Does the way museum staff define inspiration help them work with information from visitors' Social Media?

by

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ABSTRACT

Since the early 2000s, Social Media has become part of the everyday activity of billions of people. Museums and galleries are part of this major cultural change - the largest museums attract millions of Social Media 'friends' and 'followers', and museums now use Social Media channels for marketing and audience engagement activities. Social Media has also become a more heavily-used source of data with which to investigate human behaviour. Therefore, this research investigated the potential uses of Social Media information to aid activities such as exhibition planning and development, or fundraising, in museums.

Potential opportunities provided by the new Social Media platforms include the ability to capture data at high volume and then analyse them computationally. For instance, the links between entities on a Social Media platform can be analysed. Who follows who? Who created the content related to a specific event, and when? How did communication flow between people and organisations? The computerised analysis techniques used to answer such questions can generate statistics for measuring concepts such as the 'reach' of a message across a network (often equated simply with the potential size of the a message's audience) or the degree of 'engagement' with content (often a simple count of the number of responses, or the number of instances of communication between correspondents). Other computational analysis opportunities related to Social Media rely upon various Natural Language Processing (NLP) techniques; for example indexing content and counting term frequency, or using lexicons or online knowledge bases to relate content to concepts.

Museums, galleries and other cultural organisations have known for some time, however, that simple quantifications of their audiences (the number of tickets sold for an exhibition, for example), while certainly providing indications of an event's success, do not tell the whole story. While it is important to know that thousands of people have visited an exhibition, it is also part of a museum's remit to *inspire* the audience, too. A budding world-class artist or ground-breaking engineer could have been one of the thousands in attendance, and the exhibition in question could have been key to the development of their artistic or technical ideas. It is potentially helpful to museums and galleries to know when they have inspired members of their audience, and to be able to tell convincing stories about instances of inspiration, if their full value to society is to be judged.

This research, undertaken in participation with two museums, investigated the feasibility of using new data sources from Social Media to capture potential expressions of inspiration made by visitors. With a background in IT systems development, the researcher developed three prototype systems

during three cycles of Action Research, and used them to collect and analyse data from the Twitter Social Media platform. This work had two outcomes: firstly, prototyping enabled investigation of the technical constraints of extracting data from a Social Media platform (Twitter), and the computing processes used to analyse that data. Secondly, and more importantly, the prototypes were used to assess potential changes to the work of museum staff – information about events visited and experienced by visitors was synthesised, then investigated, discussed and evaluated with the collaborative partners, in order to assess the meaning and value of such information for them. Could the museums use the information in their event and exhibition planning? How might it fit in with event evaluation? Was it clear to the museum what the information meant? What were the risks of misinterpretation?

The research made several contributions. Firstly, the research developed a definition of inspiration that resonated with museum staff. While this definition was similar to the definition of 'engagement' from the marketing literature, one difference was an emphasis upon *creativity*. The second set of contributions related to a deeper understanding of Social Media from museums' perspective, and included findings about how Social Media information could be used to segment current and potential audiences by 'special interest', and find potential expressions of creativity and innovation in the audience's responses to museum activities. These findings also considered some of the pitfalls of working with data from Social Media, in particular the tendency of museum staff to use the information to confirm positive biases, and the often hidden biases caused by the mediating effects of the platforms from which the data came. The final major contribution was a holistic analysis of the ways in which Social Media information could be integrated into the work of a museum, by helping to plan and evaluate audience development and engagement. This aspect of the research also highlighted some of the dangers of an over-dependency upon individual Social Media platforms which was previously absent from the museums literature.

IN MEMORY OF

This thesis is dedicated to the memory of two people:

Dr. Ann O'Brien was the first supervisor of this work. She passed away very suddenly during the second year of the research, and her keen insight into the work, and her dry sense of humour, are sorely missed. I think she would have been glad to see this work finished.

Janet Pinto was my mother's twin sister and a very important figure throughout my life. She passed away early in 2015, but will always be very fondly remembered.

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And a great many thanks are also due to those in the museum community who gave their time and expertise to this project. A particular mention must go to Emma Hallam and Jonathan Wallis from Derby Museums, who devoted a tremendous amount of creativity and intelligence to the research.

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LIST OF ABBREVIATIONS

ADR	Action Design Research
API	Application Programmable Interface
AR	Action Research
ARC1	Action Research Cycle #1
ARC2	Action Research Cycle #2
ARC3	Action Research Cycle #3
CA	Content Analysis
CRM	Customer Relationship Management
CSS	Computational Social Science
DE	Design Ethnography
DS	Design Science
EW	Evaluation Workshop (conducted at the end of the ARCs)
EWOM	Electronic Word of Mouth
FE	Frame Element (from FrameNet)
FLC	Fuzzy Logic Controller
HCD	Human-Centred Design
HoM	Head of Museums (at Derby Museum)
IR	Information Retrieval
IT	Information Technology
KE	Knowledge Elicitation
LU	Lexical Unit (from FrameNet)
MCDA	Multi-Criteria Decision Analysis
NEF	New Economics Foundation
NFR	Non-Functional Requirement
NLP	Natural Language Processing
POM	Processes of Organisational Meaning
PoS	Part of Speech
RD	Root Definition
RegEx	Regular Expression
ROI	Return on Investment
SMC	Social Media Coordinator (at Derby Museums)
SNA	Social Network Analysis
SSM	Soft Systems Methodology
UKMA	UK Museums Association
URL	Uniform Resource Locator
VAQS	Visitor Attraction Quality Scheme (from Visit England)
WOM	Word of Mouth

1 INTRODUCTION

In an economic climate where the more traditional sources of cultural funding, such as from local and national government, are being drastically reduced or even removed completely, it is more important than ever for museums to understand, and be able to prove, the value they bring to society. One potential method for contributing to an understanding of this issue is to examine the increasing volume of Social Media content created by museum visitors. This research investigates the ways in which museum staff might incorporate information derived from potential expressions of inspiration within visitors' Social Media content, hence this research focuses on two things: the underlying nature of information based upon Social Media data, and the reactions to and interpretations of such information by museum staff.

Museums have an essential problem when it comes to considering their value, namely that the value they deliver hinges upon the subjective experiences of their visitors. The following quotation from the British inventor and industrialist James Dyson illustrates the nature of the 'hidden value' problem:

> *Museums are a must-see. They are a great way to get a feel for a city's history and culture. The Tate Modern in London has an exhibit of De Stijl-era art. We actually produced a run of De Stijl-inspired machines, drawing attention to the structural and geometric form of the humble vacuum cleaner (Kim, 2010).*

This quote shows how a noted industrialist, with a successful, innovative company, and a workforce of talented engineers and designers, has been *inspired* by a museum exhibition. Indeed, it is almost certainly the case that James Dyson has been inspired by numerous museum visits throughout his lifetime. The issue for museums embodied in the quote above, therefore, concerns trying to take fuller credit for their positive impact upon society, *due to the ways in which they inspire people*. If a purely instrumental measure of James Dyson's museum visits had been taken, then he would simply have registered as another set of footfalls through this or that gallery. However, we know from the quote above that one visit to The Tate Modern's De Stijl exhibition could have unlocked the ideas behind a line of modern vacuum cleaner designs. Simply incrementing the visitor count for the relevant gallery by one would not come close to describing the outcome of such a visit.

Recognition of the importance of accounting for the deeper impact of culture has increased over the last thirty years. During that time, museums have used qualitative techniques such as exit interviews

or open-ended survey questionnaires to try and capture such evidence. However, there is another factor to the research described in this thesis: the new opportunities that Social Media present to add information to museums' understandings of their visitors. Social Media have risen to a point of near ubiquity since the middle of the 2000s (though it can be argued that they have existed for at least a decade longer) and, at the time this research was conducted, the major Social Media platforms had user-bases in the hundreds of millions (or higher than one billion users in the case of Facebook). Keeping one's friends or followers updated about one's daily thoughts, ideas, opinions and activities is a commonplace, normal activity for millions. Might these status updates occasionally contain an expression of inspiration from the next James Dyson, created while having a museum-based epiphany?

This is the core question this research sets out to investigate. Indeed, the working title for the research was *The Epiphany Project* – though investigation into museum staff's interpretation of the concept of inspiration soon indicated that they considered the idea of a 'flash of inspiration' to be something of a cliché, and so a working title it remained. In order to answer the question in a manner likely to prove useful to museums and their staff, the research was conducted in close collaboration with those very staff, and involved attending some inspiring and exciting events. The research also required a close examination of the technologies of Social Media, in order to establish how their mediating effects might further influence and bias interpretations of expressions of inspiration in museum visitors' Social Media content. Such considerations are vital if evidence from Social Media is to be used accurately by museums and their stakeholders.

1.1 Key concepts

There are three key concepts upon which this research is based, museums, Social Media and inspiration. The processes of defining the third of these concepts is at the heart of this research, to the extent that this thesis returns to, and builds upon, a museum-friendly definition of inspiration throughout (this evolution is shown in Table XXX in Chapter 8).

As the Literature Review in Chapter 2 shows, the definition of *museum* has shifted since the late 1970s. Museums used to be defined as 'memory institutions', i.e. by focusing upon the items they collected and protected. For instance, Dempsey (2000) defines a memory institution by stating that:

> *Their collections contain the memory of peoples, communities, institutions and individuals, the scientific and cultural heritage, and the products throughout time of our imagination, craft and learning. They join us to our ancestors and are our legacy to future generations. They are used by the child, the scholar, and the citizen, by the business person, the tourist and the learner. These in turn are creating the heritage of the future. Memory institutions contribute directly and indirectly to prosperity through support for learning, commerce, tourism, and personal fulfilment.*

More recently, the emphasis upon 'collection first, people second' in museum definitions has changed, such as in this definition from the International Council of Museums:

> *A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment (ICOM, 2013).*

This reprioritisation is also evident in the UK Museum Association's definition of museums:

> *Museums enable people to explore collections for inspiration, learning and enjoyment. They are institutions that collect, safeguard and make accessible artefacts and specimens, which they hold in trust for society (The Museums Association, 2014).*

However, this latter definition is particularly relevant to this research as it refers explicitly to the term *inspiration*. As such, the UK Museums Association's definition has directed this research from the start. Some of the reasons why the definition of museums changed are explored in more detail in the Literature Review, Chapter 2 Section 2.4.

Another term that relates to museums, and which is critical to this research, is the concept of *cultural value*, which:

> *…recognises the affective elements of cultural experience, practice and identity, as well as the full range of quantifiable economic and numerical data; it therefore locates the value of culture partly in the subjective experience of participants and citizens (Holden, 2004:10).*

This research investigates the potential for Social Media to provide a source of expressions about "the subjective experience of participants and citizens", to help ascertain the value of culture. As such, the other key concept that merits definition here is that of Social Media. One heavily-cited definition of Social Media comes from Ellison and boyd:

> *We define social network sites as web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site (2007:211).*

However, despite being made only four years before this research commenced, this definition already appears dated, given its focus upon the need for such "social network sites" to enable users to "articulate a list of other users with whom they share a connection". One of the most popular Social Media platforms, Twitter (which was used exclusively as the source of data for the prototypes built during this research), enables connections between users that are often tenuous; where the only connection between Twitter users is that they follow each other on Twitter. So instead, this research uses two other, more general aspects of Social Media to define it. The first is provided by Kaplan and Haenlein:

> *Social Media is a group of Internet-based applications that …allow the creation and exchange of User Generated Content (2010:61).*

Secondly, according to Korschun and Du:

> *… social media encourages peer-to-peer communication – … – which can create a sense of community around the shared values of participants (2013:1495).*

Therefore, Social Media is defined here as a mechanism by which people can communicate with each other using self-published information. Whether Social Media really *does* have the potential to "create a sense of community", for museums at least, is one of the questions investigated more thoroughly by this research.

1.2 Research rationale

There are three aspects to the underlying motivation for and rationale behind this research. The first concerns the personal motivation of the researcher, who entered into this research after several years of working in the IT department of a financial services company, but who also had prior experience of developing digital cultural heritage resources. During the time working in finance, the researcher made the personal observation that, while the financial rewards were much higher than those available in the heritage sector, heritage workers seemed more engaged with their work, enthusiastic about their jobs, and fundamentally happier than their wealthier contemporaries in finance. This led to a growing interest regarding the relationship between wealth and happiness (Wilkinson and Pickett, 2010; James, 2007), and alternative ways of considering 'success' at both a personal and social level (Jackson, 2011).

The second motivation concerns the researcher's desire to undertake research that had the potential to be meaningful and useful to museums. This led to a conviction that museum practitioners should be involved in the work as much as possible. This relates to the work the researcher had undertaken in the cultural and heritage sector, but also comes from experience of working in a user-centred fashion upon IT development projects, and from achieving more success when customers were heavily involved in the development process, rather than being kept at arms-length (Beck et al, 2001; Schwaber, 2004). This research was always going to take place in the field, not in the lab.

Finally, this research sits upon the nexus between humanity and technology. There is a case for arguing that all Information Science research takes place between people and 'systems', and in the modern world this almost always involves an Information Technology-based system. However, the fact that this research investigates *Social* Media potentially puts even more emphasis upon the human-behavioural aspects. So, while technological prototypes *were* created as part of this research, their principle purpose was to investigate technological constraint; i.e.: to change human systems in ways that were within the bounds of technical possibility. The *fundamental research*, then, was to examine the nature and outcomes of those changes.

As a result of the above, the researcher's own starting point for undertaking the research was from a perspective of positivity towards museums (and culture more generally), and also optimism about the potential of technology to make a helpful contribution towards museum planning, evaluation, learning and improvement.

1.3 Research aims and objectives

The aim of this research is:

> *To establish whether Social Media can provide museums with valuable information regarding whether their activities inspire their visitors.*

In order to achieve this aim, the research investigates how museum practitioners define the nature of "inspiration" itself. Because the source of any potential evidence of inspiration is Social Media, the research also investigates the technical constraints of the data source, and the effect these might have upon the value of any evidence.

In pursuit of the above, the research has the following objectives:

1. To understand how museum practitioners define the process of inspiration in relation to visitors.
2. To ascertain how the ways in which visitors' inspiration, as understood by museum practitioners, might apply to the day-to-day work of museums.
3. To work with museum staff to design, adapt and evolve a prototypical computer system with which to capture relevant, valuable evidence of inspiration from Social Media.
4. To work with museum staff to evaluate the visitor information, potential expressions of inspiration and information about the potential impact of museum events upon their audiences, captured by the prototype systems developed to fulfil Objective 3. This information is to be evaluated primarily in terms of its relevance to the work of museum staff.
5. To evaluate methods by which the evidence of inspiration captured by Objective 3 above could be disseminated.

These research objectives require a balance to be struck between investigating how museum practitioners respond to Information Systems providing evidence of inspiration and how the systems and technologies underpinning the source of evidence might constrain any Information System in ways that effect the value of the information. This balance required a mixed approach to the research that involved an equal focus; a 'back and forth' essentially, between museum practitioners and the types of IT systems that are used to collect and analyse Social Media data, and visualise the results (see Chapter 3 for a detailed discussion about how this balance was maintained).

1.4 Scope of the research

The majority of the Social Media content captured and analysed during this research is written in English, so the research focuses upon museum-related research and practice in English-speaking countries. The practical result of this is that most of the research literature reviewed comes from the UK, North America and Australia, though some relevant research from mainland Europe was also included. All fieldwork was conducted exclusively with museum staff from the UK.

As regards the chronological scope of the work, this is constrained heavily by the phenomenon of Social Media itself. Kaplan and Haenlein refer to a famous moment from 2004 when the publisher Tim O'Reilly used the phrase "Web 2.0" to describe: "… a platform whereby content and applications are no longer created and published by individuals, but instead are continuously modified by all users in a participatory and collaborative fashion (2010:61)", but perhaps the more significant occurrence in 2004 (on the 4th February) was the launch of Facebook. Thus most of the literature reviewed tends to have been published post the middle of the first decade of the 21st Century.

One other note concerning scope: there are many different types of museum, or museum-like organisation. Some maintain collections, while others centre upon a particular place such as a significant building (these places are often referred to as *heritage sites* or *attractions*). Some deal with ancient history, some modern history, some with concepts that are barely historical at all. Some museums are entirely digital – indeed there is at least one online museum of online museums (Coudal Partners, 2015). Art galleries are also intrinsically linked with museums, even galleries that focus upon ultra-contemporary modern art. Libraries and archives are also heavily connected to museums under the concept of "memory institutions" introduced in Section 1.2 above – and also leading to the acronym GLAM (for Galleries, Libraries, Archives and Museums).

This research involved researching its topic in-depth with a small number of museum staff, all but two of whom worked in what could be described as 'traditional' museums. As a result, and for the sake of brevity, the term 'museums' will be used to refer to all of these types of institution.

1.5 Thesis structure

The thesis has the following structure:

- **Chapter 2** is the Literature Review, which begins by investigating the nature of inspiration at both individual and societal levels. It also looks in more depth at the topic of Social Media, before finally considering how the museums sector defines inspiration, how they use Social Media, and how they evaluate their events and activities.
- **Chapter 3** discusses the methods used to conduct the research, which as described above was impactful, human-centred research, but at the nexus of human behaviour and new technology, where both the fundamental nature of information based upon Social Media data, and museum staff's interpretation of such information, were investigated.
- **Chapter 4** describes a consultation exercise during which the findings of the Literature Review were discussed with museum practitioners. This exercise evolved the working definition of inspiration as it stood at the end of the Literature Review, and started to clarify the central topics to be investigated by the three Action Research Cycles (ARCs) that made up the body of the research activity.
- **Chapters 5, 6 and 7** describe the three ARCs:
    - ARC 1 (**Chapter 5**) investigated how the definition of inspiration, and a prototype Information System, were used to generate audience segments 'by special interest' for two different museums. This is defined as examining the *potential for inspiration* within an audience.
    - ARC 2 (**Chapter 6**) investigated how the psychological constructs that constituted a museum-friendly definition of inspiration were used to retrieve potential expressions of inspiration from visitors' Social Media content created in relation to two museum events.
    - ARC 3 (**Chapter 7**) investigated the potential for a prototype system to try and ascertain the overall *impact of inspiration* upon a museum's audience, by using the same Social Media data used in ARC2 to establish the *reach* of the events, and how those events might have *strengthened the museum's community*.
- **Chapter 8**: generalises the learning gained from the three ARCs, using evidence gathered from a workshop with museum staff in which the findings were evaluated. It uses a

framework from the Soft Systems Methodology called the Processes of Organisational Meaning (POM) model (Checkland and Holwell, 1998) in order to gain a holistic view of how Social Media information might be used within museums.

- **Chapter 9**: discusses how the findings built upon the body of knowledge regarding the potential for Social Media data to contribute to the consideration of cultural value.
- **Chapter 10**: concludes the thesis by considering how the research met its objectives, the contribution it made, recommendations to museum practitioners and researchers resulting from the research, limitations of the research and opportunities for further work.

