Accessed: 02-Sep-2013].
- [43] S. Shalom H. and B. Wolfgang, “Toward a universal psychological structure of human values,” *Journal of Personality and Social Psychology*, vol. 53, no. 3, pp. 550–562, 1987.
- [44] S. Schwartz, “A proposal for measuring value orientations across nations,” *The Hebrew University of Jerusalem*, pp. 259–319, 2003.
- [45] S. H. Schwartz, “An Overview of the Schwartz Theory of Basic Values An Overview of the Schwartz Theory of Basic Values,” *Online Readings in Psychology and Culture*, vol. 2, no. 1, pp. 1–20, 2012.
- [46] T. Holmes, E. Blackmore, R. Hawkins, and T. Wakeford, *The Common Cause Handbook*. Public Interest Research Centre, 2011.
- [47] “Creative Exchange, creative facilitators for organisational team and personal development, learning and innovation.” [Online]. Available: <http://creativeexchange.co.uk/>. [Accessed: 29-Aug-2013].
- [48] “Knowinnovation (EPSRC sandpit specialists).” [Online]. Available: <http://knowinnovation.com/>. [Accessed: 29-Aug-2013].
- [49] M. Pakanen, A. M. Polli, S. Lee, J. Lindley, and J. Goncalves, “Tending a Virtual Garden: Exploring Connectivity between Cities,” in *UbiComp '13 Adjunct*, 2013.
- [50] C. Jaensch, “Why Submit? Why Publish? Why Review?,” *The Essex Student Journal*.
- [51] S. Harnad and T. Brody, “Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals,” *D-Lib Magazine*, vol. 10, no. 6, 2004.
- [52] E. Garfield, “How to Use Citation Analysis for Faculty Evaluations , and When Is It Relevant?,” *Essays of an Information Scientist*, vol. 6, pp. 354–362, 1983.
- [53] A. E. Jinha, “Article 50 million: an estimate of the number of scholarly articles in existence,” *Learned Publishing*, vol. 23, no. 3, pp. 258–263, Jul. 2010.
- [54] T. Greenhalgh and T. Wengraf, “Collecting stories: is it research? Is it good research? Preliminary guidance based on a Delphi study,” *Medical education*, vol. 42, no. 3, pp. 242–7, Mar. 2008.
- [55] P. M. Wilcock, G. C. S. Brown, J. Bateson, J. Carver, and S. Machin, “Using patient stories to inspire quality improvement within the NHS Modernization Agency collaborative programmes,” *Journal of clinical nursing*, vol. 12, no. 3, pp. 422–30, May 2003.
- [56] W. Fisher, “Narration as a Human Communication Paradigm,” *Communication Monographs*, vol. 51, 1984.
- [57] W. Fisher, “The Narrative Paradigm: An Elaboration,” *Communications Monographs*, vol. 52, pp. 348–367, 1985.
- [58] A. Du Botton, “After God: What can atheists learn from believers?,” *New Statesman Magazine*, 2013. [Online]. Available: <http://www.newstatesman.com/culture/culture/2013/03/after-god-what-can-atheists-learn-believers>. [Accessed: 28-Jun-2013].
- [59] “Video Showcase : Call for Participation | CHI 2014.” [Online]. Available: <http://chi2014.acm.org/authors/video-showcase>. [Accessed: 30-Aug-2013].
- [60] “Shay David: Academia 3.0: The Convergence of Mobile and Video Technology.” [Online]. Available: http://www.huffingtonpost.com/shay-david/academia-30-the-convergen_b_2869081.html. [Accessed: 30-Aug-2013].
- [61] J. Lindley, “Funding Proposal,” *MRes contribution*. 2013.
- [62] M. Csikszentmihalyi, “Finding flow,” *Psychology Today*, 2007.
- [63] J. Nakamura and M. Csikszentmihalyi, “The Concept of Flow,” in *Handbook of Positive Psychology*, Oxford University Press, 2001, pp. 89–105.
- [64] J. Berger, S. Blomberg, C. Fox, M. Dibb, and Ri. Hollis, *Ways of Seeing*. London: British Broadcasting Corporation and Penguin, 1972.
- [65] B. Knowles, “Re-imagining persuasion: designing for self-transcendence,” *CHI'13 Extended Abstracts on Human Factors in ...*, pp. 2713–2718, 2013.
- [66] D. Adams, *The Hitchhikers Guide to the Galaxy*. London: Macmillan, 1979.
- [67] J. Owen-Smith, “From separate systems to a hybrid order: accumulative advantage across public and private science at Research One universities,” *Research Policy*, vol. 32, no. 6, pp. 1081–1104, Jun. 2003.
- [68] “Breakfast Flaws - Joe Galen’s music - WeeklyBeats.com.” [Online]. Available: <http://weeklybeats.com/joe+galen/music/breakfast-flaws>. [Accessed: 03-Sep-2013].