2 LITERATURE REVIEW

2.1 Introduction

This research aims to establish whether Social Media can provide museums with valuable information regarding whether their activities inspire their visitors. The research investigates methods for contributing evidence of museums' value to society, which could in turn prove museums' value to stakeholders. The Literature Review is structured as follows:

- *Defining inspiration*, which has three subsections:
    a. The definition of inspiration, which suggests that inspiration is an inherently personal phenomenon. Literature from Aesthetic Philosophy and Psychology was reviewed, along with some from Museum Studies.
    b. The impact of inspiration upon society. The review of the Museum Studies literature widened at this stage, and some Sociological and Political literature was included.
    c. A comparison between the terms inspiration and *engagement*; a term used in Museum Studies, but also in Business and Marketing.
- *Investigating the effects of Social Media:* focusing in particular upon new methods for using data from the internet to investigate human behaviour, known as *Computational Social Science* (CSS).
- *Investigating how the two phenomena of inspiration and Social Media relate to museums*. This section covers:
    a. The ways museums try to inspire people.
    b. How museums try to inspire communities and societies.
    c. How museums use Social Media to try to inspire visitors.
    d. How museums try to evaluate if they have inspired people.

In general, the literature reviewed tended to focus on theoretical discussion and considerations of museum practice, and discussion of the outcomes of such practice were less common. Similarly, while the literature contained some discussion about the use of Social Media in museums, this favoured the theoretical possibilities of Social Media use, and the practical aspects of undertaking projects incorporating Social Media, over the evaluation of the outcomes of such practice.

2.2 The nature of inspiration

The review begins by investigating inspiration, concentrating initially on its impact upon the individual, before considering how it affects society more broadly. This review also includes a discussion of the close relationship between the concepts of *inspiration* and *engagement*, a term commonly used in the literature both in relation to museums and to Social Media.

2.2.1 Inspiration and the individual

The first potential component of inspiration was emotion, and a starting point for the investigation of emotion in museums was the concept of beauty. A contemporary perspective upon beauty comes from Evolutionary Psychology, which suggests that the perception of beauty in fertile landscapes and healthy individuals would have attracted our ancestors in advantageous ways. This reflects the broader idea that emotions evolved to allow focus on important experiences, to enable decisions and prioritise actions (Dawkins, 1998; Pinker, 1998). Emotional processes occur quickly and prior to conscious awareness, affecting our decision-making before we realise (Massumi, 1995; Connolly, 2002). This makes us more likely to be inspired by something that we feel emotionally connected to (Csikzentmihalyi and Hermanson, 1995). It also means recognising the influence our feelings have had upon our thoughts can be difficult (Melchionne, 2010). According to Barthes (1986) and Wollheim (1993), we are also capable of projecting our emotions onto our surroundings, with works of art in particular being susceptible to this phenomenon.

It is therefore worthwhile considering an inspirational experience as one in which emotion plays an *obvious* role. In the world of art, one such obvious emotion can be *shock*. Shock is a key topic of postmodern critical theory, with Foucault and Derrida in particular describing how shocking, taboo ideas can shake up entrenched networks of meaning and hence enable cultural progress (Wicks, 2001; Novitz, 2001; Boyne, 1990). Interestingly, the idea that inspiration comes from the 'breaking apart and reforming of networks' has also been proposed in neuroscience, with Greenfield (2008) among others defining 'creativity' as the process where sensation and emotion break neural connections, and allow new connections to form. This idea is echoed by Johnson (2010), who proposes the idea of 'liquid networks' in which new ideas can form easily, but in which such ideas

are given space and time to be shared and improved upon. Johnson also suggests that brains constitute such liquid networks, and that online social networks do as well.

It therefore seems that a balance of strong emotion, coupled with an ability to regulate and control such emotion, could be fundamental to inspiration. The notion that emotions and rationality are separable underpins the 'dualist' philosophy of Kant and Descartes in particular (Damasio, 2001), but both Damasio and Pinker consider the separation of 'head and heart' to be erroneous. Alternatively, they contend that:

> *…the rationality required for humans to prevail and endure should be informed by the emotion and feeling that stem from the core of every one of us… my research has persuaded me that emotion is integral to the process of reasoning (Damasio, 1994:144).*

Gross (1998) examines this relationship between emotion and cognition in more depth, and proposes a framework for emotion regulation based on a review of neuroscience and several branches of psychology. The framework suggests processes such as 'attention deployment' (e.g. focusing attention, ignoring negative stimulus) and 'intellectualisation' (e.g. reframing a negative experience into a positive one) as methods of regulating emotions consciously. One thing that is apparent about the concept of emotion regulation is that it requires skill and can be improved with practice. This is discussed in relation to art appreciation by both Dewey (1934) and Eisner (1972, 1985), both of whom emphasise how recognition of emotion affects the expert evaluation of art, and the importance of not regulating emotion out of the evaluation entirely, but instead rationalising it and establishing its meaning.

The notion that rational thought is also a core component of inspiration is essentially Platonic: Plato contrasted the 'lesser' beauty of real, tangible things with *The Beautiful* – a divine form of beauty accessible only to the intellect (Janaway, 2001). This was further explored by the Empiricists Hutcheson and Hume; the former proposing that 'internal sensible pleasure' accounted for pleasure stimulated by 'beautiful' abstract ideas (e.g. scientific or mathematical theories); the latter proposing a universal, measurable standard of taste based upon heightened sensitivity, reason, expertise and knowledge (Shelley, 2001). The concept of a universal standard of beauty, elevated above the 'merely pleasurable', was also proposed by Kant, who wrote of 'disinterested' (i.e. unemotional) satisfaction with beautiful things and ideas (Crawford, 2001). Hegel later proposed that the role of the artist was to capture beauty by channelling feelings (Hegel, 1975), and hence illustrating humankind's dominance over nature (Inwood, 2001).

Hume's description of the expert appraisal of beauty informs more modern discussion of connoisseurship within the literature. Eisner (1985) claims "awareness and understanding of experience" to be fundamental to the technique of the connoisseur. Furthermore, and in line with Dewey (1938), Eisner also expresses the social value of sharing such understanding in the form of public criticism. By so doing, one assumes the role of the public expert, someone about whom Pinker states:

> *… in all societies, expertise is distributed unevenly… Experts are invaluable and are usually rewarded in esteem and wealth. But our reliance on experts puts temptation in their path… Like the Wizard of Oz, they have to keep their beseechers from looking at the man behind the curtain, and that conflicts with the disinterested search for truth (1998:305).*

The concept of a universal standard of taste and the role experts play point to the more social aspects of inspiration. These are of particular relevance to museums, and hence are discussed further in Section 2.2.2.

The role played by creativity in inspiration became increasingly apparent as this research progressed. The importance of creativity to inspiration centres upon the idea that inspiration needs an output of some sort – inspiration with no product is *admiration*. Creativity is often discussed in semi-mystical terms that relate both to emotion and intuition. Hegel, for instance, suggests that:

> *…artistic creation, like art throughout, includes in itself the aspect of immediacy and naturalness, and this aspect it is which the subject cannot generate in himself but must find in himself as immediately given. This alone is the sense in which we may say that genius and talent must be inborn (1975:284).*

The mythologising of creativity can be criticised for implying that creativity occurs solely in a talented elite, thus denying 'ordinary' people opportunities to be creative (Dewey, 1938). However, much contemporary thought considers creativity a healthy part of everyday life for all (Pinker 1998), an idea strongly supported by Carey (2006). Johnson (2010) describes how creativity occurs slowly and is more social than the 'creative genius' myth suggests; thoughts and ideas accrue gradually until a key connection is made; the 'snapping into place' of the connecting idea merely appears spontaneous. This key connection is often triggered by a profound experience that affects the emotions and intellect intrinsically (Csikzentmihalyi and Hermanson, 1995). Dewey states that the *appreciation* of art was one of the principal methods of gaining profound experiences (Dewey, 1938; Shusterman, 2010), and by Dewey's reckoning, such aesthetic experiences were palpable, discrete

entities with clear beginnings and endings, which leave us in a different state upon their conclusion (Dewey, 1938; Melchionne, 2010; Latham, 2007). The passivity inherent in Dewey's idea is strongly criticised by Carey, however: passive *appreciation* is not necessarily *inspiration*.

It is also important to note a clear mapping between the 'cognition, emotion and creativity' relationship inherent in this definition of inspiration and the core categories of Bloom's Taxonomy of Educational Objectives; an attempt to develop a standard organisational scheme for the education sector. These three fundamental categories proposed by Bloom et al (1956) are cognitive, affective and psycho-motor-related outcomes of learning activities, and this fundamental structuring is referred to (often as the 'head, heart and hands' model) throughout a large body of educational research.

2.2.2 Inspiration and society

To consider the role inspiration plays at a more social level, the review focused upon three factors:

1. Identity – that is, how ones individuality is projected outwards.
2. Normalisation – how commonly-held ideas take root and become 'the social norm'.
3. Mediation – how the process of sharing ideas, potentially leading to normalisation, takes place and can be controlled.

These concepts are of particular relevance both to the role of museums and Social Media.

Profound, inspirational experiences are key to the formation, reinforcement, or alteration of our senses of identity. During the Enlightenment, personal identity was linked to the mind, which, while being self-conscious, was also considered both separate from, but influenced by, external factors such as bodily sensation, socialisation with others, and a sense of belonging and nationality (Inwood, 2001). More recently, however, some have started to question the significance of the boundaries between mind and body, and also between individuals and the environments they inhabit (e.g. Dewey, 1910; Edwards and Potter, 1992; Connolly, 2002), suggesting that the feedback-loops between individuals, culture and society are so dense as to render ideas of separation meaningless. Hence culture and society define individual's dispositions and interests, motivate them to learn (Csikzentmihalyi and Hermanson, 1995) and enable them to contribute knowledge back into society (Connolly, 2002), as well as rendering their identities vulnerable to disturbance by social pressures

(Wicks, 2001). The need for personal identity to sometimes 'take a stand' against society's normalising influence was one of the major preoccupations of Foucault, about whom Žižek states:

> *With Foucault, we have a turn against… universalist ethics which results in a kind of aestheticisation of ethics; each subject must, without any support from universal rules, build his own mode of self-mastery; he must harmonise the antagonism of the powers within himself – invent himself, so to speak, produce himself as a subject, find his own particular art of living. This is why Foucault was so fascinated by marginal lifestyles constructing their particular mode of subjectivity (1989:2).*

Foucault concluded this after investigating how the definition of 'insanity' can be used by the powerful to control subversive ideas (Foucault and Pearson, 2001; Boyne, 1990; Wicks, 2001).

A contrasting force to that of identity is the concept of normalisation, which is a fundamental aspect to Habermas's concept of *The Public Sphere*, which, Calhoun states:

> *…institutionalized,… not just a set of interests and an opposition between state and society but a practice of rational-critical discourse on political matters… The very idea of the public was based on the notion of a general interest sufficiently basic that discourse about it need not be distorted by particular interests (at least in principle) and could be a matter of rational approach to an objective order, that is to say, of truth (1992: 9).*

The Public Sphere theory contends that rational, informed debate is fundamental to democracy, as it leads to agreed-upon ideas that enable democratic decision-making. One of Habermas's key concepts in this area is the *theory of rational communication* which sets the criteria to which a debate must conform to cause the formation of valid public opinion. A summary of these criteria is provided below, derived from Dahlberg (2001):

1. *Autonomy from state and economic power*: the debate must be relevant to citizens' concerns and take place in a location where citizens feel they may speak freely.
2. *'Validity claims' must be exchanged and critiqued during the debate*: participants must be able to support the statements they make knowledgeably, using sources made available for rational critique.
3. *Reflexivity*: participants must be open to criticism of their own positions, and be prepared to change them.
4. *Ideal role-taking*: participants must view the issues being debated from the point of view of their opponents.

5. *Sincerity*: participants must disclose all personal information about themselves, their background, and their 'self-interests' relevant to the debate.
6. *Discursive inclusion and equality*: every participant affected by the issues debated has the right to contribute.

In light of many (if not all) of these aspects of rational communication, the concept of expertise thus becomes a factor in the establishment of cultural norms: how effectively one can base one's point of view upon established knowledge, and also integrate other, similarly well-articulated, knowledgeable points of view into one's own, becomes key to the process. However, this also increases the power of those that mediate and control sources of knowledge within society, and much of this power relates to technology. The effect of media technology upon arts and culture is described in a seminal paper by Benjamin (1936), which discusses how technologies like photography and film destroyed the 'aura' of authenticity belonging to original artworks. This effect of 'mediation of the truth' is perhaps *the* central theme of postmodernism, which is summarised by Novitz:

> *Typically, philosophical postmodernism is critical of the idea that the truth is attainable, if by that it is meant that it is possible to determine and to come to know how things really are, in and of themselves, by using our natural faculties. Since one cannot have unmediated access to things themselves, to brute facts, language is not constrained by an extra-linguistic world; rather the 'play of signs' creatively constructs what we mistakenly believe to be a world of brute reality (2001:158).*

While the idea that *all* of reality and 'truth' is 'constructed' is not without vocal critics (e.g. Chomsky, 1995; Sokal and Bricmont, 1998), a compelling implication for museums of the 'construction of reality' is described by Žižek (1989) in *The Sublime Object of Ideology*. 'Sublime objects' (of the sort often collected by museums) are those to which 'fantasies' of value and significance are attached. Žižek names objects, events and people to which such potent significance is attached 'quilting points' that draw together the fabric of society – pins to which key ideas anchor themselves, enabling the formation of social norms, and even ideologies. The mediating role of museums in the relationship between individual identity and cultural norms will be discussed in more depth in Section 2.4.1.

2.2.3 'Inspiration' versus 'engagement'

It is also important to acknowledge the similarity between the concepts of 'inspiration' and 'engagement', because the latter term is used heavily in literature about both museums and Social Media. Ashley (2014) focuses on the meaning of the term in the museum sector by studying a specific exhibition that set out explicitly to 'engage the world'. She discusses inconsistencies in the definition of 'engagement' by different museum professionals, and her research concludes that 'engagement' does indeed have a spectrum of meanings from 'inspiration' at best, to 'manipulation and control' at worst. She suggests that too great a 'marketing-focus' upon 'engagement' could de-prioritise the key things that she believes define museum experiences: intellectual stimulus and building connections within communities.

Other studies into museum engagement come from the very marketing world that Ashley is so concerned by, for example Miller (2011), who surveys museum 'non-visitors' to propose ways of attracting them; Leask et al (2013), who focus on attracting visitors from 'Generation-Y'; and Hausmann (2012B), who investigates the value of Word of Mouth marketing for museums. Brodie et al (2011) also review use of the term and note its use in sociology, psychology, politics and organisational behaviour, and, increasingly since 2005, marketing. Their summary of the marketing-centric definition is closest to the concept of 'inspiration' as defined thus far, in that it considers engagement to be composed of three dimensions, the *cognitive*, the *emotional* and the *behavioural*. Also, both Brodie et al and Vila-López and Rodríguez-Molina (2013) note a rise in use of the term as the focus of the marketing literature shifted from the marketing of products, via the marketing of services, to the marketing of *experiences*. Experiential marketing contends that a commercial competitive edge is provided by the entire experience of a brand or service; that is 'co-created' by both the service producer and consumer. In support of this, Jensen and Buckley (2014) note that the live experience of a science fair was one of the aspects that visitors responded to most positively.

Engagement at the personal, participative and emotional level is also discussed in relation to engagement with the arts. Edmonds et al (2006) define the features of creative works that engage viewers as 'attractors', 'sustainers' and 'relators' – i.e. the features that attract the viewer's attention, keep it, and caused connections between the viewer and artwork that make them want to experience it again, and hence build a relationship with it. Similarly, Davies et al (2012) also consider 'level of participation' with art forms as one of the dimensions in their study of engagement, concluding that active participation equates to higher levels of engagement. This further supports

the assertion in Carey (2006) that creative participation in the arts is a more profound experience than passive consumption.

Engagement is also often described as 'public' or 'civic', in terms redolent of Habermas, with regard to public 'lay people' engaging with the rational work of 'official' experts, usually from formal institutions (famous politicians or scientists, for example) . Descriptions of public / civic engagement tend to focus less upon the personal experiences of members of the public, and are more concerned with the power relationships between experts and the interested consumers of their knowledge. The (at least assumed) gap in knowledge between 'expert' and 'consumer' makes engagement of this sort much less likely to be 'co-created' as per the marketing sense of the term: Bickerstaff et al, for example, describe The Royal Society's engagement with the public as '…brokering public opinion (2010:487)', terminology that implies the control being firmly with the scientists, hence painting the public in more passive terms. However, Powell and Colin (2008) who, while acknowledging that a concentration of power 'with the expert' is perhaps an inevitable part of public engagement with science, also highlight the benefits of encouraging the public to provide the structure to such engagement by co-designing and co-organising 'engagement activities'. Irwin (2014) proposes 'three orders' of civic engagement: the first order is the 'top-down' model in which scientific experts disseminate knowledge to a passive audience, the second order concerns increased dialogue between the public and scientific experts, while third order engagement involves well-informed, rational members of the public putting forth their own expert opinions. All these authors suggest the core benefit of encouraging public engagement is an increased level of trust in science.

Stilgoe et al (2014) are more circumspect: they recognise the potential benefits of increased public / civic engagement, but are unsure how effectively such benefits are being realised. Instead, they claim that work is needed to investigate the unintended consequences of public engagement with science. Fogg-Rogers et al (2015) challenge the idea that the public are interested in co-creative experiences with their research in the context of a public science festival. Their visitor survey indicates that the majority of visitors preferred lectures to other, more two-way forms of science communication such as discussions and hands-on labs; however, they acknowledge that this research was conducted at one festival only, though over three separate years. Also, their statistics suffer from a lack of information about visitors' pre-visit expectations; their discussion of the festival's content indicates that lectures were the festival's main communication format, and there is no discussion regarding how the event was promoted to the public, so it may have been that visitors were expecting to be lectured to.

2.3 Social Media

Social Media technologies can be defined as two-way, dialogical communication channels that enable direct interaction between institutions and their audiences (Korschun and Du, 2013; Smith and Iversen, 2011). Their uptake in the past ten years has been rapid, with 65% to 75% of internet users estimated to have joined a social network in 2012, compared with 8% in 2005 (Stein, 2012; Korschun and Du, 2013). In the Marketing literature, Social Media are described as key components of the latest 'generational shift' to 'Generation Y', implying that their strategic consideration is required by organisations such as museums (Leask et al, 2013).

Public engagement with Social Media involves entrusting resources to people who are playful, skilled users of digital image manipulation and publishing software, and who also may be cynical of authority. Hennig-Thurau et al (2010) liken spreading messages via Social Media to pinball: one can decide how hard and fast to place one's message on a network, and occasional opportunities to 'guide' it arise, but other than that, it bounces around, often in unexpected and unwanted directions. Several authors (Nakajima, 2012; Chouliaraki, 2010; Smith and Iversen, 2011) discuss the public's 'remix culture', and also how Social Media's blurring of publicity and privacy may cause user 'performativity' (i.e. turning aspects of their lives into media performance).

Another of Social Media's disruptive effects concerns their impact upon the 'old' media. Social Media enable countless millions of new media channels that are linked to individuals and to organisations of any size (Johnson, 2001). These channels can also have global reach (Waters and Lo, 2012). The outcome of this is that the previous, more hierarchical structures of old media, where ideas and information spread from the 'top down', are now in competition with these new channels, and information has more pathways via which to spread. Shirky (2009) claims that such a flattening of the media hierarchy has positively affected modern democracy. However, despite the increased quantity of channels via which information can flow, some contend that a decrease in quality of commentary and criticism (Lovink, 2011), and poor participant behaviour (Dahlberg, 2001), undermine Social Media's claim to improve democracy. A lack of sincerity and a tendency for the medium to strip nuance and detail from communication can make participants increasingly judgemental (Johnson, 2001; Wong, 2011). Fragmented narratives, decreased attention spans and participants' increased desire to 'perform' are also cited as hampering debate (Chouliaraki, 2010; Lovink, 2011). Also, participation in Social Media does not equate directly with 'appearing in public'. Social Media can make participants *globally* public, and posts also persist through time. Thus

expressing controversial points of view can cause problems such as abuse from strangers, or having one's comments held against you in future (Wong, 2011). Social Media's potential global reach may also heighten performativity, and the lack of concrete reality can enable satire or parody in ways that detract from the sincerity needed for effective democracy (Chouliaraki, 2010; Dahlberg, 2001).

2.3.1 Computational Social Science (CSS)

The increased use of Social Media has also resulted in a potential new source of data regarding human behaviour, which is part of a broader move to use data from internet sources in academic research. Computational Social Science (CSS) either works with data taken from the Internet; or analyses the behaviour of people using the Internet. CSS incorporates Psychology, Economics, Sociology, Political Science and Anthropology, as well as Computing, Mathematics and Physics (Conte et al, 2012; Lazer et al, 2009). CSS analyses many categories of digital data such as emails, mobile phone usage and credit card purchases (Giles, 2012), with Social Media also providing a significant and fast-growing data source (boyd and Crawford, 2012; Edwards et al, 2013; Giglietto et al, 2012).

The intention of CSS is to help Social Scientists investigate, and potentially alleviate, social problems such as financial instability, social divisions, health problems, crime and social unrest, by allowing their analyses to keep pace with social and technological change (Conte et al, 2012; Karpf, 2012; Lazer et al, 2009). It recognises that the amounts of data concerning human behaviour generated by and available to large organisations such as governments and corporations, and the research these organisations undertake using such data, risks marginalising the traditional role of Sociology completely (Savage and Burrows, 2007). In response, academia is obliged to investigate the implications of CSS techniques, from a position of longer-standing knowledge of social processes, either to validate, or to raise concerns regarding, their use (Edwards et al, 2013; Lazer et al, 2009).

One of the opportunities enabled by CSS is the ability to model complex social interactions across multiple ontological scales - e.g. from the micro, individual scale to the macro, global / social scale (Conte et al, 2012). Both Thumim (2010) and Graham (2012) suggest evaluation across these different ontological levels can cause specific problems for museums. The application of computing to such social complexities may also lead to insight regarding the structure and nature of cooperative relationships in social networks; how new forms of behaviour or social institutions

emerge; how culture forms, stabilises and spreads (Conte et al, 2012; Lazer et al, 2009); how ideas and individuals influence society; and the ways in which new 'Digital Publics' form around shared concerns and interests (Edwards et al, 2013). CSS also has the potential to allow data to be processed while maintaining information that might be destroyed by longer-standing statistical techniques (Conte et al, 2012). CSS also provides an entirely new ability to conduct near real time, longitudinal analyses of social trends among large populations, which were previously only analysable using 'snapshot' surveys (Edwards et al, 2013; Karpf, 2012). CSS may also allow analysis of previously 'hard to reach' segments of the population: those that tend to avoid partaking in surveys, for example (Housely et al, 2013).

This leads to the first of several problematic areas for CSS: ethical questions related to privacy and informed consent of participants. While Social Media is ostensibly 'in the public domain', people may not have intended for it to be used in research, and hence it may be unethical to do so. Also, data anonymisation must be undertaken cautiously as there are precedents where individuals' details in 'anonymised' published data have been used to infer identity (boyd and Crawford, 2012; Lazer et al, 2009). Kosinski et al (2013) epitomised this issue when they inferred many different types of sensitive personal information, such as sexuality, ethnicity and political orientation, with degrees of accuracy ranging from 60% to 95%, by analysing what people had 'Liked' on Facebook.

Other problem areas for CSS result from 'Social Media users' not necessarily being a representative social demographic (Giles, 2012). Indeed, the exact demographics of Social Media users can often be harder to ascertain than is the case in formal surveys, in which specific demographic questions can be asked (Edwards et al, 2013). Furthermore, CSS often depends upon technologies that have structures or behaviours inherent to specific Social Media platforms such as Twitter, Facebook and Flickr. Thus the data retrieved from these systems are not raw or unmediated (Tufekci, 2014; Lovink, 2013; Edwards et al, 2013; Van Dyke, 2012). Such issues highlight the potential dangers of a growing tendency to perceive large volumes of mediated, subjective information to be synonymous with 'the truth' (boyd and Crawford, 2012).

Producing computer models of social systems may also cause a tendency to 'bend the data to fit the model', to decontextualise it and alter its meaning (Tufekci, 2014). Indeed, on the topic of de-contextualisation, Krippendorf (2004) contends that it is impossible for meaning in text to be ascribed directly to the ideas and feelings of the author, as all text is interpreted by the reader; hence all meaning derived from the analysis of text needs to be seen as being created by the analysis itself. Studies using CSS techniques can also be hard to replicate, which may further undermine their credibility. As a result, CSS can be described as offering large-scale, but shallow opportunities for

analysis (Edwards et al, 2013; boyd and Crawford, 2012); any research that uses such techniques must therefore be open regarding the limitations of understanding that can be gleaned from using them. However, as both Savage and Burrows (2007), and Lazer et al (2009) point out, these techniques are already in use away from academia, often by organisations that know or care less about the problems outlined above.

2.4 Inspiration and Social Media in museums

The final section of the review brings together the two topics above, inspiration and Social Media, within the context of museums. It focuses on the following topics:

1. How museums try to inspire people.
2. The social impact of museum-related inspiration.
3. How museums use Social Media.
4. How inspiration in museums is evaluated.

2.4.1 How museums try to inspire people

Before the 1980s, museums considered their primary role to be collecting and preserving objects. This resulted in an increase in the specialist knowledge and expertise of museum staff, and an attendant distancing of the staff from the general public (Skramstad, 2004; Hein, 2007). Since the early 1980s, however, consideration of the experiences of visitors has increased (Barett, 2011), resulting in a sector that believes museums exist to:

> *"Engage a wider population… Enable as much delight, motivation and enjoyment by as many people as possible" (BritainThinks 2013B:10)*

Hooper-Greenhill (1994) suggests the increasing importance of an understanding of visitors' psychology. Increased understanding of emotion is hence considered important (Scott, 2009; Holden, 2006). Regarding experiences in museums, Kaplan states:

> *An exhibition that communicates must educate and excite the mind and the senses; when communication is optimal it creates an 'affect' among spectators and*

> *audiences. Affect happens when various exhibition elements combine in subtle and perhaps ultimately unpredictable ways for individual viewers, who are then able to cross an invisible 'threshold' of cumulative personal and cultural experience. Thus, the viewer is an active participant in the communication process, not a passive observer (1995:41).*

This statement is echoed by Chan (2008), who uses service experience measurement techniques from the Marketing sector to confirm that museums affect us on both cognitive and emotional levels. Yellis (2010) discusses the importance of factoring the emotional aspect into exhibition design using 'sensory cues'; and Usherwood et al (2005), relate the feelings of empathy expressed by museum visitors towards the people referred to in exhibitions.

Museums are often described as having an advantage when generating profound experiences, with art given particular credence (Greenblatt, 1991; Carey, 2006; Dewey, 1938; Curtis, 2009). This advantage is attributed to visitors' willingness to 'open themselves up', focus upon and absorb such experiences (Duncan, 1991; Selwood, 2010; Kirchberg and Tröndle, 2012). So deep are such museum experiences that they are described in the literature as 'numinous' (Latham, 2007); they can generate 'reverence' and 'awe' (Yellis, 2010). Museum-based experiences are often described as having a 'transformative' capacity. Soren states:

> *Transformational experiences seem to happen if we discard old ways of thinking and provide new opportunities for individuals to invent personal knowledge and explore new ideas and concepts. Creating challenges in which people can discover the interconnectedness of ideas are important to personal change (2009: 234).*

Such change is not just about acquiring new knowledge; it can also affect deeper, longer-term and more strongly-held beliefs; personal identity itself can be altered. Breathnach (2006) refers to 'narratives of the self' which interactions with heritage sites and objects affect, while Jones describes visitors constructing 'authenticities of the self' by positioning themselves in relationships with historical objects that are nodes on a "…network of relationships with past and present people and places (2010:189)."

One positive outcome of museum-based transformative experiences can be an increase in the wellbeing of the visitor, a phenomenon investigated at a personal level (Ander et al, 2013; BritainThinks, 2013A) and discussed at the national policy level in the UK (The Museums Association, 2012). The idea that engaging in artistic and other cultural activities might be good for one's sense of wellbeing is not a new one, though in recent years there has been a shift from thinking that Dewey's

(1938) assertion that the passive consumption of art (or 'art-worship') was enough to induce a spiritual sense of wellbeing towards the idea that creative participation in artistic activity has a much more beneficial effect (Carey, 2006).

A wellbeing framework with a high level of impact upon the museums sector, in the UK at least, is the New Economics Foundation's Five ways to wellbeing (Aked et al, 2008), which underpins The Happy Museum Project (Thompson et al, 2011). An example of how the Five ways to wellbeing concept has transferred to the museum sector is Leicester University's Mind, Body, Spirit project (Dodd and Jones, 2014), which conducted Action Research (AR) with a set of UK museums to introduce the concept of wellbeing into their work, and used the University of Central London's Wellbeing Measures Toolkit (Thomson and Chatterjee, 2013) for its evaluation (see Chapter 9, Section 9.1.2 for a discussion of this experiment).

Another important topic for museums is that of *authenticity*. Authenticity is linked closely to *experience* (Pine II and Gilmore, 2007), which is in turn an important component of inspiration. In a museum context, authentic experience is influenced heavily by the honesty with which the originality of objects is communicated (Kirchberg and Tröndle, 2012; Hede and Thyne, 2010; Yellis, 2010; Cameron, 2004; Hooper-Greenhill 1995). The role of the curator is seen as particularly key to this process (Chhabra, 2008, 2007; Crew and Sims, 1991), as is the effect that reproduction of objects can have upon authenticity (Bolter et al, 2006; Cameron, 2006; Benjamin, 1936;). In recent years, new digital reproduction and communication processes (which are particularly relevant to this thesis) have further influenced museums' authenticity (Pujol and Champion, 2012; Newell, 2012; Dribin and Rickhoff, 2010), in ways that could potentially lessen the perceived importance of the role of museum professionals such as curators (Marty, 2012).

Communicating well with visitors is vital to museums, both on a personal level between curators and visitors, or more widely via major exhibitions and the media (Hooper-Greenhill 1995). This prioritisation of communication over collection is sometimes called the 'New Museology' (Barrett, 2011). It began in the 1980s (Weil, 2004; Cameron, 2006), and is part of an overarching 'demystification' process throughout the cultural sector (Holden, 2004), which recognises the potential for arts and culture to inform public discourse on important topics (Barrett, 2011). The literature also describes museums themselves as 'channels' or 'intermediaries', via which narratives are disseminated. Museums are referred to as 'transmitters' of information, and visitors 'receivers' (Hooper-Greenhill, 1994, 1995). Museums are also called 'brokers' in a 'cultural exchange' (Russo, 2011).

Visitors also bring their experience of other media into museums: Wallace describes how:

> *… visitors now enter museums with well-stocked mental film banks. In particular, a vast amount of media history is being produced and consumed. People carry in their heads both raw footage (video clips culled from endless replays on TV) and narrative sequences (recalled from movies, docudramas and documentaries) (1995:111).*

One particular advantage for museums is the way the public consider them free from 'media bias': instead perceiving them as content aggregators that allow sources to be compared and their veracity to be judged (Usherwood et al, 2005). In the 'New Museology' model, the exhibition becomes a narrative that is constructed by visitors using the objects chosen by curators. Curators can choose how much they attempt to intervene in such narrative-building, but the visitors control the process nevertheless (Crew and Sims, 1991). Exhibitions, in general, use specific objects to make general points, but the visitor will always gather such 'big' ideas and relate them back to the specifics of their own experience (Rounds, 2012). The skill of the curator, then, becomes a case of providing visitors with stories to connect with. Yellis states:

> *…successful exhibits are permeated by and layered with story. Everywhere you look, everywhere you go, there is something to immerse yourself in, something to go deeper into, something to surround and support and involve you. Most interesting of all, the stories are all true, or at least we think so, and, hopefully, are unique stories that have never been told before—or, at least, never told in this way (2010:94).*

2.4.2 Museums, inspiration and society

This section examines the social function of museums to try and define why it matters that museums should inspire us; why, as Scott states:

> *The historical value of museums is experienced through the communal archive, cultural transmission, experiencing the past, learning the lessons of history and a sense of belonging. Social value is experienced through museums' contribution to sense of place, community identity and the use of its civic spaces (2009:200).*

Museums help spread and maintain important ideas. As 'museum ideas' come from an Enlightenment tradition of rationality, and the public tends to perceive them as 'unmediated facts', museums can strengthen the beliefs that bind society (Duncan, 1991). However, this can also over-emphasise museums' authority, until they perceive themselves as elevated above visitors (or, as a result, non-visitors) (Kirchberg and Tröndle, 2012).

Museums can be used (and abused) to strengthen ideas that underpin nations and governments (Cameron, 2008B). One way this occurs is via 'canonisation' (Cameron, 2006), in which, for example, 'the top 100 objects of nation X' are chosen: a process that Social Media technology lends itself to (Lovink, 2011). Žižek (1989) describes how such processes can cause ideologies to form, with the mass media in particular enabling ideology formation that benefits the wealthy individuals who control them (Connolly, 2002; De Luca et al, 2012). As a mass medium of a sort, museums are not immune to being so abused (Kaplan, 1995). The perception of museum trustworthiness makes them ideal for proclaiming national triumphs (Silberman 2008; Coffee, 2013; Duncan, 1991).

By contrast, Cameron (2005, 2008B) describes the freedom museums give visitors to reinterpret history in more personal ways, and this freedom may also extend to exhibition developers (Crew and Sims, 1991), and can thus foster innovation. If exhibition developers and members of the public alike have more personal freedom to express and interpret ideas, more risks may be taken, with the potential to provide 'life changing' experiences for audiences (McMaster, 2008). Happily, research into public opinion about museums indicates that the UK public approve of museums spreading innovative ideas (BritainThinks, 2013A), recognising inspiration and innovation as a factor in the progress of society.

Museums' role as social places that support important ideas allows them to "…create the conditions in which a healthy functioning democracy can flourish (Usherwood et al 2005:93)." As discussed in Section 2.2.2, Habermas's theory of the Public Sphere makes public opinion the primary legitimising force within a democracy (Calhoun, 1992). For a democratic state to be healthy, the public must be well informed, and museums can help fulfil this. By enabling forces such as shock and disgust, museums can also help disrupt the notion of a rational 'public opinion', too, though the notion of 'shock-enabled progress' is reconciled with the Public Sphere to a degree with the idea of 'counter-publics': new communities that form from the shared rejection of mainstream public opinion (Warner, 2002).

Public opinion formation requires discussion and debate, which museums can facilitate. However, there is a stumbling block: the public, in the UK at least, appears vehemently opposed to museums

hosting debates (BritainThinks, 2013A), though an earlier survey by Cameron (2005) suggested Australian and Canadian visitors were more open to it. This sentiment rests on the idea of museums as 'temples' – sacred (if secular), contemplative spaces - which the public may not wish to see undermined. The contradictory requirements for museums of delivering on their civic requirements while retaining their 'sacred aura' is described in a seminal paper by Cameron, who believes that museums can provide both by maintaining a conscious separation between them. He states:

> *…there is something missing in the world of museums and art galleries. What is missing cannot be found through the reform of the museum as a temple. In my view, it is clear that there is a real and urgent need for the reestablishment of the forum as an institution in society. While our bona fide museums seek to become relevant, maintaining their role as temples, there must be concurrent creation of forums for confrontation, experimentation, and debate, where the forums are related but discrete institutions (Cameron, 2004:68).*

Carnall et al (2013) raise two further issues about the 'temple': firstly, they emphasise a preoccupation with social responsibility which can effect museums' participation in and facilitation of debates. Speaking from the perspective of a natural history museum, they describe how dialogues with the public are often impregnated with potentially irrelevant emphasis on the social, to the detriment of the scientific. Secondly, they perceive a tendency for (potentially) more knowledgeable museum staff to dominate interactions with the public, a concern echoed by Coffee (2013), who worries that some museum professionals see themselves as elevated professionally, or even morally, above visitors.

As museums could potentially foster *any* type of ideology, what must they do to foster *democracy*? Firstly, they need to enable controversy and give all sides of the debate a fair hearing, but secondly they need to allow *civilised*, *rational* discussion of such ideas (Scott, 2009). It is important for democracy that the public are informed about issues that affect society, no matter how troubling, and many commentators support this (e.g. Cameron, 2004; Cameron, 2005; Selwood, 2010; Jensen and Kelly, 2009; Ashley, 2013). Harrison (2005) further suggests that the rich environments of modern museum exhibitions make them particularly effective at performing this role, while Ames (2004) makes a similar case for the power of art.

Cameron (2004) and McMaster (2008) both emphasise the risk of tackling controversy for museums, but stress a moral obligation to be courageous. Wallace (1995) also illustrates how 'controversy' sometimes conflates with 'relevancy', and thus help visitors relate museum content to their own

lives. Controversy is also subjective: the capacity to take offence, or to cope with challenging ideas, varies from person to person; so the idea of a "…consensual, collective morality (Cameron, 2005:215)" is itself problematic. This echoes the concern of Harrison (2005), who suggests that some of the burden of dealing with controversy must fall upon the visitors too.

The powerful effects of art and culture upon individuals allow museums to: "…play an important role in catalysing a change in value and meaning in society (Curtis, 2009:175)". Such change is not engendered merely by provocation, however. Museums are also expected to help the general public achieve such a balance by engendering *"… social and civic competences* (Zipsane, 2011:137)*"*. This can be related back to the *theory of rational communication* introduced in Section 2.2.2; for instance museums may provide 'autonomous' environments for debate, due to their perceived lack of bias. This is further highlighted by Thumim (2012), who describes museums' willingness to allow the public to speak with their own voices. Cameron also describes how museums are often tolerant, calling them a "…non-judgemental environment to explore sensitive topics (Cameron, 2005: 228)". Whether museums can *really* claim autonomy given their reliance on government funding and donations from the wealthy is, however, debatable (O'Neill, 2006).