APPENDICES

Appendix 1: Table of metaphors

<p>00:22-00:38</p> <p>Opening sequence, a series of abstract images that are meant to signify personal changes in my life related to starting the HighWire programme. Introduces the Makie doll – the doll was central to my first HighWire project - which returns at various points in the film, it can be seen as an avatar.</p>
<p>00:51-01:15</p> <p>A sequence of material primarily taken from the digital economy programme summer conference, the videos are of brainstorming outputs from over 100 digital economy PhD students – representing the diversity of research interests in this area. At 01:04 where I talk about ‘negative spaces’ – a visual representing negative space is overlaid.</p>
<p>01:32-01:50</p> <p>Two sets of undergraduates at their graduation ceremonies, filmed from two opposing angles, with documentation from the HighWire programme detailing teaching staff from different disciplines, all composited together. Intended to augment the narration at this point, which is talking about the multi/inter/super disciplinary nature of HighWire, by visualising the artefacts of tradition.</p>
<p>01:52-01:58</p> <p>Showing an information sheet pertaining to the ‘Special Topics’ module of the HighWire MRes, composited together with my personal notes on the early sessions. The narration talks about lots of ideas, some details of the ideas are shown in my notes.</p>
<p>02:16-02:47</p> <p>Various images that morph and shift over each other, including further appearances of the Makie doll. The constant change represents the fact that, at that time, my interests and perceptions were in flux. The actual images include various textual pieces including my own work, papers that I refer to, and quotes from my mentors, on the subject of discussion (impact metrics).</p>

02:49-02:57

The river represents the idea of a paradigm shift.

03:00-03:15

Complex composite of many friends, colleagues and mentors who influenced my thinking. Intended to signify the diversity of the ideas and people that altered my thinking, and the complex weaving process that is implicit to the journey.

03:19-03:32

This is an image of my friends swimming at Ullswater in the Lake District. The visual metaphor here should reflect the idea of my “double edged point of view”. The swimming was a double-edged experience too, the sharpness, and unpleasantness, of the rocks that have to be walked over juxtaposed with the beautiful, refreshing, and pleasantly warm water.

04:05-04:06

The image of a vintage car on a motorway is intended as an ironic reference to the narration, which is referring to ‘digital artefacts’.

04:11-04:20

Composite of the Paris metro and other images intended to provide a link to the concept of serendipity. ‘Luck’ – as a construct – is something that always plays a part in metro/underground journeys as chronicled by the 1998 Peter Howitt film, *Sliding Doors*.

04:36-04:51

A range of images composited together. They provide visual support for my decision to *not* work with the marketing department to research impact metrics for my summer project. The paper plane rises and then falls, symbolising my rising and then falling emotional state. Other overlaid images (for instance ‘*value not equal*’ taken from a computer terminal) hint at the complexities beneath the decision to abandon that project.

05:22-05:25

The film shows somebody flipping bar mats, and attempting to catch them. This is a tongue-in-cheek reference to the ‘risky [decision to make], but with deep tangible impacts’ that the

narration speaks of. Obviously flipping bar mats is without an important socio-economic impact – it is a futile activity – but it *is* risky.

06:38-06:59

A selection of images including photographs of presentations delivered by workshop leaders, and also from learning materials. These are not a metaphor at all, but literal representations of the kind of materials we were working with.

07:03

In a selection of 'partying' images, an image of a menu board pops up focusing on a drink called "Happy Joe". The reference is neat, because at this point in time, I was finding happiness and solace in alcohol and bars.

08:00-08:18

This is one of the first points at which there is a focus on water and its reflective properties. Reflection and fluidity are themes that run throughout the film as a substantive metaphor for my approach to the MRes year – which has focused on continual reflection and a fluid mind-set.

09:17-09:23

One of a series of pieces of footage featuring toy rubber dinosaurs, the toys themselves were used at a research 'sandpit', however here they're suggesting that aspects of academia are dinosaur-like.

09:58-10:38

All of these images were captured during the journey back from Finland. They were taken during the time where I conceived of this idea. The initial incarnation of this idea is shown in its rawest form.

10:50-10:53

Reflection.

13:27-14:06

The visuals – a series of haikus written while editing the film – provide an embodiment of the sentiment in the narrative. *Warped Haiku* was actually found in the HighWire studio, the author is still unknown: “Day breaks, seas divide. Moments float on copper clouds. Together in mind.”

14:31-15:15

A series of quotes are used here. I’ve given some explanation of why/how each quote is relevant:

<p>“One must still have chaos in oneself to be able to give birth to a dancing star” – Friedrich Nietzsche.</p>	<p>Nietzsche’s sentiment seems quite clear, and is probably the best single sentence to sum up the arguments in this report. If we – researchers – are entirely sterile, in the positivistic tradition of testability, then it seems unlikely that we’ll ever produce anything akin to ‘a dancing star’.</p>
<p>“Research is what I’m doing when I do not know what I’m doing” – Wernher von Braun.</p>	<p>I interpret the German rocket scientist to mean that, you do not necessarily need to have a clear idea of your strategy, aims, or objectives, in order to be doing high quality research.</p>
<p>“The internet didn’t get invented on its own. Government research created the Internet so that all the companies could make money off the Internet. The point is, is that when we succeed, we succeed because of our individual initiative, but also because we do things together.” – Barack Obama.</p>	<p>I included this for two reasons, for one because of the reference to the Internet – the diamond of digital innovations. And secondly because of the clear leaning towards state-backed investment in research, with an understanding that the benefits, if handled correctly, can filter down to individuals, and then right back up to the nation itself. Arguably this is one of the most valuable forms of ‘impact’ deriving from research [67].</p>
<p>“Continuous effort – not strength nor intelligence – is the key to unlocking our potential” – Winston Churchill.</p>	<p>Consider the sentiment of Churchill’s words, but applied to research and academia. For instance, is becoming the researcher with the most publications that will produce radical innovations?</p>

<p>“Education is an admirable thing, but it is well to remember from time to time, that nothing worth knowing can be taught” – Oscar Wilde.</p>	<p>If we extrapolate Wilde’s reference to education into the research world, you could argue that the most ‘worthwhile’ innovations may come from experimentation and life, rather than study.</p>
<p>“We think the Mac will sell zillions, but we didn’t build the Mac for anybody else. We built it for ourselves. We were the group of people who were going to judge whether it was great or not. We weren’t going to go out and do market research. We just wanted to build the best thing we could build” – Steve Jobs</p>	<p>Jobs is highlighting how he headed up Apple, and made it into one of the most profitable companies in history, by electing to follow designer intuition (as opposed to market research) Maybe academia should consider when this kind of philosophy could further research outcomes, is this kind of approach embraced enough?</p>
<p>“I’ll let you be in my dreams if I can be in yours” – Bob Dylan.</p>	<p>Dylan’s quote is the last in the sequence, and possibly the most tenuous. Included, in part, because of my own sentimentality towards the singer’s words, and also because of the word ‘dream’ (the quote in the film has an error, the original version was singular). Dylan’s dream is of a dystopian nightmare, where he is the only sole left alive. He discovers everybody else is having the same dream. It represents the power of the crowd, and the risks that you sometimes have to take, in order to – collectively – avoid nightmarish circumstances. The same could apply to the relationship between researchers, funding bodies, research institutions, and the desire to see radical change.</p>
<p>17:25-18:00</p> <p>The film concludes with images of friends and colleagues holding a series of further quotes in various locations. Each quote embodies metaphorical or figurative meanings in relation to the conclusions of the project (further explanation in the concluding remarks section of the report).</p>	
<p>17:30-20:00</p> <p>The only music included in the film is a piece I composed at the end of 2012, see appendix 2.</p>	