Another effect that museums can have is to encourage communities to build, both around and against particular ideas (Barrett, 2011; Warner, 2002). Community formation can be a gradual, painstaking process, but it is a process that, according to the UK Museums Association (2012), museums are obliged to support in order to realise their potential. Both Silberman (2008) and Travers (2006) explain how community-building arises from using museum content to connect across cultural and generational divides. Museums have been more inclusive of a broader social cross-section due to the New Museology (Hooper-Greenhill, 1994), when curators switched from being 'protectors of objects' to 'facilitators of participation' (Barrett, 2011). Wider inclusion has inspired exhibitions about cultural minorities which examine history from under-represented points of view (Harrison, 2005), and in the present day, when immigration is more common and national cultures are less homogenous, it is important that they continue to do so (Holtorf, 2011).

The increase in inclusivity may have been more gradual than is apparent from some of the literature, however. In the early days of the New Museology, papers such as Duncan (1991) and Wallace (1995) discussed how museums could define the identity of communities on their behalf, or lend their professional expertise to help minority causes. Even publications as recent as Skramstaad (2004) talk of museums being leaders in the community (though Skramstaad at least acknowledges that communities may not wish to be led). This is a language of control over community groups, and not of genuine service provision. Indeed, both Harrison (2005) and Carnall et al (2013) make the point

that the concept of 'community' is nebulous and tends to be defined from Western / European perspectives by the sector. Indeed the very term 'inclusive' has an implication of 'granting permission'.

One step closer to enabling fuller inclusion is to devolve control over the museum to the community, in ways such as those described by the art gallery professionals interviewed by Fischer and Levinson (2010). In one incident they describe having to approach a group of local young artists via a 'cooler' intermediary to persuade them to exhibit their work: it is clear where the power lay in that relationship. This more modern approach to community building models museums as heavily-connected nodes on social networks, using terms such as 'connectors' or 'contact zones' (Museums Association, 2012). This has led to projects such as The Open Museum in Glasgow: a museum, without premises, that provides access to objects from the city's collections and helps communities develop exhibitions on their own turf (O'Neill, 2006).

This is in line with literature that conceives of society as a whole as a multi-layered network, within which social movements are as likely to emerge from 'the bottom up' (the 'micropolitical' level) as well as be imposed from 'the top down'. Analysing the network within which the museum operates might enable a more accurate assessment of its influence. Barrett (2011) also makes the point that 'community' is never fixed or static: it is a fluid concept, a process, within which individuals constantly update their relationships with the society they inhabit. As a result, any evaluation of a museum's influence needs to be ongoing: a constant monitoring rather than a series of occasional snapshots.

2.4.3 Social Media in museums

Many museums have sophisticated online presences which encourage and support 'real' visits, and enable 'virtual' visits from around the globe. As part of this work, museums use Social Media to widen public access to museum resources (e.g. Fletcher and Lee, 2012; Hausmann, 2012A; Marty, 2012; Waters and Lo, 2012; Finnis et al, 2011; Kelly and Russo, 2010), and also use Social Media to collaborate with visitors by using techniques such as crowdsourcing or folksonomy (i.e. the 'social tagging' of museum objects) (e.g. Proctor, 2013; Hall and Zarro, 2012; Mancini and Carreras, 2010; Vaughan, 2010; Jensen and Kelly, 2009; Stuedahl, 2009; Kalfatovic et al, 2008; Russo et al, 2008). The literature also discusses how museums might use Social Media to build or strengthen communities

among their visitors (e.g. Cairns, 2013; Brandão et al, 2012; Russo, 2011; Proctor, 2010; Waterton, 2010).

More negatively, there is also discussion about how all of these Social Media-enabled processes might impact upon the authority of museums (e.g. Phillips, 2013; Arora and Vermeylen, 2012; Stein, 2012; Terras, 2011; Wong, 2011; Russo et al, 2008; Russo and Watkins, 2007). Hausmann (2012A) also listed the following barriers to the effective use of Social Media by museums:

- Limited resources with which to use Social Media (e.g. staff, computers).
- The cost-benefit ratio –Social Media is hard to start working with without investing in equipment and training.
- The hierarchical nature of museum organisations – decision making may not keep pace with technology.
- The difficulty in measuring a return on Investment – this is particularly relevant to this research and is covered in Section 2.4.5.

Surveys of the use of Social Media by museums are rare, but such as they are, they indicate that the promotion of events was the most common use. Lovejoy and Saxton (2012) surveyed the Twitter usage of 100 US non-profit organisations, of which only 15% were from the Arts, Culture and Humanities sector, and coded the Tweets (i.e. posts) found into three broad categories: *information*, *community* and *action*. Of these three categories, both information and action were generally considered 'promotional' in nature, with only community being related to attempts to enter into dialogue with an audience. The majority of Tweets (66.4%) fell into the one-way 'promotional' category. Hays et al (2012) conducted a content analysis of the Social Media use of national tourism organisations (e.g. Visit Britain or Tourism Malaysia) and found that they primarily used Social Media to support marketing efforts made via more traditional channels, and as such the majority of their posts were also non-interactive. Fletcher and Lee (2012) conducted a museum-specific survey with 315 respondents, which similarly concluded that promotional activity was the most common reason for using Social Media in museums, with Facebook and Twitter being the most commonly-used platforms. Promotional activity being the most common use for Social Media is also supported anecdotally by Mancini and Carreras (2010), Kidd (2011) and Hausmann (2012A). Marty (2012) and Hays et al (2013) also discuss the difficulty in accounting for the success of promotion via Social Media, whereby visits, ticket sales and so forth are hard to attribute directly to their use.

Hausmann (2012B) contends that museums are particularly reliant upon promotion via visitors' Word-Of-Mouth (WOM), an activity that has been deemed particularly relevant to Social Media. Cao

et al (2009) describe such Electronic Word of Mouth (EWOM) and conclude that effective EWOM depends upon two aspects of Social Media: the effects of the network within which WOM may spread, and the characteristics of those active in such networks. Williams et al (2015) conducted an innovative digital survey of Twitter data relating to a tourism destination and related festival; one of their key conclusions being that EWOM is increased by encouraging the creative participation of influential users on the network.

Because of the importance of WOM, museums are now encouraged to 'open-up' to feedback and questions, in the assumption that such user-generated content will spread information about the museum through online social networks, and lead to engagement with new visitors (BritainThinks, 2013B; Arora and Vermeylen, 2013; Russo et al, 2009). This has led some museums to rethink their communications strategies (Marty, 2012; Vaughan, 2010), potentially including Social Media in exhibition design and in electronic catalogues (Hausmann, 2012A; Villaespesa, 2013). Thus Finnis et al (2011) state that Social Media are:

> *"…about having the right content in the right channels to engage the right audience in the right way. This can mean big opportunities for institutions with limited resources if they can get this right." (Finnis et al, 2011)*

However, there is plenty of acknowledgement within the literature that "getting it right" can be difficult: Walters and Lo (2012), Fletcher and Lee (2012), and Kidd (2011) all emphasise the effort required to engage an audience and describe how Social Media efforts can lose momentum.

With regard to alternative uses of Social Media aside from promotion, Kelly and Russo introduce the concept of *value networks*:

> *Value networks… create new partnerships through exchange and the relationships between roles. They enable external partners, individuals and institutions to collaborate in the development and distribution of knowledge which has social and / or economic value through user innovation (2010: 292).*

First generation value networks arise when museums put their collections online. Second generation value networks involve both the sharing of data between institutions, and increased consideration of users. Social Media, Kelly and Russo believe, enable third-generation value networks, where users repurpose museum content for themselves.

The description of 'third generation value networks' shows how Social Media cause online content to cross 'virtual' institutional boundaries (Mancini and Carreras, 2010). One major project that illustrates this is the Flickr Commons, discussed by Kalfatovic et al (2008), Terras (2011), Vaughan (2010), Marty (2012), and Cairns (2013). A global consortium of museums uploaded images to the Flickr image sharing website, resulting in marked increases in access to those images (Kalfatovic et al, 2008; Marty, 2012). According to Vaughan's survey of consortium members (2010), 94% cited widening access as a very important reason for joining the Flickr Commons. However, whether such use of resources within third-party Social Media platforms increases traffic back to institutions' websites is less clear: Cairns (2013) indicates a 20% increase in traffic to the Library of Congress site as a result of the Flickr Commons, but both Marty (2012) and Finnis et al (2011) warn museums not to not to take such traffic gains for granted.

Another caveat for museums hoping to use Social Media to widen public access was that items uploaded onto Social Media platforms could be repurposed by users in unexpected ways that can challenge museums' authority. Russo et al state:

> *As museums attempt to make their collections and expertise more accessible on audience terms, certain concessions to experimentation will need to be made, allowing audiences to express what it is that they value as opposed to being offered a learning environment focused exclusively on institutional views. The challenge for museums is in its ability to support multiple representations and critical examination in a public forum (2009:160).*

Many authors describe the ways in which Social Media enable people to apply information and knowledge to their personal interests. According to Cameron and Mengler (2009), Social Media usage by museums 'loosens' museum knowledge, 'liquefying' it in a manner reminiscent of the 'liquid networks' that enable inspiration and creativity described by Johnson (2010). Kelly (2010) claims that Social Media support the 'interest in abstract ideas' of those considered more likely to visit museums according to a major Australian survey of 2005. Kidd recounts how Social Media: "…put the story centre stage; recognising and even embracing subjectivity (Kidd, 2011:65)" in a manner contingent with the New Museology.

The most easily-occupied 'online territory' for museums is their local community network. Giaccardi (2011) explains how Social Media, particularly when accessed via smartphone, can strengthen visitors' senses of the places that museum knowledge pertains to *while they move around them*. Stuedahl (2009) proposes using Social Media to 're-contextualise' museum objects. Social context

has also been a major theme in art since 'relational' or 'social' aesthetics emerged in the 1990s, and Social Media can be used to contribute to artworks that incorporate the viewer (Nakajima 2012). Contextualising visitors within museum knowledge provides: "…the means to create individual narratives that more closely reflect lived experiences (Cairns, 2013:109)", in ways that both generate insight about museum objects, and create new relationships between participants (Proctor, 2013; Smith and Iversen, 2011).

The immediacy of Social Media stands in contrast to more formal museum knowledge. Cameron and Mengler state:

> *…museums need to re-imagine themselves as information spaces that take account of how people use, create and engage with information, involving alternative knowledge structures such as shifting, navigating, accessing, creating and viewing. One of the barriers to these flexible non-linear systems is the nature of the museum collections documentation space itself – that is, one that is slow, stable and enduring to include qualities that allow speed, fluidity and momentary interactions (2009:203).*

Vaughan (2010) describes how Social Media enable museums to link their knowledge to current events; Proctor (2010) describes how the contemporary (in the form of temporary exhibitions and big 'events') is beginning to take precedence over the historical in museums, due in part to Social Media, and Charitonos et al (2012) describe how Twitter's chronological ordering, rather than logical structuring, of information might be at odds with the typical structures of museum knowledge.

The increased use of Social Media in the museum sector is not just about museums spreading their knowledge out to the public. Social Media also provide opportunities for collaboration between experts at different institutions (Proctor, 2010), and visitors bring their own networks into museums. Museums are learning to encourage the latter by adding Social Media elements to displays for users to interact with, using smartphones in particular (Villaespesa, 2013; Soren, 2009; Giaccardi, 2011), often resulting in: "…the emergence of unexpected, often mutually beneficial outcomes (Wasserman, 2011:23)."

Analysis of the new experiences created by the use of Social Media both by and in museums is not entirely optimistic. Stein (2012) is cautious both about reduced information quality caused by Social Media, and about the ability of the public to filter out such poor quality information, though he sees a role for museums in helping them to improve their filtering skills. Arora and Vermeylen (2013) express concern regarding how the apparent ease of use of Social Media may mask complex political

decisions about the context and relevancy of art that are made upon the users' behalf, without their knowledge. Van Dijck (2011) takes this further, explaining how algorithm developers make such political decisions; the algorithms categorise, sort and filter Social Media content, make innumerable cultural and political decisions on our behalf as they do so, then dress the output up as 'collective memory' or 'social experience'.

Given museums' traditional role as public spaces encouraging civil behaviour, their ability to alleviate problems relating to the poor quality of debate in Social Media is often mentioned within the literature, and several commentators propose a moderating role for museums (Stein, 2012; Russo, 2011; Mancini and Carreras, 2010; Proctor, 2010; Cameron and Mengler 2009; Cameron, 2008A). There is some evidence from the few surveys of museum Social Media use conducted so far that behaviour in museum Social Media and social-curation platforms is indeed civil (Vaughan, 2010; Hall and Zarro, 2012). Museum's access to relevant, meaningful content is also cited as an advantage when encouraging visitors to consider answers to important social questions (Villaespesa 2013; Stein, 2012), and museums' lack of perceived bias and high levels of trustworthiness are also a factor (Usherwood et al, 2005). Russo (2011) also refers to the potential lack of willingness within the museum sector to tackle controversial subjects as a barrier to realising the potential of Social Media (Russo, 2011), and while Kelly (2010) suggests a willingness among *visitors* to engage with controversial subjects in museums, this was strongly contradicted by the Museums 2020 public consultation in the UK (BritainThinks, 2013A).

Some are wary of the support for the state and establishment museums have shown in the past. Kidd, for instance, states:

> *As museums are being increasingly conceptualised as "forums" and recognised as "contact zones", places traditionally of imbalance, asymmetry, and often disempowerment, talk of "democracy" is now rife in the rhetoric. However, my own research into participatory projects across cultural institutions has shown that in practice the historical and embedded nature of those imbalances can render even the best conceived and facilitated projects problematic when assessed in terms of democracy and ownership (2011:65).*

Both Giaccardi (2011) and Cameron (2008A) recognise the role that museums have always had to ascribe meaning and significance to objects, a process which (as described by Žižek (1989)) may strengthen the 'fantasy' of their value, and increase our desire to own objects with such status. The algorithmic processes that make political decisions on our behalf discussed by Van Dijck (2011), may

not, therefore, be doing anything particularly new: they instead indicate a shift in the role of mediating museum content from the museum curator to the algorithm developer.

2.4.4 Evaluating museums

Analysing the impact of museum services upon audiences constitutes a subset of museology known as *Visitor Studies*. Hooper-Greenhill (1995) provides a short chronology of this research: it began in the 1960s by concentrating on visitors' demographic data, then increased in detail and sophistication by considering visitors' prior dispositions, interpretations of museum experiences, and post-visit levels of satisfaction. By the 1980s, detailed ethnographic studies of museum visitors were taking place, as were more involved quantitative studies using marketing techniques such as segmentation and barrier analysis (Barrett, 2011). The sector began to realise the influence of the *entrance narrative*: the variety and effects of pre-visit expectations that visitors from different demographics brought to museums (Coffee, 2013; Kirchberg and Tröndle, 2012). However, while individual museums may disseminate data about their visitor numbers (e.g. Tate, 2013; Science Museum, 2013), there is little research about audience engagement, relative to the volume of theoretical research related to the design of exhibitions or the use of new technology, for example (Kirchberg and Tröndle 2012).

Successful evaluation and continuous improvement of museum performance are important: Marty (2012) warns that failing to gain credit for their positive contributions could raise questions about the necessity of museum experts, even though, he contends, their expertise *is* as vital as ever. Similarly, if there is no evidence of public benefit from museum services their sources of funding may run dry (Russo, 2011; Scott, 2009). Conversely, though, opportunities to apply valuable influence may increase in a world in which the fluidity of information and knowledge can affect perceptions of object value (Arora and Vermeylen, 2013), and museums should know when they have asserted such influence.

One of the few broad studies of the museum sector in the UK was by Travers (2006), who claimed it was the first wide-ranging amalgamation of data about museum use and activity. The Travers report includes data such as museum expenditure and income, visitor numbers, and the number of loans and publications made by the museums surveyed. Short case studies are included, but are low on

detail. Alternative techniques to assess *intrinsic* public and cultural value were referred to by the report, but were not used.

Regarding visitors' perception of museums, the UK Museums Association commissioned a survey of public opinion concerning the role of museums, and concluded that museums are trusted sources of information for the public, who have a strong emotional attachment to them (BritainThinks, 2013A). Two further studies, Usherwood et al (2005), and Brophy and Butters (2007) considered museums alongside other 'repositories of public knowledge' (i.e. libraries and archives); Usherwood et al also concluded that the public trust museums to provide unmediated sources of factual information. Brophy and Butters analysed the public's requirements for museums, with 'acquisition, viewing, manipulating and discussion of content' and 'enjoyment of cultural experiences' coming closest to the topic of inspiration.

One method of considering and managing information about museum audiences is by *segmenting* them. The process of audience segmentation was initially conceived to study consumer behaviour for activities such as product marketing, but its application to the arts, culture and hence museums is now common. The purposes of segmenting an audience include:

1. Aiding strategic thinking by management, by enabling the mix of content and services provided by a cultural institution to be lined up with audiences that are likely to be interested (Arts Council England, 2011A).
2. Helping to ensure a good balance of events for different interest groups.
3. Attracting funding and sponsorship for exhibitions and other events by aligning them with companies and organisations that aim their products and services at similar audiences.
4. Providing focus for the development of content, or infrastructure, by giving staff target audiences to consider, or by helping content creators find audience members to collaborate with directly.
5. Training staff to handle various visitor groups according to their needs.
6. Targeting advertising and other promotional activities.
7. Deliberately targeting audience segments that do not currently attend (Arts Council England, 2011A).
8. Focusing evaluation upon relevant audience segments.

Some examples of audience segmentation activity related to museums and wider cultural audiences include:

- The Target Group Index (TGI): a classification of the UK leisure market into six segments such as “couch potatoes”, “hedonistic dilettantes” and “culture vultures”. The classifications are based upon an annual 25,000 person survey of leisure activity (Morris Hargreaves McIntyre, 2006).
- Arts Council England’s Arts Audiences insight: incorporates 13 segments with names such as “urban arts eclectic” and “mid-life hobbyists”, and derived from the TGI index and the Arts Council’s own ‘Taking Part’ surveys. These segments are organised using a two dimensional matrix that matches level of engagement with the arts against the likelihood of the individual attending an event. The audience segments are defined using detailed descriptions of individuals within each segment (Arts Council England, 2011B).
- Audience Spectrum: developed by The Audience Agency and Experian on behalf of the Arts Council, the Audience Spectrum replaces Arts Audiences Insight and includes segments with names such as “Commuterland Culturebuffs” and “Home and heritage”. Audience Spectrum also incorporates data from Taking Part, but further includes data from Experian and the cultural organisations that use the system, too (The Audience Agency, 2015).
- Culture Segments from Morris, Hargreaves, MacIntyre (2013): a classification of eight segments with names such as “release” and “expression”, from an UK cultural consultancy and research agency with a background in conducting audience research for museums such as the Tate.
- Falk and Dierking (2013): a segmentation scheme specifically related to museum audiences, with seven classifications such as “explorers”, “rechargers” and “affinity seekers”. Falk (2009) originally produced his classifications as a reaction to what he perceived to be an over-reliance upon standard demographics such as social status, age, sex or ethnicity in museum Visitor Studies.