Appendix 2: Lyrics to 'Breakfast Flaws'

This is a piece of music I created on December 2nd, 2012, as part of the WeeklyBeats project [68]. The original sentiment behind the lyrics was to do with relationships and emotion, however within that there is a theme related to breaking down barriers, experimentation and rule breaking, and really just thinking about different approaches to problems. As such I elected to use it in the closing sequence of the film. These are the lyrics for the piece.

*Construct walls
Become a shelter
Stick to the rules
Logic denotes calm*

*Build up floors
They'll be the shoulders
A firm foundation
Solidly flawed*

*Closing curtains
To make it all cosy
Block out the light
Outside's out of sight, out of mind, is fine*

*Break the rules
Make your own freedom
Dreams come true
Do it, let's try it, I'll see you there, my eyes are open*

Appendix 3: Film script

The script is included for reference only, it contains subtle differences to the script recorded for the film, and contains a significant number of spelling mistakes and similar.

"I wants, never gets" but I want to tell you a story.

My life changed direction in October 2012. I became part of the HighWire Doctoral Training Centre - something that I'd describe as part way of life, part mentality and part post-graduate research centre.

Something that characterises HighWire - and something that I only recently began to make sense of, is the concept of a post-disciplinary research centre. Post-disciplinary? *What a load of pretentious garbage?* I thought. I was, and still am, extremely happy to be part of HighWire, but initially was sceptical about the implications held within the words "post-disciplinary" - does this insinuate that disciplines are passé? Dead? Unfashionable? I really didn't get it.

Centres like HighWire must fit into the negative spaces left behind that remain once the traditional, silo'd, faculties and disciplines in the University have staked claims to their home territories. HighWire itself, is actually affiliated with three disciplines - Management, Computer Science, and Design - which in some way, you could argue, undermines the concept of a fully post-disciplinary centre. These affiliations however, are a necessary, and arguably makes HighWire "super-disciplinary" centre. To help students acclimatise to this either "super", "post" or "undisciplined" way of working, the HighWire PhD course is preceded by a compulsory masters in research methods, delivered by staff from the three affiliated faculties, allowing us the opportunity to become familiar with three distinct, and contrasting styles, of designing, conducting, and understanding research.

The first self-directed research on the masters course is a module called 'Special Topics'. There is no particular remit for how the research should be directed, but the main message is to do "something different to your core interests". I didn't have a "core" to begin with, so I had some very disparate ideas.

Fascinated by 'game of academia', I elected to concentrate my work on impact metrics - an area I became fascinated with, and an area I saw potential to - maybe ironically - have impact in... before too long I was disappearing down an 'impact rabbit hole' and saw a whole plethora of inter-related, systemic nuances that echo the games that are necessary to survive in academia. These nuances appeared to me, on the whole, to be centred around maintaining existing power structures and the status quo. A self-preserving land-mass, supporting and maintaining traditions... inherently tending against radical change.

As I delved deeper, and deeper into my studies around bibliometrics, scientometrics, alt metrics, research impact, citation indexing, H-indexes, and so on, a disquiet grew inside me: I became quite cynical about the nature of 'playing the academic game' - I began to think that the rules of the game focus collective energy toward forcing new ideas into existing paradigms. Isn't it worth considering a paradigm shift, and whether that shift would allow the retargeting of resources for greater efficiency?

I spoke with friends, colleagues, mentors - anyone I could - about these issues and my concerns - what quickly became apparent was that my disquiet with the existing paradigm, had some sympathy with the challenges running and working in a 'post-disciplinary' research centre.

I developed a double-edged point of view, on the one hand being sceptical and critical of traditions, and on the other wanting to imagine how if these issues were addressed, could it - hopefully positively - impact upon the ability of centres like HighWire to more effectively deliver on the promise of *Creating innovative people for radical change*

If we take a cognitive leap forward, could addressing these issues, indirectly, aid in making research institutions more dynamic, more impactful, and by doing so becoming a part of a solution to big puzzle. The puzzle of the wickedly pervasive problems facing our global society? It may be a grandiose thought, but it seemed to make sense.