All of these schemes would fall under what Black classes as ‘…psychographic segmentation which relates to lifestyle, opinions, attitudes etc (2005:11).” Falk and Dierking’s segmentation scheme is criticised by Dawson and Jensen (2011) for three reasons: they found flaws in the statistical methods used to create it, they take issue with the authors’ reaction against demographics embodied within it (vindicated, to some extent, by the addition of the two new ethnically-related segments in the most recent version), and they raise concerns with what they label the ‘reductionist’ concept of categorising visitors using simplified conceptions of their identities as a whole, given how susceptible ‘identity’ is to contextual factors, and how liable it is to change. The last of these criticisms could also be levelled at any of the segmentation schemes described above.

In the virtual world, audience segmentation is one of the fundamental aspects of Google Analytics, the most widely-used website usage analysis tool, which provides website owners with the ability to match sections of their websites to defined audience segments, then track user behaviour and generate statistics related to those segments (Finnis et al, 2011). There are also some examples of using digital methods to generate audience segments automatically by generating clusters of museum survey data or Twitter data related to arts and culture. The first of these examples (Brida et al, 2013) suffers from the difficulty of creating a meaningful questionnaire about the nature of a museum visit, which is an issue that the second study (Williams et al, 2015), involving a much larger sample of more open-ended Twitter data, avoids.

A more fundamental topic related to the evaluation of culture concerns the difference between *instrumental* and *intrinsic* value. Holden produced two key papers (2004, 2006) in which some of the issues related to the analysis of public engagement in the cultural sector are discussed. Among these were:

- A tendency to measure the most easily captured metrics, not the most valuable.
- A preoccupation with cultural production (i.e. how to create exhibitions) not consumption (i.e. what exhibitions achieved).
- A concentration on objective outcomes ('how many people attended?'), not subjective responses ('how did people benefit from attending?').
- A lack of understanding about why evidence was collected and how it was used.
- Inability to act upon evidence collected (Holden, 2006).

He also discussed further shortcomings regarding the ways in which the cultural sector was evaluated instrumentally rather than intrinsically, stating:

> *We need a language capable of reflecting, recognising and capturing the full range of values expressed through culture. Some of those values may be covert and naturalised, they may coexist or conflict, but only with clarity about what they are can we hope to build wide public support for the collective funding of culture (2004:9).*

The classic method of evaluating cultural institutional performance is to *instrument* it. Instrumental assessment of culture comes from considering both straightforward measures (such as counting museum visitors), and ancillary effects (such as increases in spending in the local economy due to a new museum). The biggest problem with attempting such instrumentation of cultural activity is that it is extremely hard, if not impossible, to correlate such activity with ancillary effects (Holden, 2006). Reasons for this include:

- Cultural events of very similar types can have widely variable effects. For example, a community theatre project would have very different benefits for the local community to a professional theatre company putting on the same play in the same theatre.
- Cultural events do not affect people and society evenly. For instance, the benefits of two art projects in different schools will vary depending upon the prior educational level of the children involved, even if the projects are funded and organised in the same way.
- Cultural participation and benefits are rarely produced in direct, linear proportion: 'more culture in', rarely leads immediately to 'more benefit out'; a 'critical mass' may need to build first.

Furthermore, it is hard to assess the comparative advantage of the arts over the benefits that the same level of investment in another solution might return (McCarthy et al, 2004).

Regardless of such issues, measuring instrumental value remains common practice, and cultural projects may be altered, indeed compromised, to support ancillary benefits and make such benefits easier to measure. Such inclusions within cultural projects may also require museums to make complicated strategic decisions about which social processes they would best support (Zipsane, 2011), and thus may move cultural professionals into territories better suited to others (Rounds, 2011; Scott, 2009). Another issue is that the things easiest to instrument become those most often evaluated, regardless of the value in doing so (Malde et al, 2013). Symptoms of this, according to Holden (2006), are the predominance of reports about the cultural *production*, where information about effort, costs and the activity of cultural professionals is easy to acquire; and the accompanying lack of information about cultural *consumption*, which requires expensive surveys, review by experts and other activities that drain project budget without necessarily improving the product. In summary, Holden states:

> *There are, then, problems with the instrumental argument for culture both because the evidence is weak, and because of the systemic effects that the concentration on outcomes and impacts has produced. With an ever-growing body of evidence we seem to have lost sight of two things: one, that data is not knowledge; and two, that even the best objective data fails to account fully for why culture should be funded. The value of culture cannot be adequately expressed in terms of statistics. Audience numbers and gallery visitor profiles give an impoverished picture of how culture enriches us. Current forms of impact measurement are necessary, and they need to be improved, but they can never be sufficient (2004: 21).*

Holden and others (e.g. Selwood, 2010; McMaster, 2008; Travers, 2006; McCarthy et al, 2004; Weil, 2004) argue, therefore, that profound experiences need alternative forms of evaluation. This has led to an increased consideration of *intrinsic value*, for instance Selwood's review for the National Museum Directors' Council (2010) and Clark and Maeer's evaluation of the Heritage Lottery Fund (2008). Intrinsic value seems very close conceptually to this research, as shown in this statement from Scott:

> *Instrumental learning outcomes are associated with acquiring facts and skills. But the learning that was most valued [by museum visitors] was expressed in the affective language of the intrinsic dimension, using words such as enrichment, discovery, enlightenment, inspiration, perspective, awareness, insight refreshment, affirmation, joy, pleasure and excitement (2009: 199).*

Another attempt to steer evaluation of museums in this direction was the UK Department of Culture, Media and Sport's *Peer Review Pilot* of 2009. This was shaped by McMaster's report of 2008, which tried to address intrinsic value by using the concept of *cultural excellence*. 'Excellent' culture, according to McMaster, incorporated risk-taking, innovation and reduced barriers to access (e.g. by offering free entry) to maximise the chances of life-changing events for members of the public. Another aspect of this philosophy, which opened it up to the criticism of elitism (Scott, 2009), was the assertion that such risky and innovative cultural products require the subjective opinions of experts to be fully and properly considered, hence the study's 'peer-review' aspect.

One review of this experiment (Graham, 2009) was very critical, highlighting:

> *… the more general conceptual problems generated by the McMaster criteria being transferred to a museum context. The core logic of the McMaster Review is that excellence is "life changing" via a transformatory aesthetic moment. However, museums have not tended to be bounded into "changing people's lives" as, or at least not only as, an aesthetic encounter. Indeed, museums have long traditions of seeing their roles as pedagogic and civic, a purpose that, while certainly concerned with "life changing", has an extended scope… (2009:326)*

The McMaster idea of what makes a 'life-changing', inspirational moment, therefore, may have fallen too far towards the emotional, affective side (at least with regard to 'life-changing' experiences in the museums selected for the pilot) and may not have credited what Johnson (2010) would call the 'slow-burn' of cognitive connections clicking steadily into place, which serve to balance the experience. Graham also highlights the perils of holding an 'expert peer review' that

excludes the public from such intrinsic evaluations, a point also made by Holden (2006) and re-iterated by Bakhshi et al (2009), Selwood (2010), and Rounds (2012): members of the public were, after all, the individuals whose lives were supposed to require changing.

The apparent failure of the Peer Review Pilot did not end the debate regarding intrinsic value, however, and several more proposals listing alternative measures of value were subsequently released, building upon Holden (2004, 2006) and McCarthy et al (2004). Selwood (2010) was commissioned by the National Museum Director's Council to review and report on these studies, and produced an Appendix that amalgamated the various measures of value they proposed.

If peer review is inappropriate for considering intrinsic cultural value in museums, what other methods could be used? Kirchberg and Tröndle (2012) nod towards neuroscientific studies, but point out that, thus far, such methods are restricted to the lab and are yet to be tested in public environments such as museums. Canning and Holmes (2007) suggest the 'Repertory Grid Technique', adopted from psychology, as a method for capturing the intrinsic world views of diverse cultural participants. However, information from the digital realm (such as Social Media content) is also being considered as a potential source of valuable data for evaluating intrinsic value, as expressed in Lilley and Moore's *Counting What Counts* report (2013) and Rife et al's *Measuring Cultural Engagement* (2014).

According to Barrett (2011), forays into the digital world have further highlighted deficiencies within many museums when it comes to understanding the public - though this does not only apply to museums (Korschun and Du, 2013). One notable exception to this is the *Digital Engagement in Culture, Heritage and the Arts* framework, from Visser and Richardson (2013), a practitioners' guide to both improving and measuring efforts to engage current and potential visitors to cultural institutions, which also includes sections on developing and evaluating the effectiveness of Social Media channels. That Social Media may at least have *the potential* to provide vital insight into the impact of museum services upon the public is also discussed by Villaespesa (2015, 2013), Langa (2014), Finnis et al (2011) and Giaccardi (2011), though they indicate that work in this direction is at an early stage: with Villaespesa's discussion of matching Social Media metrics to museum strategy (2015) being the most advanced example reviewed.

A literature search conducted into inspiration, museums and Social Media tends to confirm claims by Holden (2006) and Kirchberg and Tröndle (2012) that Museum Studies research slants towards theoretical discussions of professional practice. Around 20% of the papers found were composed *entirely* of reviews of literature and theoretical discussion. Around a further 15% of the papers found

were case studies of exhibitions or artistic practices in museums and galleries. These case studies also tended to focus on individual or small numbers of exhibitions: wider surveys of activity across multiple museums were much rarer, with only 11% in total containing any kind of survey.

An indication of the overall volume of museum-related Social Media activity is provided by INTK (2013), a Dutch communication strategy organisation. Table 1 shows statistics for the ten most acknowledged museums on both Twitter and Facebook, which showed that, in 2013, the top ten museums had accrued 7.9 million Twitter followers and 7.6 million Facebook likes in total.

Ten museums with the most Twitter followers		**Ten museums with the most Facebook likes**	
MOMA (US)	1,437,514	MOMA (US)	1,431,338
Smithsonian Institution (US)	961,252	Musée du Louvre (France)	1,039,002
Tate (UK)	901,128	Saatchi Gallery (UK)	1,030,822
Saatchi Gallery (UK)	852,514	Metropolitan Museum of Art (US)	934,081
Solomon R. Guggenheim (US)	802,748	Royal Collection Trust (UK)	823,793
Design Museum (UK)	708,373	Tate (UK)	595,315
Metropolitan Museum of Art (US)	594,455	Museum of Islamic Art (Qatar)	500,298
Royal Collection Trust (UK)	585,917	Solomon R. Guggenheim (US)	499,131
The Andy Warhol Museum (US)	561,422	Acropolis Museum (Greece)	392,481
The British Library	450,543	British Museum (UK)	388,490
Total	*7,855,866*	*Total*	*7,634,751*

Table 1 Top ten most popular museums on Twitter and Facebook [accessed: 08/08/2013]

As a rough indicator of the trend for an increase in volume of Social Media use, Finnis et al (2011) reported the number of Twitter followers in 2011 for the Tate (191,935), the Design Museum (186,665) and the British Library (102,851). This indicates increases of over 450%, 380% and 430% respectively during the two years between 2011 and 2013, and underlines the relevance of Finnis et al's statement that:

> *Cultural organisations need to be more proactive in setting up meaningful measurement frameworks for social media, in order to demonstrate the quality and value of social media interactions with cultural audiences. Benchmarking data*

> *is required, in order to compare social media performance across organisations with similar audiences or missions. (Finnis et al, 2011:10)*

However, the above quote raises an issue. Firstly, while Finnis et al (2011) report *some* benchmarking data, and their survey covers 16 institutions (i.e. a bigger sample than normal within the literature), they also follow the literature's common preoccupation with emphasising cultural production over consumption by also focusing on data regarding museum practice (e.g. which museums have Social Media strategies, what tools are being used for web user analysis and so forth). Others that take the same approach are Fletcher and Lee (2012) and Vaughan (2010): the former conducted another survey of how museum practitioners use Social Media in the US, while the latter surveyed the practices of staff from museums that had joined the Flickr Commons. While sharing such practical experience spreads valuable knowledge, these publications do not propose methods for using the data collected about audience Social Media usage to indicate any value the public might gain from their interaction with museums.

All of the three papers discussed above speak of engagement with the audience. Finnis et al propose instrumental methods for assessing 'levels of engagement' by counting the volume of interactions between museum staff and visitors on Facebook, a technique also used by Langa (2014) and Waters and Lo (2012). The potential for using Social Media interactions to analyse visitor intentions and behaviours was also discussed, but no proposals made about how to do so, and there was no indication that the museums surveyed *were* actually doing so. Responses from museum communications staff discussed by Fletcher and Lee (2012) suggest they were at least aware of the insight that could be gained from Social Media regarding the visitor experience, but again no examples were included. Vaughan (2010) presented anecdotal evidence from museum staff about 'rewarding interactions' with members of the public, and describes 'huge amounts of goodwill', but much of what is discussed concerns the value of these interactions to the museum, in terms of finding out more about mystery objects, rather than indicating any intrinsic value gained by the public. This is in turn similar to Jensen and Kelly (2009), who describe working with members of the public to plan an exhibition, but who say little regarding the value of doing so for those collaborators.

The point here is not to raise any suspicions regarding the engagement these papers report; in fact, quite the opposite; it is almost certain that extremely useful expressions of potential engagement are present in museum related Social Media, possibly at high volumes. The only piece of research reviewed that considered this in detail was Villaespesa (2013); while this features a case study from a single museum (The Tate Modern), the study in question concerned an 'in-exhibition' experiment

with Social Media that captured a fuller picture of the expressed experiences of Tate visitors by employing a combination of Content Analysis and Sentiment Analysis upon their Tweets (see Chapter 3). However, while was a step towards considering ways in which visitor Social Media could be used to provide a more 'rounded' indication of museum experience, it fell short of proposing ways in which data about visitors' potential expressions of their thoughts and feelings could be mapped onto indicators of museum value. Villaespesa's more recent paper (2015) does provide this type of analysis, however, explaining how data from Social Media has been incorporated into the Tate's strategic review processes.

2.5 Conclusion

Inspiration is a word that, for the UK Museums Association at least, defines museums. This review initially produced the following working definition of inspiration in museums:

> *An experience containing a balance of rational thought and emotion.*

This initial definition was derived from a review of the activities of museums and conflated three fundamental aspects of museum work:

- The *emotions* of empathy and excitement that make visiting and interacting with museums a valuable, memorable experience.
- The *ideas* derived from the information and knowledge that museums manage for and with their communities, locally, nationally and globally.
- The *experiences* (both planned for and serendipitous) that occur within museums.

Inspiration may rarely happen with a bang and a flash, as per the cliché, but more often it may occurs at the end of a 'slow-burn' of repeat visits and the gradual acquisition of knowledge; the eventual conclusion of a longer-running relationship between the visitor and the museum. Such longer-running relationships are at the heart of museums' ability to influence society as they become the basis upon which communities can build around ideas. Museums' ability to fulfil this role have always been influenced by technology, however, and the new technologies of Social Media are no exception. One potential benefit of these technologies might be the opportunity they could provide for museums to gain fresh insight into a problematic area: how can they measure the *real*

benefit they provide individuals and society in a more rounded manner, that takes their intrinsic value into account?

This factor, along with the other primary aspect of the definition, creativity, was covered within the review, but the precise relationship of these factors to inspiration were unclear. It took the consultation exercise described in Chapter 4, the three Action Research Cycles covered in Chapters 5, 6 and 7, and the evaluation exercise that led to the general learning points described in Chapter 8, for the 'final' definition (at least as far as this research is concerned) to be proposed (see Table XXX in Chapter 8). It is also important to note that the relationship between thought, feeling and creativity contained within this definition of inspiration maps directly onto Bloom's Taxonomy of Educational Objectives (Bloom et al, 1956), which at its root organises educational activities and learning objectives into cognitive, affective and psychomotor categories.

3 METHODS

This research investigates how museums might be provided with valuable insight regarding the inspiration they cause in their visitors, by using visitors' Social Media content as a data source. This research, therefore, concerns people - museum staff and visitors. It also concerns computer systems – Social Media platforms and the systems required to collect and analyse data from those platforms automatically.

This balance between humanity and technology has implications regarding *the philosophy underpinning the research:* human beings, the inspiration they feel, and the decisions they make are subjective, and people do not always behave rationally and logically. Computers embody the opposite: they are mechanical, they do not have subjective points of view, and their behaviour is based upon classical logical structures. This indicates a mixture of an *interpretivist* philosophy (human / subjective / potentially irrational) and a *positivist* one (computers / objective / logical). The discussions of research philosophy and the chosen approach in this chapter describe the relationship between these two philosophical positions, and explain why, despite the numerous positivist activities undertaken as part of this study (related to computer systems), an interpretivist approach had to be taken to answer the core research questions.

Maintaining the balance between humanity and technology also affected *the methods used*: the research is placed at an interface point between museum staff and IT systems – specifically at a point where the staff can, potentially, use those systems to gain insight into their relationships with their visitors. Also, the research utilises a new set of technologies and techniques: i.e. Social Media platforms and related analysis processes. In other words, this research is a study of *systemic change in a new space*. Thus the discussion on methods in this chapter focuses on the ways the researcher and museum staff worked together to investigate new computer systems, and used those new systems as a catalyst for such systemic changes.

Finally, maintaining a balance between humanity and technology had practical implications both for the *structure of the research activity*, and the *ethics of the research*.

3.1 Research philosophy

Inspiration is a subjective experience which is felt internally. Similarly, the ways in which museum staff might interpret evidence of inspiration are also subjective. However, museum visitors may, potentially, express inspiration in the form of Social Media data, and these potential expressions are fundamentally observable and quantifiable. Furthermore, the computers used to help create Social Media data, submit it, publish it, collect it, and analyse it are machines created by a scientific culture, that have positivist, scientific principles (in particular the principles of classical logic) at their core. This research, therefore, is placed at a point at which two distinct philosophies overlap. These are:

1. Interpretivism: a philosophy that discounts the possibility of objective reality, particularly when studying systems "in the real world" away from the laboratory (Stamper, 1987). Interpretivist research assumes that our knowledge of what we consider real is provided to us through social mechanisms such as our relationships with people, the language and documents we use, and the meaning we share with others (Klein and Myers, 1999).
2. Positivism: the philosophy underpinning the Natural Sciences, in which empirical observations of objective reality are used both to formulate and test hypotheses based on logical statements, from which theories can be built (Lee, 1989; Hempel, 1966).

3.1.1 Interpretivism

The philosophy with the most relevance to this research is interpretivism, which regards *subjective* meaning as felt and understood by people, rather than describing reality purely in terms of observable, measurable entities (Weber, 2004). This is most appropriate to the core objective of investigating the subjective concept of inspiration, and in particular how museum staff interpret potential expressions of inspiration made by museum visitors.