After my special topics module was completed, the next task for me was design a summer project. The summer project needs to have a supervisor, a real world stakeholder, and it is equivalent of a masters dissertation. There is scope to do research in the wild and to produce digital artefacts.. it does not have to be a solely desk-based research project. Serendipity was kind to me and by chance, while having a conversation about using linked data to express research output, it transpired that the University marketing team were at that time interested in the same area I had been researching: impact metrics. The catalyst for the serendipity, Professor Jon Whittle, was curious too. We all met together, and it seemed like a great project. Jon agreed to supervise. I was excited.

However, it quickly became apparent that despite having a shared perspective, my aspirations were not well aligned with the aspirations of the others involved. Even though there was a fairly straightforward project in there, that would've been achievable, I wanted to rock the boat. I wanted to show how, in my opinion, some characteristics of academic traditions actually decay a wholly well-intentioned core, almost engendering impotence in some departments. I didn't feel able to proceed, so I decided to move on.

I made a move, quite a drastic move, towards researching 'virtual religion' or 'cyber spirituality'. I wasn't quite sure what virtual religion *is*, but I knew I felt enlivened by the move into an area full of scope to be radical, creative, to make new ground. Risky, probably yes, But more likely to have some deep, and tangible, impact upon the world. I began working with Lynne - who is still supervising me now - and we planned a smartphone application that would explore value-action gaps in individuals, based on Schwartz's values system, with a view to linking this to 'pseudo spirituality'. I was happy, excited, and motivated to work on the project and with Lynne.

... but this isn't the end of the story. So far I've told you the beginning, the next chapter - the middle - was the ubiquitous computing summer school in Finland.

I began my preparation by staying up all night long with some friends in Lancsater - at the time I thought that staying up all night before an intensive week or work was stupid, but in *hindsight* I think it was *essential* I followed my first sleepless night with an improptu party in Manchester, I got 3 hours sleep, an early start, and a long day travelling, and finally arriving in Finland to the midnight sun. After settling into our accommodation, I and Robert Potts, decided to go for a beer. We were out until around 4AM that day.

The following morning, at the initial session of the workshop, I began to feel like the situation was slightly problematic, and not just because of the fatigue and hangover. My team members didn't seem to be accustomed to working in the same way I was used to. They appeared to be quite 'dry', a technical bunch, mainly concerned with ticking boxes as prescribed by the academics running the workshop, at the expense of being truly original and testing boundaries. The characteristics of the team were galvanised by the content presented by the workshop leaders, the style it was delivered in. It wasn't *wrong*. Far from it, it *appeared* totally right.... but I couldn't escape the feeling that we were all masquerading. Talking the interdisciplinary, creative, design thinking talk... but not actually walking the walk. It is like we were a collective a toddler, taking faltering baby steps, but shouldn't we be dreaming of climbing Mount Everest?

Initially my response, was, again... to go out 'on the town' for another night. The following day I was..... exhausted. But.. I was determined enliven my team and to encourage us as a group to move against my perception of sterility in the workshop. So I worked hard. After working hard, I was compelled to go out on the town again.

This was the pattern that repeated for the whole week. Work very hard, party very hard, have around 2 hours sleep. And, repeat.

The whole week was a struggle for all members of the team, but I'm happy to say that towards the end of the week we had jelled, created some really great work, and were fully invested in our concept. The true power of interdisciplinarity came into relief: we were greater than the sum of our parts, we could see that, and we could communicate it. Although the journey through the workshop was tough, I couldn't have asked for a better outcome. Resulting from the team's hard work, and capitalising on the value generated between all of us, I, and the team, have had a paper accepted at a conference: my first!

Conversely I had some rather negatively charged epiphany moments on the final day of the workshop, regarding the content, and why it was delivered in the way it was (which had, from the outset, seemed rather odd to me).