Another aspect of interpretivism concerns the complexity: positivist research in Social Science often discounts many of the factors that affect situations, either by focusing upon those considered completely relevant, or by conducting research in unrealistic laboratory conditions within which "irrelevant" stimuli can, in theory, be controlled (Lewin, 1952B). Interpretivist research, by contrast, embraces such complexity.

A further aspect of interpretivist philosophy is *action*. Weber states:

> *By 'action' is meant human behaviour linked to a subjective meaning … on the part of the actor or actors concerned; such behaviour may be overt or occur inwardly - whether by positive action, or by refraining from such action, or by acquiescence to some situation. Such behaviour is 'social' action where the meaning intended by an actor or actors is related to the behaviour of others, and conduct so oriented (Weber, 2004:312).*

Stamper (1987) supports this by suggesting that it is the activity, or action, performed by individuals within the world that underpins their knowledge of the world in the first place. In other words, action and meaning are inextricably linked. This in turn leads Stamper to an assertion that an Information System (such as that being investigated here) is not just something that enables understanding, it also enables activities linked to that understanding. As such, one way for a researcher to gain a deeper understanding of the role of information in a given system is to become part of that system, and to collaborate with the people that derive understanding and meaning from action undertaken within that system. This philosophical idea underpins the Action Research (AR) approach taken by this study.

One particular interpretivist method of potential relevance to this research is *hermeneutics*, an approach based on the study of the meaning of text. A core aspect of hermeneutics is an attempt upon the part of the researcher to reduce the distances in space, time and culture between themselves and a text's author. Such distances must be appreciated, accounted for and hence 'removed' to the greatest degree possible (Grondin and Plant, 2003). Given that this research tested the feasibility of finding evidence of inspiration within Social Media, and Social Media is to a large extent a textual medium, one might consider that hermeneutics would be a particularly appropriate analysis method. However, one of the differences between Social Media analysis and other forms of textual analysis is the scale at which one can operate. It is possible (indeed quite easy) to collect content created by thousands of authors from all across the globe, and thus reducing the gap in space, time, and culture between the researcher and many hundreds or thousands of authors is unfeasible. As a counterpoint to the hermeneutic idea that distance between author and reader can be reduced such that the reader can grasp the author's intended meaning, Krippendorf (2004) argues that texts may *only* acquire meaning in 'the contexts of their use' (P33-34): i.e. that it is solely the via the process of analysis that meaning is applied. This is a key idea with regard to the core of the investigation, and explains why the phrase "potential expressions of inspiration" is used in place of "evidence of inspiration" throughout.

3.1.2 Positivism

Positivist research is based upon empirical observation and the measurement of quantifiable entities. Statements made by researchers using a positivist approach must therefore be validated or invalidated by empirical evidence (Hempel, 1966). Key to the success of positivist approaches is choosing the correct *units* of measurement to relate to the empirical observations undertaken. Units are abstract concepts, defined by the positivist researcher to represent the aspects of reality that their experiments observe (Dubin, 1969). Classical logic (first espoused in Ancient Greece) is also central to positivism, where it is used to develop *hypotheses*.

In positivist research, basic connections between an experiment's units of measurement are made using *laws*. Laws are also quantitative in nature and are formulated logically and mathematically (e.g. "X tends to increase as Y decreases"). This is known as the *linear* mapping of the observable behaviour of one unit onto the observable behaviour of another, the result being a linear function that can be plotted as a line in a graph. Collections of laws then form theories: note here that Dubin (1969) also states that *the terms 'theory', 'model' and 'system' are synonymous*.

The foundation of positivist philosophy and the use of empirical observation in science comes from the Natural Sciences, but also underpins much of Social Science (e.g. Dubin, 1969; Lewin, 1952A). One example of positivist Social Science is the behaviourist school in psychology, which only considers hypotheses based upon observable human behaviour to be valid, and discounts interpretivist approaches which account for mental, internal processes (Hempel, 1966). Hevner et al (2004) contend that the paradigm of behavioural science is at the root one of two fundamental paradigms underpinning research into Information Systems (the other being *Design Science*, discussed in Section 3.4.2).

Positivism is an appropriate philosophy for any research being conducted digitally as the aspects of positivist philosophy map completely onto computational / digital systems and processes:

- *Units of measurement* are the variables used in computer programs.
- *Hypotheses* are the logical tests used within the program:
- A computer program literally tests whether variables equal certain values, or fall within certain ranges, throughout, using the same basic logical constructs as positivist science.

- *Theories* (being synonymous with systems or models) are equivalent to computer systems and subsystems, which are also modelled using abstract references to the real world, using approaches such as the Unified Modelling Language (Bennett et al, 2002).

It is therefore impossible for any research relying upon digital / computational approaches not to be positivist to some (usually large) degree. Positivism is, however, an inappropriate philosophy for research into the subjective experiences of people, which, fundamentally, are not based on empirical observation. The following statement from Hempel emphasises this in a manner particularly relevant to this research:

> *The operational procedure invoked in any operational definition must be so chosen that it can be unequivocally carried out by any competent observer, and that the result can be objectively ascertained and does not essentially depend on who performs the test. Thus, in defining the term 'aesthetic merit' in reference to paintings, it would not be permissible to use this operational instruction: contemplate the painting and note that place on a point scale from 1 to 10 that seems to you to best indicate the beauty of the painting (1966:89-90).*

3.1.3 How interpretivism and positivism are balanced in this research

Social Media data analysis often relies upon purely positivist techniques such as counting the frequencies of terms in text, or applying classically logical rules to attempt to infer meaning from the ways in which texts are structured. Fundamentally positivist approaches such as these, which underpin the modern world's computer-based systems, do not match exactly with reality and the ways human beings perceive and understand the world. Instead, there are often subtle complexities in the relationships between computers and humans beings, and this research took the position that the most important questions regarding how Social Media content could be organised and analysed existed in the space where human expectations and the rational, classical logic of computers attempted to align themselves. This pointed to a need to mitigate computing's positivism with interpretivist techniques in order to establish the potential value of information from Social Media, and this need was satisfied by choosing a method that involved close collaboration with museum staff in the field.

Prototype computer systems were required to answer questions about the technical constraints of extracting information from Social Media, but they needed only enough sophistication to answer those questions while staying within the bounds of technical feasibility. Any further - potentially labour intensive - honing of those computing methods might then be undertaken with subsequent research (see Section 10.5 in the Conclusion), once the processes by which museum staff might derive *meaningful* and *valuable* information from such automated Social Media analysis had been established.

3.2 Potential research approaches

To decide upon the type of method appropriate for this research, three methodological approaches to research were considered. These approaches are described in Cornford and Smithson (2006), Iivari (1991), Benbasat et al (1987) and Franz and Robey (1984):

1. *Nomothetic*: an approach that attempts to discover general laws by the application of empirical experimentation to hypotheses about reality, as per the section on positivism above. To facilitate the processes of generalisation to common laws, nomothetic research focuses heavily upon procedure (Franz and Robey, 1984) and designs repeatable experiments involving methodical and well-documented approaches to data sampling, the use of control sets and so forth (Cornford and Smithson, 2006).
2. *Idiographic* methodological approaches involve the researcher's immersion into a situation such as an organisation's context and culture (Benbasat et al, 1987, Franz and Robey, 1984). The idea behind idiographic research is to understand individual, and hence non-generalisable, phenomena, in the hope of gaining *a deep understanding*. It is the depth and richness of an idiographic study that makes any understanding gained applicable to broader reality (Cornford and Smithson, 2006). Idiographic approaches map most closely onto interpretivist philosophy.
3. *Constructive* approaches are a third set of methodologies which, according to Iivari (1991) are directly applicable to the study of Information Systems. They involve the construction of abstract frameworks that describe Information Systems, or the creation of 'physical' (or at least 'broadly physical') IT artefacts such as new pieces of experimental software.

Both nomothetic and constructive approaches are inappropriate for this research as using them would limit understanding of *how* potential evidence of visitors' inspiration gleaned from Social Media might be interpreted by museums. What would museums wish to use such evidence for? Could they interpret it safely, or did it mislead them? How could they be confident it was valid? In what ways, if any, could they interpret such evidence in order to improve their future activities? What, in essence, did evidence of visitors' inspiration taken from Social Media *mean* to a museum? These questions need to be answered first, to establish the value of building a realistic model of inspiration and mining Social Media data with it. It is for these reason that this research is, fundamentally, ideographic, in spite of the fact that in order to answer these questions, the researcher worked with (essentially positivist) computers to construct prototype systems. Any systems (i.e. models / theories) built in participatory action with museums were, therefore, the means to the end of answering fundamentally ideographic questions.

According to Benbasat et al (1997), ideographic approaches are also appropriate in situations where innovation is occurring amongst practitioners and more formal research not only lags behind, but has a duty to catch up, as discussed by Edwards et al (2013) and Lazer et al (2009) in their reviews of CSS. This situation often occurs in the computing domain, and it can be argued that the public uptake of Social Media and attendant analysis of Social Media content is another example of its occurrence.

3.3 Methods

In the light of the discussion of approaches above, Action Research (AR) was chosen to answer the fundamental question regarding what information about inspiration derived from Social Media data might *mean* to museum staff. In particular, Participatory Action Research (PAR), was chosen, as it is a method largely from the interpretivist tradition that attempts both to capture and also generate socially-constructed knowledge by taking part in practical activities with the subjects of the research (Brydon-Miller et al, 2003), in this case, museum staff. Emphasis was placed upon a particular form of PAR used in IS research, namely the Soft Systems Methodology (Checkland, 1999; Checkland and Scholes, 1990; Checkland and Holwell, 1998), though the research also incorporated aspects of Agile systems development (Beck et al, 2001; Leffingwell, 2010; Crispin and Gregory, 2009), and knowledge engineering (Shadbolt and Smart, 2015; Gavrilova and Andreeva, 2012).

3.3.1 Action Research (AR)

AR is a method that enables the application of theory in practical situations by instigating systemic change and encouraging reflection upon the outcomes. According to Lau (1999), AR methods have been used since the 1940s. In its earliest guises, AR resulted from a perceived need to take Social Science research from the laboratory into the field, while still maintaining a largely positivist, theory-building approach to the work (Lewin, 1952C). In the ensuing years, however, it has become a more interpretivist approach aimed at investigating socially-constructed knowledge from the subjective viewpoint of the researcher (Brydon-Miller et al, 2003).

AR is usually motivated by a recognition that certain social situations are too complex to be studied adequately under laboratory conditions, and / or by reducing such complexity to simpler models. Instead, the AR approach investigates complex systems by planning, instigating and reflecting upon changes to those systems; the 'action' of the title (Baskerville, 1999). Such systemic complexity is also uniquely situated in time and uniquely influenced by the points of view of the people involved, therefore: "… Any meaningful investigation must consider the frame of reference and underlying social values of the subjects (Baskerville, 1999:4)." Lau (1999) defined four specific types of AR, the one most appropriate to this research being Participatory AR: a category in which the researcher intervenes practically within the situation and takes part in the action to change the situation. Often the researcher brings specialist skills of some kind to the action that were not previously available to the subjects, while the subjects provide knowledge of the organisational context (Sein et al, 2011; Davison and Vogel, 2007).

AR has the following key characteristics (Lau, 1999; Baskerville, 1999):

1. AR is *collaborative*: it involves working directly with subjects in their own organisational environments (Lewin, 1952B), and empowering them to affect the research (Baskerville, 1999).
2. AR is *practical* – it involves systemic change: indeed Heller (1993) indicates that an 'action-oriented methodology' is distinct from 'action-research' if it fails to instigate a tangible change of some sort in the system under investigation. Such changes can include prototypical Information Systems Development (Chiasson and Dexter, 2001), or the implementation of new 'off the shelf' Information Systems into an organisation (Davison and

Vogel, 2007). Susman and Evered even state: "Action research implies system development (1978:589)".

3. AR is *reflective*: reflection is as important a part of causing lasting, positive systemic change as the 'productive' action itself (Peters and Robinson, 1984). Reflection by the researcher also enables specifics of the action situation to be generalised to a broader theory (Davison and Vogel, 2007).
4. AR is *cyclical*: the work takes place in a sequence of iterations, each with the same structure.
5. AR *expands scientific knowledge*: it is not only intended to improve the situation of the subjects of study (Baskerville, 1999). However, according to Susman and Evered (1978) because interventions always take place within specific subject organisations, it is unrealistic to consider AR to be 'scientific' in positivist terms of forming generalised laws.
6. AR *includes an ethical framework*: it has a responsibility not to affect the participating organisation negatively (Lewin, 1952B).

Conducting AR in cycles ensures that there is space for reflection and hence enables opportunities to both learn and improve the research process, making the overall AR approach very flexible (Davison and Vogel, 2007). Reflexivity on the part of the researcher is particularly important when conducting interpretivist research, as an understanding of the researcher's cultural and social context helps general conclusions to be drawn about the work. It is also important for the researcher to reflect on the nature of their relationships with collaborators when using participative methods such as PAR, as the closeness they feel to their subjects can cause them to adopt similar perspectives (Bryman, 2004).

The approach taken by this research involves a cycle of *diagnosing*, *action planning*, *action taking*, *evaluating* and *specifying learning* that is typical of AR: specifying the problems that cause the need for change, specifying the actions required to try and bring the change about, undertaking those actions, evaluating the outcomes of performing the action, and identifying learning points, both in terms of carrying them forward into the next cycle, and in terms of generalising learning for other situations (Baskerville, 1999; Susman and Evered, 1978). The research activity was structured around these five phases; how exactly the development and evaluation of prototype systems to affect changes in museums' information systems mapped onto these AR phases is summarised in Table 2 at the end of the following section.

3.3.2 Action Research and Information Systems development

Systems development as a method for conducting research into Information Systems is discussed by Nunamaker and Chen (1990), who state that there is nothing, at an epistemological level, to distinguish the ways in which scientists and engineers conduct their research. They state:

> *The pattern of this research progress is: 1) build a system, 2) develop theories and principles from observing behaviour, 3) encode expertise in software tools for easy access, and 4) use these tools to help the development of new systems (Nunamaker and Chen, 1990:632).*

However, Nunamaker and Chen's description of systems development makes *the developed system* itself the subject of the study. This is not to devalue the issue of human interactions with systems; the interfaces between people and the technical parts of systems are aspects of many systems development studies, but *the developed system itself* is still the key artefact and the central subject of such studies, and as such is different to this research. In this research, the museum staff were the key subject, the *meaning* they derived from Social Media information was at the core of the research, and the prototype systems produced as part of this research were the 'catalytic' parts of the research process, which enabled the action to change the system.

A crucial method which was developed specifically to perform AR in IS research is the Soft Systems Methodology (SSM) (Checkland, 1999; Checkland and Scholes, 1990). This interpretivist methodology offers a holistic approach to the analysis of *human activity systems*. SSM comes from systems engineering (which is also the basis of computer systems development) but differs from it substantially, because it recognises that to properly understand continuously changing complex systems, one must embark upon a continuous learning process about those systems. SSM states that every system contains a core *transformational process* that converts inputs to outputs. Systems may be visualised using *Rich Pictures*, and should consider three categories of people: owners, actors and customers, as well as the environmental context within which the system exists. Most crucially, the *weltanshauung* (sometimes translated to 'worldview', but also 'outlook' or 'framework') from which the model is created must also be considered. As it relates closely to AR, SSM also emphasises the importance of working cyclically instead of linearly (Checkland, 1999). Weltanshauung is a particularly useful concept within the SSM when it comes to reflecting upon the subjectivity of participants.

Another key tool from the SSM used during the Specifying Learning phases of each ARC was the *Processes for Organisational Meanings* (POM) model, which is part of the Soft Systems Methodology, and is defined in the book *Information, Systems and Information Systems* (Checkland and Holwell, 1998). The POM model (illustrated in Figure 1) is based upon an iterative cycle of seven processes:

1. The interactions between *individuals and groups* in an organisation.
2. The *perceptions of the reality* that affect those individuals and groups.
3. The *discourse* between individuals and groups, which is the medium via which sense is made, intersubjectively.
4. The process of *creating meaningful information* and knowledge from data and capta (i.e. filtered, more relevant data).
5. The political process of *assembling intentions and accommodations* (i.e. decisions and compromises) by the individuals / groups that intend to take action.
6. The *undertaking of purposeful action*, either to maintain the status quo, or affect change.
7. *Processes undertaken by Information Systems* in support of the creation of meaning (4), the assembly of intention (5) and the taking of action (6). Such Information Systems are further broken down into:
    a. Formal, organised Information Systems created by the organisation.
    b. Information Technology systems (mainly computing and communications systems) that support such formal Information Systems.
    c. Technical and professional Information Systems and IT knowledge in support of such information systems.