The techniques that we used during our workshop - experience-based design methods with video-prototyping, are commendable and interesting techniques. What was clear, however, was that the techniques, nor the way they had been presented, were actively encouraging a high-level, abstract, creative mindset. I began to suspect that maybe the leaders of the workshop were in fact trying out a previously untested combination of techniques, with one eye on the potential to publish work based upon their findings.

Was this workshop innovation centred? Was it user-centered (where the users are the students)? Or... was it really publication centred? Based around playing the game, complying with tradition, and maintaining a status quo?

In the final hours, or the final day of the workshop, something annoyed me intensely. Our leaders suggested that we - the students - do not take the final stages of our projects 'so seriously'. It was suggested that we should go to party, rather than work late in order to make our presentations as good as they could be. I like partying as much, or arguably more, than the next person - however I was *passionate* about the idea we were presenting, and I wanted to do whatever I could to present it well.

As it happened we *did* take it seriously, we ignored the advice of our leaders to 'not take it so seriously' and worked late into the night.

Did that small comment about 'taking it seriously' reflect some of the systemic issues that I'd already touched upon in my work to do with impact metrics? Does the academic 'game' actually force us, researchers, to only focus on perceived measures of success - publications for instance - and conversely dilute focus away from the human tendency for being naturally, intuitive, innovative?

Eventually the work was completed, late at night. There was still time for partying, and it was, predictably, another post-4am retreat to bed.

Hung over, exhausted, yet buzzing with excitement (even if looks can be deceiving)... the presentations happened. All excellent. Exciting. Fresh. Visionary.

With all of the "work" done, another night of partying, *all* night.

No sleep.

To the airport, and on to the road home.

The week had taken its toll, I'd never been so sleep deprived in my life.. Despite that I kept awake on the plane, and chatted to my colleagues about life, research, academia, strife, then at 36,000ft, above Denmark I suddenly knew that *this* (this film) was what I wanted to produce for my HighWire summer project. I saw how I could draw upon my, very subjective, experiences and *use* them to explain challenging ideas, I realised that HighWire was probably one of the few places that would *allow* me to work in this mode, and I was immediately aware of how that opportunity was reflective of the broader challenges inherent in promoting true post-disciplinarity.

The message is multi-faceted, and requires a firm foundations to sit upon. Those foundations are laid in the story I've told you up until now.

We've had the beginning, and the middle, and now for the end: my argument. The conclusions of my research. Your takeaway.

- The stated aim of the HighWire school is to create *innovative people for radical change* - and to do so using a contrasting approach to that traditionally adopted for discipline-bound PhD researchers; this different approach is what defines HighWire as post-disciplinary

- However the structures within the University and within the academic establishment per se, the beaurocratic hoops that our lead academics have to jump through, and the requirement for students to demonstrate impact traditionally ... these factors inherently stifle the ability to access the *full* benefit of post-disciplinary working.

- My story from the summer school in Finland is an example of this.... the workshop leaders are well aware that they exist within a "publish or perish" culture.. and the fact that they're both successful professors is testament to their ability to play the game, to work the system, to look after themselves and their departments. HOWEVER... we need to ask is this approach the *best* for research outcomes?

- Is it the best for students?

- If you agree with the extensive research that supports interdisciplinarity, then logically the argument would suggest that preoccupation with *publishing* should be the thing taken less seriously, and that the kind of work resulting from workshops should be the thing that's given precedence in its place.

My intention with this piece of work is to hint at the broader issues within the new-school of academia, including those venues - like HighWire - that describe themselves as post/inter/cross-

disciplinary. These broad issues form my meta-narrative, the foundations for the more terse infra-narrative to be built upon. The infra-narrative's message is less general, and describes my perception of the establishments inability to acknowledge the utility of story telling, subjective experience, emotionality, intuition.. in terms of the design and communication of research. This is particularly relevant in post-disciplinary centres like HighWire.

I attempted to illuminate one element of this in my work for Special Topics... but in a more traditional way, on paper. I wrote a brief literature review and analysis, concluding with the suggestion that communities of practice theory could provide an alternative way of quantifying impact by understanding how research itself stimulus connections between researchers. These are the connections that, as research into interdisciplinary working shows, tend towards invaluable collaborations.