The POM model:

> *… is cyclic, with pathways which link all the elements with each other, there is no clear starting point for use in the model. In a particular situation the initial focus might, for example, be on action (element 6). It might be found to be inadequately supported by the IS in element 7a, or it might be found that some boring action previously undertaken by people could now be automated. In another situation, a new development in IT (elements 7b and 7c) …might cause a re-think of possible knowledge (element 4), intentions (element 5), and action (element 6) (Checkland and Holwell, 1998:p108).*

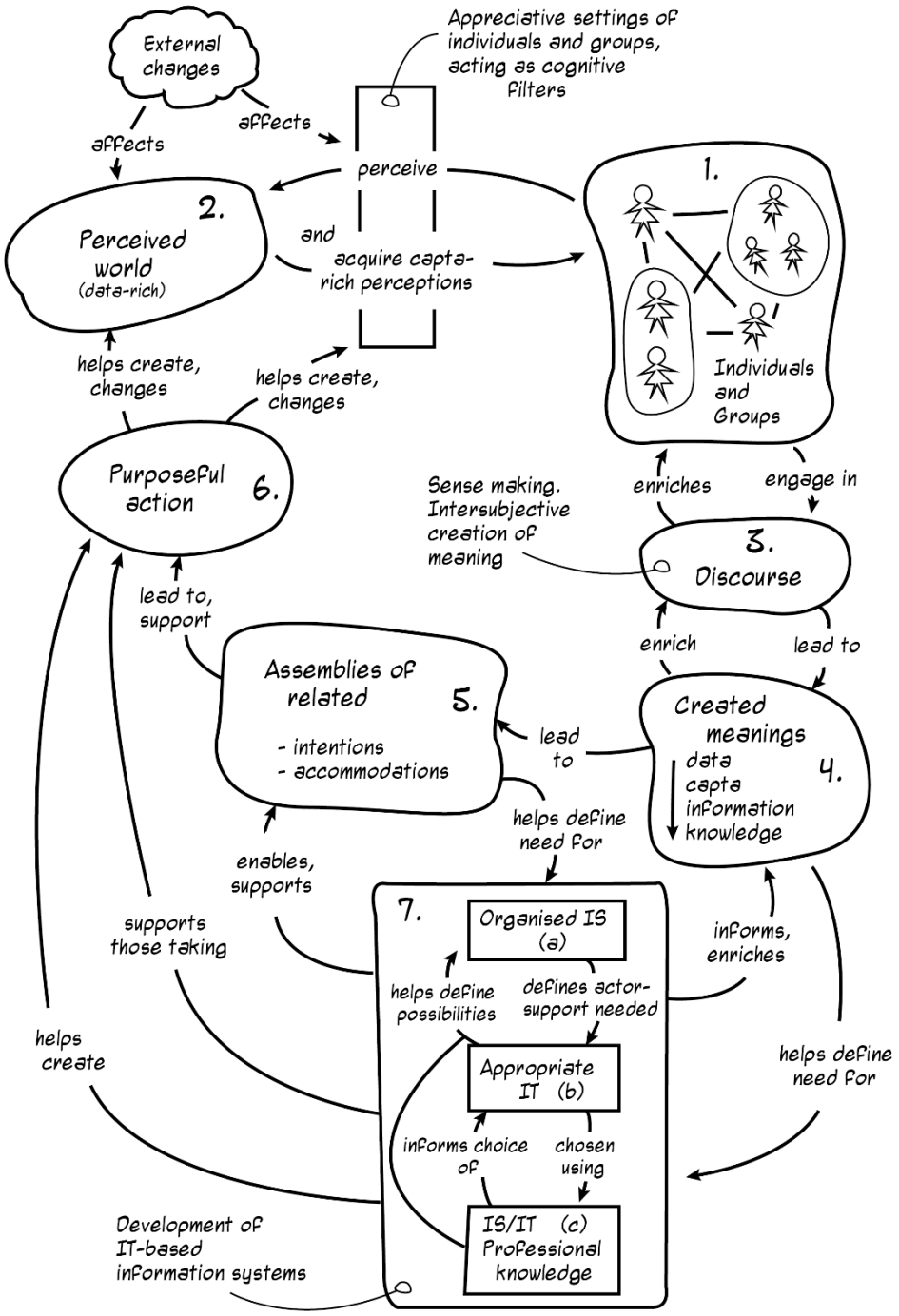

Figure 1 Processes of Organisational Meanings Model (Checkland and Holwell, 1998:106)

The last of these examples was particularly pertinent to this research, leading to the POM Model being used extensively as a method for aiding generalisation of the findings from the AR, by enabling the contexts of the various prototypes (sitting in element 7 of the model) to be illustrated and discussed in ways that are more broadly applicable to museums in general, as opposed to the

collaboration partners specifically. The workings of the process of structuring findings with the POM Model are shown in Appendix 4.

The research design was also influenced by three relatively new and overlapping methods that are based upon AR, and that place the relationships between human subjects and technological systems at their centres. These are *Design Science* (DS), *Design Ethnography* (DE) and *Action Design Research* (ADR), and all involve implementing innovative technological solutions to problems. DS starts from the premise that technology and human behaviour are inseparable in Information Systems, and there is often a tension between these two parts which can only be resolved through design. Design is, in turn, both a product and a *process*, a process which must involve the users of the Information System (Hevner et al, 2004). DE is proposed by Baskerville and Myers (2015) as a method of approaching DS entirely from within Information Systems research. In DE, the researcher participates in the design process with the intention of actively changing systems, as a method of studying both those systems themselves and the opportunities for change provided by new technology. Hence prototyping is an important part of DE, because: "…introducing an artefact and studying the interactions of the artefact with its environment, begs for a prototyping style of design approach (Baskerville and Myers, 2015:35)." ADR, however, is an explicit attempt to interweave DS and AR. Like AR, it is a phased approach, based on cycles of problem formulation, building, evaluation, reflection and formalisation of the learning achieved (Sein et al, 2011).

Both Sein et al and Baskerville and Myers cite Järvinen's review (2007) in which DS and AR are compared and found to be very similar: indeed Järvinen is able to derive a whole series of stages from a review of studies into the various AR methods, and then map them wholly and completely onto a similar set of stages derived from a review of DS. To this end, as the use of DS in Information Science research is still a relatively new approach, this research took a similar approach by mapping a set of lower level methods from Information Systems and computing onto the AR phases identified in Section 3.3.1. This mapping is shown in Table 2.

When discussing planning, the literature on AR tends to be framed towards solving problems for organisations, hence the Action Planning phase of each cycle is often discussed by the AR and DS literature in terms like:

> *Successful problem identification is the crux of the research effort. Individual members of the AR Group bring with them their own views of what is wrong with the organization. These should be reflected upon in the problem statement.*

Problems would be important to the person proposing them and have significance to the whole organization (Cunningham, 1976: p 222).

Action Research Phase	**System Development Activities**
Diagnosis	Problem situation analysis (based upon an assessment of *structures* and *processes)* Stakeholder analysis Development of Rich Pictures
Action Planning	Unstructured requirements analysis User Story development Identification of appropriate weltanshauungen (from which to view the problem situation) Identification of specific classes of problem Review of appropriate computational methods
Action taking	Systems design System development Data collection Data analysis (e.g. classification, clustering etc) Test and training dataset annotation Unit Testing Data visualisation development
Evaluating	Reviewing the systems' output with museum staff Reflecting upon the system design process
Specifying learning	Reflecting upon the evaluation Reflecting upon potential uses of systems Structuring these reflections using the POM Model

Table 2 Phases of an Action Research Cycle

However, focusing as it did upon new Social Media technology, this research was more about identifying potential *opportunities* as problems. This resulted in a subtle change of emphasis within this research from examining the problem space of the museum to examining the technological space of Social Media platforms and related computing techniques first, *before* examining the museum staff's 'problem space' and mapping potential Social Media-based solutions onto it. The core planning activities therefore proposed change to the museums' systems to allow the

opportunities provided by Social Media information to be observed and evaluated. As discussed above, there were two aspects to the type of changes that were planned for:

1. *Changes to 'hard' systems*: in other words, the development of prototype computer systems intended to capture and analyse Social Media data and cause change to the Information Systems under study.
2. *Changes to 'soft' systems*: the 'softer' approach was used to encourage the collaborators to learn together and reflect upon the changes the new technology had caused.

Another Action Planning activity that occurred in this research was to conduct a review of literature related to computing techniques relevant to Social Media data analysis as part of every Action Planning phase. A key part of this work was to focus upon computing techniques that also provided an opportunity to collaborate with the museum staff and explore their knowledge and ideas about Social Media, the ways they used it, and its current and potential value to their organisations.

3.3.3 Interviews, workshops and recording methods

It is worth including a note on the topic of interactions with museum practitioners, and the methods used to record them. This research was collaborative and involved 17 interactions with practitioners (these are listed in Appendix 5). All the interactions described were recorded and at least partially transcribed; however, this research did NOT use a qualitative method such as Grounded Theory, according to which the text of interview transcriptions is coded and analysed in depth. The core method of this research is Participatory Action Research using technical prototypes, and this method was chosen to anchor the research within the bounds of technical feasibility, using technologies related to Social Media analysis that are becoming ever more widely available to people such as museum practitioners. To maintain this distinction throughout, only the interactions described in the initial consultation exercise (described in Chapter 4) will be described as 'interviews'. The other interactions which took place as part of the Action Research Cycles that followed will be described as 'workshops'.

3.3.4 The IS and computing methods 'knowledge base'

According to Hevner et al (2004), DS relies upon a 'knowledge base' of methods, tools and techniques to be applied to the design of the IT artefacts used to affect systemic change. They state:

> *The knowledge base is composed of foundations and methodologies. Prior IS research and results from reference disciplines provide foundational theories, frameworks, instruments, constructs, models, methods, and instantiations used in the develop / build phase of a research study. Methodologies provide guidelines used in the justify / evaluate phase. Rigor is achieved by appropriately applying existing foundations and methodologies. In behavioural science, methodologies are typically rooted in data collection and empirical analysis techniques. In design science, computational and mathematical methods are primarily used to evaluate the quality and effectiveness of artefacts… (Hevner et al, 2004:80-81).*

The above quote indicated the need to maintain a 'knowledge base' of Information Systems and computing methods, which was used within the research not only to develop the system prototypes, but to support the other activities undertaken in each AR phase. This section discusses the knowledge base in relation to the five AR phases used to structure the research activity (see Table 2).

Some systems analysis and project management techniques from the computing domain were used: in particular stakeholder analysis (Bourne, 2009) and requirements analysis (Robertson and Robertson, 2013). With regard to stakeholder analysis, a stakeholder management framework, Bourne's *Stakeholder Circle*, was used to organise analysis of stakeholders and manage related stakeholder data, in particular during the initial consultation phase of the research (described in the *structure of the research activity* Section 3.5 below). For requirements analysis, some aspects of the "project blast-off phase" from Robertson and Robertson's Volere requirements management process (2013) were also used during the consultation to structure the researchers reflections and ideas. The ARCs during which the main prototype systems were developed also applied structure to requirements by creating User Stories, which are described as "… the basic unit of work for the team… (Leffingwell, 2010:48)", as they are also a project planning tool.

As much (but not all) Social Media content is textual in nature, methods relating to the analysis of text were used heavily. One appropriate set of methods for text analysis is *Natural Language*

Processing (NLP), which enables analysis at a scale only mechanical processing can enable, though at a potential cost to the degree of understanding that can be derived from the text. Defining what that cost was in terms of the 'loss of textual meaning' to the museum staff was a key aspect of the research. NLP involves the study of all aspects of text, from the structures of individual words (morphology), via the relationships between words (syntax) and the meaning inherent in word combinations (semantics) to estimations of the goals of the speaker (pragmatics) and the communications between multiple speakers (discourse) (Jurafsky and Martin, 2009). The type of techniques used in this research include building indexes based on *inverted documents* that count term frequencies (Baeza-Yates and Ribeiro-Neto, 1999), *lexical semantics* to build clusters of Social Media information based on terms with related meanings, and *thematic role extraction* based upon the FrameNet annotation project (Baker, 2014). These techniques are discussed in more detail in Chapters 5, 6 and 7.

The final specialised computing tool that was used was a *Fuzzy Logic Controller* (FLC) (Cingolani and Alcala-Fdez, 2012) for the purpose of encoding knowledge about the relative value of pieces of Social Media content. This related to a technique from operations research called *Multi-Criteria Decision Analysis* (MCDA) that encourages experts to evaluate entities according to the varying importance of their properties (Lootsma, 1997). This technique was used in ARC 3, and was useful as much for the *knowledge engineering* activities, and in particular the *Knowledge Elicitation* (KE) activity, that took place to support it. The MCDA scoring exercise, in other words, provided a framework for working with museum staff to investigate the potential value of Social Media data to their organisation (Shadbolt and Smart, 2015; Gavrilova and Andreeva, 2012).

Another part of the investigation into the 'soft' system concerned the design and development *process*; as per the definitions of DS, DE and ADR, the IT artefacts produced were a form of ethnographer's diary for a systems developer. This was particularly the case because Agile techniques such as Test Driven Development were used (Crispin and Gregory, 2009), and the tests developed thus became pieces of documentation for the prototypes. Other artefacts such as rule-bases (part of the Fuzzy FLC) also created forms of documentation of the knowledge acquired. With regard to ADR, Sein et al suggest that IT artefacts designed as part of research have theories about the subject of the research "engrained" within them, and are: "…repeatedly tested through organizational intervention and subjected to participating members' assumptions, expectations, and knowledge (2010:42)". Therefore, continued review and reflection upon the development of the IT system prototypes (also involving the museum staff whenever possible) became the core aspect of the evaluation of 'soft' systems that was crucial to answering key questions related to the meaning

of Social Media information to the museum. This extended to the researcher not only reflecting upon the work, but reflecting upon his own relationship with it, and constantly updating information about his *weltanshauung* (worldview in relation to the research) throughout.

3.4 Structure of the research activity

The research work is structured as follows and illustrated in Figure 2:

1. An initial consultation exercise to discuss the inspiration definition was conducted, involving unstructured interviews with 13 members of staff from different museums across the UK. It is described in detail in Chapter 4.
2. Three Action Research Cycles involving the development of one system prototype each. The first prototype was produced directly from vision / requirements information arising from the initial consultation, while visions for the second and third prototypes were influenced by the previous cycles.
    a. Action Research Cycle 1 is documented in Chapter 5, and can be considered an investigation into the *potential for inspiration* within a museum audience.
    b. Actions Research Cycle 2 is documented in Chapter 6 and is at heart an investigation into trying to find *potential expressions of inspiration* within the social media content related to a pair of museum events.
    c. Action Research Cycle 3 is documented in Chapter 7. It draws the previous two investigations together by investigating the *impact of inspiration* upon a museum's social network.
3. In order to further identify and document the general themes and learning points that emerged during each ARC, a final Evaluation Workshop (referred to as the EW) was held to compare the information each ARC produced (see Chapter 8).

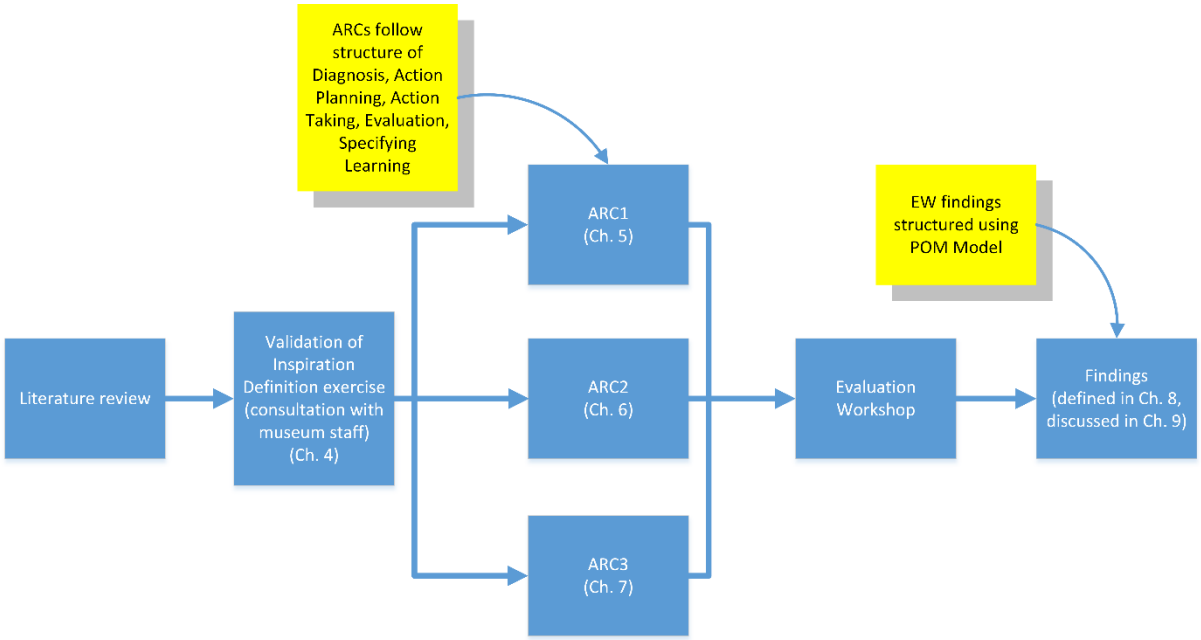

Figure 2 Structure of the research

With regard to the chronology of the research, it can be seen from Figure 3 that the three Action Research Phases (ARCs) were not sequenced one after another. This was as a consequence of having to work in a manner convenient to the museum practitioners, who were volunteering their time for free, the result being that the project had to fit in around their other commitments. The practical implication of this was that development on one prototype could be carried out while the work on another was 'blocked' waiting for evaluation (though this happened more with ARCs 2 and 3). One outcome of this was that there was less of a formal 'hand-over' of learning from one ARC to the next. This is why all the collaborative parts of the 'Specifying Learning' phases of each ARC were rolled into one, day-long evaluation workshop, conducted with the museum staff.

3.5 Ethical considerations

Using Social Media data raises ethical questions related to privacy and informed consent of participants. While Social Media is ostensibly 'in the public domain', people may not have intended for it to be used in research, and hence it may not be ethical to do so (boyd and Crawford, 2012; Lazer et al, 2009). As a result, the decision was taken to focus exclusively on the Twitter Social Media

platform for data collection, due to the following clear statement that is made upon sign-up to the service for all Twitter users:

> *The Content you submit, post, or display will be able to be viewed by other users of the Services and through third party services and websites … You should only provide Content that you are comfortable sharing with others under these Terms.*
> ***Tip*** *What you say on Twitter may be viewed all around the world instantly. You are what you Tweet! (Twitter, 2015 – original emphasis shown)*

The above statement is shown at the top of the Terms and Conditions page, before any detailed legal text is displayed, under a heading: "Basic Terms". As such (after consulting the supervisors) it was decided that the above statement clarified the position that any data retrieved from Twitter during the period of this research was not only in the public domain, but the people that had created the data had made a conscious and informed choice to make it public, hence retrieval and analysis of that data did not contravene the UK Data Protection Act, to which research at Loughborough University is required to conform. Other Social Media platforms (e.g. Facebook) had less clear usage and privacy policies with regard to data protection issues, and hence data was not collected from them.

The AR method also has an ethical component built in, which was mandated in its very earliest forms by Lewin:

> *Any organisation in which the experiment might proceed has definite, practical purposes. Interference with the objectives of the organisation cannot be permitted. On the other hand, to carry through an experiment, the experimenter must somehow have sufficient power to set up the necessary constellations and variations. As a rule, the only way to acquire such power is to gain the active cooperation of the organisation. There would be little chance to gain such power if it were not for the fact that many experimental studies if properly conducted have immediate or long range practical implications. (Lewin, 1952B: pp 166 – 167).*

In other words, the type of 'interference' caused by conducting AR (by definition, from within the collaborating organisation) can only be justified if the research is conducted in a manner that benefits the collaborating organisation. In the case of this research, the benefit of assessing the opportunities of using Social Media information regarding museum events was clearly expressed by several museums. However, the detailed aspects of the AR method in relation to 'evaluation' and

‘specifying learning’ also had to be followed carefully in order that such benefits be realised and disseminated.

4 DISCUSSING THE DEFINITION OF INSPIRATION: A CONSULTATION WITH MUSEUM PRACTITIONERS

Research objectives 1 and 2 were:

1. To understand how museum practitioners defined the process of inspiration in relation to visitors.
2. To ascertain how the ways in which visitors' inspiration is understood by museum practitioners might apply to the day-to-day work of museums.

To begin addressing these objectives, a consultation about the initial Literature Review was conducted with museum staff. This provided an opportunity to discuss the Literature with museum professionals, with the following aims:

1. To ascertain the relevance of the definition of inspiration (resulting from the Literature Review) to museum practitioners.
2. To begin planning the AR cycles that followed.

This Chapter describes this consultation with museum practitioners. The initial section describes the methods used to organise the consultation work and structure its findings. The findings are then covered in the remaining two sections, the first of which covers the nature and definition of inspiration, and the second of which discusses how a more detailed definition of inspiration might help museum practitioners work with potential expressions of inspiration found in visitors' Social Media.