My experience in Finland embodied this phenomenon almost perfectly.. and in the grips utter exhaustion, on a plane, over Denmark... it suddenly became clear to me: by bridging of a few synaptic gaps a cohesion emerged from my interest in spirituality, research impact and the challenges facing the research centre I'm part of. *This work* is the unifying factor for those interests.

I'll recapitulate.

Human beings tend to rationalise information into narratives and metaphors: structures that are inherently subjective, and therefore not particularly attractive to researchers looking for 'valid research instruments'. Stories have been the primary way of disseminating information for thousands of years. Shouldn't narratives therefore, stories and metaphor, have a more prominent place in both the process of *doing* research and the *communication* of research outcomes? Couldn't a more subjective, experience-based element help to distinguish average work from seminal work... to aid in arriving at a more meaningful research? Can a decrease in objectivity foster an increase in tangibility?

Furthermore, what about the communication medium? Although there are exceptions, journal publications are still the goal for most researchers, and the journals only tend to take a single media: text.

If we suppose for a moment that yes, maybe narrativising research *could* be useful, then can't we also argue that a range of different media should be available in order to do that?

Maybe different media are preferable for different topics, and maybe different researchers have strengths in different media? Hopefully this film, with its textual accompaniment, is an example of how this is the case.

I believe, that some types of research are deeply restricted both in terms of design, and communication, by entrenched traditions with respect to validity of methods, publishing paradigms, and career progression pathways: a self-reinforcing triangle.

I also believe that this story is an example of the potential benefits held within the counter viewpoint. A point of view describing how personal experience, and non-traditional working can articulate value that other methods simply couldn't do. The research "method" by which I arrived at this conclusion will not be found in a research methods textbook, but does that mean it is an invalid one, for this purpose?

Here I'm describing one centre, HighWire, but the same argument can be extrapolated out to include, I would argue, any school that purports to do what HighWire does: be innovative, working towards radical change.

I'm lucky that I'm part of a centre that will at least *allow* me to explore this area, for better or for worse. However I'm scared, and I'm concerned that the establishment will struggle to appreciate the mode that I'm working in, as there are little to no precedents for the value of it. In this way I'm demotivated to continue this work, and more motivated to *not* challenge traditions for the

sake of career security. If you insist you do not have a discipline, but meanwhile accept that all jobs in academia are tied to a discipline, it is quite obvious that being post-disciplinary might not be the best way of succeeding in academia! These points talk to the meta-narrative, but focussing back to the infra-narrative, a more specific point emerges.

The method I used to arrive at this conclusion isn't the solution, it is an experiment; it is an experiment in conducting research through experiencing things first hand, and then communicating it through an expressive medium, so that others can 'experience' it second hand.

Narrative structure is a tested method - maybe not empirically, but certainly practically - it is tried, tested, and you could say is the *original* method.

The only way of contextualising my point is to use a metaphor: this method is a star in a galaxy that sits in a Universe filled with different approaches to discovery, exploration, innovation, and dissemination. In the galaxy of post-disciplinarity, a galaxy that may well provide the foundations for the radical innovations our society is separate to see, this star is just beginning to shine.

To do research well, you need two things. A good insight, and a good way of communicating that insight. To communicate, you need your audience to listen. Academic traditions are quite restricted and do not play to this need for rich communication. Academia tends towards complex language, and cold - quite inhuman - accounts of research.

What I'm arguing is that maybe we can improve upon the current paradigm, by acknowledging the value of human experience, not just accepting it but deliberately designing in an emotive core to humanise research methods and communication....

Maybe by doing that we can create even more innovative people, for even more radical change, and take one step closer toward being freed from the shackles of disciplines, and truly become post-disciplinary.

The finest examples of culture: novels, plays, operas, paintings, sculpture, songs, and stories... they're all born from their creators emotions, and derive value from affecting their audience.

My research, detailed in this film and its written accompaniment, concludes that the if the same were true in centres like HighWire, outcomes will improve and the value of post-disciplinarity will grow, and blossom.

I hope that I've affected you such that you'll consider my suppositions.

And in conclusion, I hope that as a national and global society we *can* deliver HighWire's promise to create innovative people, for radical change.