4.1 Methods used to organise the consultation

The consultation consisted of a set of interviews at six different museums in England and Scotland. The intention was not to analyse the interviews in depth (e.g. by using a qualitative method such as coding), as the research focused instead upon the development of prototype Information Systems during AR Cycles (see Methodology Chapter Section 3.5). The intention of the consultation was to ascertain if and how the findings of the Literature Review were relevant to museum practitioners.

However, it was clearly important to ensure that this information gathering process was approached methodically.

As the prototyping aspects of the research involved Information Systems and IT development, two IT systems development techniques were used to structure the researcher's reflections upon the information collected:

1. Bourne's *Stakeholder Circle* system (2009) was used to manage information about the practitioners themselves.
2. The 'project blast off' phase from Robertson and Robertson's *Volere* requirements gathering and analysis process (2013) was used to consider how practitioners might use an Information System to work with potential expressions of inspiration in visitors' Social Media.

4.1.1 Finding information from a sample of museum practitioners

A consultation with eleven museum practitioners (listed in Table 3) took place during meetings with staff from five different museum organisations, at six different museums, in the United Kingdom between October and December 2013. Descriptions of the museum organisations are listed below, though as participant anonymity is being maintained, these are included with the intention of indicating that museums and heritage sites of various sizes and levels of popularity were involved:

1. A heritage site in an 18th Century building; one of many such locations run by a major English organisation.
2. A small community museum run by a local trust, located in a building of major historical significance within a UNESCO World Heritage Site.
3. A medium-sized urban museum in a major city the North of England, with a particular focus on social and political history.
4. An internationally famous collection in Scotland.
5. An organisation which runs several major museums in a major Scottish city.

The list of practitioners interviewed grew organically: initial interviewing opportunities arose from the researcher's participation in the Museum Development East Midlands Digital Strategies programme (Museum Development East Midlands, 2013); others came from the researcher's

personal network, while some were sourced using desk research. The definition of inspiration was also discussed with delegates at the Let's Get Real conference in September 2013 (Culture 24, 2014).

The practitioners were consulted using semi-structured interviews, some of which took place on a one-to-one basis, others with multiple participants. As the participants gave their time for free, the interviews were organised so as to inconvenience them as little as possible. Participants were also encouraged to refer to their day-to-day work activities in the context of the theories of inspiration defined by the literature, in order to ground the conversation in their practical concerns.

Interview ID	Date	Professional's Role	Museum Type	Museum Focus
I4	10/12/2013	Curator 1	History and art	Global / multicultural history
I6	11/12/2013	Curator 2	History and art	UK history
I1	30/12/2013	House Manager	Heritage site	Society and politics
I1	30/12/2013	Learning and Engagement Officer 1	Heritage site	Society and politics
I3	21/12/2013	Director (retired)	History	Society and politics
I3	21/12/2013	Marketing Manager	History	Society and politics
I2	11/11/2013	Learning and Engagement Officer 2	Heritage site	Industrial and social history
I2	11/11/2013	Public Relations Volunteer	Heritage site	Industrial and social history
I5	11/12/2013	Digital Manager	Central museum services	Various
I5	11/12/2013	Visitor Studies Curator	Central museum services	Various
I5	11/12/2013	Policy Research Officer	Central cultural services	Various

Table 2: Discussions with museum practitioners about the definition of inspiration

As discussed in the Methods Chapter (Section 3.3.3), these interviews were only partially transcribed, and they were not coded. The purpose of the interviews was to provide some groundwork for the Action Research to follow, and provide an indication that the Literature Review had provided a definition of inspiration that museum practitioners might recognise. As a result, the interviews were largely unstructured, though they did have some slight structure – the key piece being that practitioners were asked to define inspiration themselves first, before the literature was discussed. The interviews also included discussions about the current use of Social Media in the museum, and how practitioners thought access to visitors' expressions of inspiration from Social Media might fit into their daily work. See Appendix 5 for a complete list of all interactions with research participants.

4.1.2 Organising practitioner information: stakeholder management

To help process the information collected about the practitioners, a stakeholder management process, Bourne's Stakeholder Circle (Bourne 2009), was employed to provide some structure to the researcher's reflections regarding how each participant might relate and react to a system that could provide evidence of inspiration from visitors' Social Media content. Part of using Bourne's process was also to identify the practitioners to whom the research might be most valuable, in order to help find a collaboration partner for the subsequent AR.

One of the key ways in which this process helped reflect upon the consultation with practitioners was that it encouraged consideration of the various properties of the stakeholders in question, such as what their proximity to an Information System for managing potential expressions of inspiration would be, and the amount of impact a project to create such a system might have on their day-to-day work or longer-term career. It was therefore unnecessary to use all the elements of the Stakeholder Circle, but the following properties of each stakeholder were considered:

1. Power: their ability to instigate change within a project to produce an Information System such as the one being investigated here.
2. Proximity: how regularly they might interact with the team creating such a system, and from which point of view.
3. Value: how much of a stake the stakeholder would have in this sort of Information System. What kind of benefit would a system for working with potential expressions of inspiration bring to them? Would they be putting their reputation on the line by supporting it?
4. Action: how likely would they have been to do something that would affect the development and use of such a system?

By considering these properties, a picture of which museum practitioners might be most affected by an Information System to provide evidence of visitors' inspiration started to emerge. Another aspect of the Stakeholder Circle that was used was the analysis of disposition towards (i.e. level of enthusiasm for) a project of this nature, from which it was possible to ascertain with practitioners would consider it to have the greatest amount of potential value (see Section 4.3 below).

4.1.3 Eliciting and managing system requirements

The interviews with practitioners during this consultation phase also covered the current use of Social Media by their museums, and where they thought an Information System that could find visitors' potential expressions of inspiration from Social Media might fit into current processes. The researcher's reflections upon this topic were structured by conducting two activities from Robertson and Robertson's 'Project Blast Off' phase: 1) establishing a *project vision*, and 2) considering the *work context* of a potential system for managing evidence of inspiration in museums.

The need for a short, punchy definition of project purpose or vision, to use to focus and refocus participants upon the goals of the project and remind them where the core values of their activities lie, is discussed by Robertson and Robertson (2013), Leffingwell (2010) and Cohn (2005). Robertson and Robertson (2013) suggest a structure for the definition of the high-level project goal that involves a "three pronged approach" based on Purpose, Advantage and Measurement, to produce a relatively short vision statement. Defining the *work context* of a system involved thinking about the information that might flow into the system, the information that would flow from it. The outcomes of thinking about the project vision and the work context are discussed in Section 4.4.

4.2 Findings regarding the definition of inspiration

The museum practitioners consulted as part of this phase brought their personal experience of working in the sector to bear upon the concept of inspiration. Each interview started with the question: "what do you think inspiration is", before the literature was discussed. This provided them with an opportunity to share their ideas without being led by what the researcher had learned from the Literature Review. The results in general built upon the concept of inspiration as defined by the Literature Review, but did not contradict it. Section 4.2.1 illustrates the degree to which many of the practitioners agreed with the definition as it emerged from the Literature Review, by considering some of the points they made about emotion, experience of tangible, material objects, and rational, cognitive thought processes. Then, Section 4.2.2 describes the ways in which insight from the museum sector built upon and expanded the definition, by considering the topics of personal change in the visitor, creativity, and the ways in which inspiration builds over time.

4.2.1 Information that supported the initial working definition

The initial, working definition of inspiration that emerged from the Literature Review was:

> *An experience containing a balance of rational thought and emotion.*

One clear indication that the initial definition of inspiration that emerged from the Literature Review might resonate with museum practitioners was the following quote from Curator 2, which she made at the start of her interview when asked to propose her own definition of inspiration:

> *I think probably you do have an emotional reaction. And usually there's a connection with something of interest in your life or your research. You've got that emotional and intellectual connection at the same time, which makes you want to go on and do something in response to it. So it's an active thing – it makes you want to respond in some way (Interview I6).*

It seemed from this that a definition based upon the relationship between emotion and rational thought, and the experiences that trigger such a balanced reaction, had some relevance to the work of Curator 2. Several of the practitioners interviewed also described times where they had perceived the emotional impact of their museums, collections and exhibitions upon visitors. For example, the House Manager described the emotional impact of the heritage site where she worked, a site that has a compelling and quite problematic story to tell about the social history of poverty in the UK:

> *I've had people faint from reacting to this building, and cry, and have to leave. It's so emotional because of the distance in people's minds of how long ago it was – it is still living history, very much so. And also the general concept… If it wasn't emotional, then we're not doing our jobs very well, are we (Interview I1)?*

She also emphasised that the emotional component of the visitor experience was entirely planned for and welcomed, as it helped emphasise the factual information about the site:

> *… we just want a reaction, and want people to emotionally react to what the building is and its story, and everything that goes with that. A lot of the time it's a positive, you know: 'I really enjoyed myself'. Sometimes it's 'it really disturbed me': we want a reaction (Interview I1).*

One particular piece of the literature supported by the connection made between 'emotion' and 'reaction' is Edmonds et al's model of attractors, sustainers and relators (2006:37), and it also relates to the psychological discussion of emotion in Connolly (2002) and Pinker (1998), who discuss the speed at which emotional reactions occur before rational thought takes place.

Curator 1 introduced another aspect to the topic of emotion, however, by discussing the potential for the emotional component of a visitor's reaction to an exhibit to instil a sense of wellbeing, based on a feeling of belonging to a community:

> *What are emotions? I mean emotional response doesn't need to be love and hate. It could be other feelings. It could be a sense of security. It could be a sense of awe at discovering something bigger, wider. Or establishing a better understanding. Or confirming an understanding… Finding that link with others - finding that the person is not the only one thinking that way. Orienting a person better within their social context (Interview I4).*

This can be related directly to the first of the *Five ways to wellbeing* (see Literature Review, Section 2.4.1): "connect with the people around you" (Aked et al, 2008), and by extension it relates to the underlying concepts of The Happy Museum (Thompson et al, 2013), which is based upon the five ways. However, Curator 1 provided a balanced account of the role of emotion in museums, by coming out strongly *against* the idea of museums deliberately provoking debate by stirring negative emotions in relation to controversial subjects. In a reference to the findings of the Museums 2020 public consultation (BritainThinks, 2013) referred to in the Literature Review, she stated:

> *… visitors said they do not want museums to be an arena for social justice or whatever. They wanted museums to tell them about the material culture. And so, over-politicising the museum is not acceptable. And a lot of bigheads in the museum world got upset at the survey, because they didn't want to hear the public. I mean, really… It tells you there are things that it's best to… It's more ethically correct for me as a museum professional to start with the object and **what the object has to say**, as opposed to pick up a hobby horse of mine and try to find objects that fit it (Interview I4 – Researcher's emphasis applied).*

It should be noted that this is a somewhat different concept of 'negative emotional experience' to that described by the House Manager above. The scenario the House Manager was describing concerned a reaction to the troubling story of a heritage site that was conveyed by telling the story without seeking to overtly stimulate a negative reaction, whereas Curator 1's statement above was a

response to questions posed by the literature in relation to the political role of museums as debating fora. The concept of 'everything starting with the object', and the ethical task of the curator in trying to remain true to the object that Curator 1 describes, also relates to topic of visitors experiences of tangible, material objects and places, though it also raises the question (indicated by the Researcher's emphasis in the quote above), regarding whether or not a curator can objectively let an object 'speak through them' (see the Conclusion to this chapter, section 4.5).

There were two aspects to the topic of experience that emerged when discussing inspiration with the museum practitioners; experience of the museum and its objects, and the personal experience that the visitors brought with them to the museum. The following statement from the House Manager alluded to both, with emphasis upon the former:

> *The museum for us, we're the connector, the sort of outlet for people to touch this area of history. This is a physical vehicle for people to be inspired by the social history of Britain, and in particular the Welfare State. We say here, we do have a physical collection of items, but our collection is the building. And the reason the building's important to people. And that's the sort of link. And it's inspiring people to connect themselves to that link (Interview I1).*

The statement emphasises the importance the House Manager ascribed to the physical location within which visitors' experiences occurred, but as we have seen from the statement by Curator 1 at the end of the previous section, she also considered the role of the objects to be key. Curator 2 also stated that she would turn to the collection first for personal inspiration, and then draw that back towards the needs of the audience. The Museum Director, however, highlighted another aspect of the relationship between a museum and its current and potential audience of visitors: the idea that the collection constrained the experiences that the museum could deliver. In reference to a focus group of local people the museum had organised to gain input into its high level strategic direction, he stated:

> *Basically, they were saying: 'we want a museum of Manchester social history from the 19th Century, with old kitchens and things like that. If we'd have taken their advice, we would have been up the creek, we really would, because* ***it wasn't what we saw ourselves doing****, we didn't have the collection with which to do it (Interview I3 – Researcher's emphasis applied).*

Emphasis has been applied to a particular phrase in the above quotation, and its implications related to the way practitioners can sometimes perceive themselves (very often justifiably) as the experts in a visitor / practitioner relationship. This is discussed further in the chapter conclusion (section 4.5).

The discussion of experience never moved too far away from the discussion of emotion, in a manner that resonated with Damasio's refutation of the Cartesian separation of head and heart (1994, 2001) discussed in the Literature Review Section 2.2.1. Curator 2 once more summed up the complicated relationship between the working parts of the model of inspiration – personal experience, emotion and intellect, but in a manner that emphasised the importance of the personal experience of the visitor:

> *I think you always bring your own emotion and your own experience, and that's why people always take something different from a work. That's why, I think, we try to encourage people to look at works of art themselves, and not just rely on a label to tell them what to think, or what a painting means. Because there's an extent to which anyone can look at a painting and get something from it, and respond to it. I think people are afraid to do that, because I think people feel they should be told how they should look. And there's some information that will help, and some that adds to an emotional response, and intellectual response, but initially, I think, a powerful work of art will have that direct impact on an individual (Interview I6).*

This quotation indicates a perception that, as per the Literature Review, Curator 2 also values the rational, intellectual aspect of visitors' museum experiences. However, it also hints at one of the problems regarding inspiration, expressed strongly by the Visitor Studies Curator:

> *I think it's a very personal thing. I think there's obviously a definition of what it means, but what inspires people when they visit a museum, or whatever… It's difficult for us to measure because it's different for everybody. It's based on how you feel at the time. It's hard to pin down (Interview I5).*

The discussion of the rational, cognitive aspects of the museum experience manifested itself most often when the practitioners discussed the 'big ideas' underpinning their collections. The statement below from the Marketing Manager provides a good example, which ties the 'big ideas' of democracy and emancipation covered by her museum to her own personal experience:

> *Our big thing is about voting and democracy. You might suddenly realise that… especially me as a woman. Women didn't have the vote until relatively recently, and to me, I find that massively inspiring, that people died for that, and so I've voted in every single election I've ever been eligible for (Interview I3).*

Curator 1 also touched upon this subject, but in a slightly different way. She described how the physical experience of material things, many of which might be everyday objects from the lives of 'ordinary people', might somehow disrupt or contradict the strongly-held personal beliefs (or even dogmas) of visitors, because they provide concrete contrast to such abstract ideas that resonate with personal experience. She stated:

> *If you look at faith as doctrine or belief, people will have an abstract understanding of their faith based on the tuition they have received from family and schooling and whatever, you know, formal and informal education. So they will draw images of it, and understandings of it, that are current, now, today. And when they read about its history, they read it again in an abstract form because it's taught as a historical subject or as an indoctrination subject: "this is the history of your religion". But when you look at the material culture, the material culture betrays a lot of these ideas or understandings of one's faith, because material culture is a product of the social interaction AND the faith interaction in a geographical place, in a time place, and it will NOT FIT the ideal doctrine, not necessarily. And it's that kind of difference or dichotomy between the two, the material evidence and the belief that is passed on, and it's always a challenge for a person of faith to face versions of his understandings that have happened in different cultural contexts, geographical contexts, periods of history. And that can be a source of inspiration, because if they are only seeing the one version that they have been taught, that makes the world black and white, and the world is not black and white (Interview I4).*

Indeed in many ways Curator 1 appears to support Benjamin's (1936) theories regarding authenticity and the mechanical reproduction of objects by suggesting that it is the experience of *authentic* objects, from the real, everyday world, which can somehow cut through ideology. This also relates to Žižek's similar theory (1989) that ideologies can also build around key objects, events and personalities: while Curator 1's idea may seem to contradict Žižek by suggesting material objects as an *antidote* to ideology, Žižek's theory concerns famous, *canonical* objects such as major works of art: objects upon whose fame museums often trade. Curator 1, however, was focusing more upon

the social history of *everyday* (i.e. non-canonical) objects - objects that visitors might be able to relate to their own lives - and it is that type of relationship to the everyday, across time, which she believed can help cut through indoctrination and dogma. The idea that an experience of an object might lead to a personal change in the viewer begins to indicate that the initial definition of inspiration from the Literature Review might not be comprehensive enough to encapsulate all the practitioners' ideas.

4.2.2 Practitioners' ideas that added detail to the definition

The consultation with practitioners brought three new aspects of the definition of inspiration into focus, all of which had been covered by the Literature Review, though without their potential importance to practitioners being clear initially. These ideas are:

1. The potential for inspiration to lead to *personal change*, introduced at the end of the previous section, but considered more below.
2. The key role that *creativity* plays in inspiration: that inspiration should lead one to do, or make something, was inherent in much of the literature, but the ideas put forward by the practitioners caused an increase in emphasis of this aspect.
3. That *inspiration builds over time*, and contrary to the cliché is not normally a flash-in-the-pan 'eureka' moment.

As well as describing how inspiration can cause a questioning of dogmatic belief, Curator 1 also described how she thought inspiration could cause people to become more confident in themselves and their beliefs, in a manner related to the ways museum might improve a personal sense of wellbeing:

> *…inspiration is part of your journey in life, and understanding, and surely it would make you more secure, and more understanding of yourself, and therefore less threatened by what you don't know (Interview I4).*

This initially appeared incompatible with Curator 1's statements regarding ideology and dogma (discussed in the previous section), though it can also be seen to subtly support these ideas. It seemed that Curator 1 believed that an increased sense of security and personal understanding could come from the realisation that "life is not black and white", and hence inspiration might

improve one's ability to cope with life's complexities. Hence she indicated that the museum's role first to undermine unrealistic dogmatic belief with evidence of everyday humanity, but then to reassure those who have been so undermined that others have coped with similar complex realities in the past.

The House Manager provided another example from her museum that she thought indicated how uncovering life's complexity, by adding nuances to situations that are often perceived as black and white, might change visitors' perceptions. In her example, attitudes to poverty were related to the forces that caused the UK to vote in favour of the introduction of the Welfare State in the immediate aftermath of World War II. The key term relates to the realisations she perceived in visitors:

> *… it was the ideology around what it is to be poor that changed, rather than poor people, and that's why the NHS [the UK's National Health Service] came in, because they couldn't treat them in that way – they saw them in a different light due to their actions in the war. And people think: "oh yeah. Actually, I realise that now", and then they relate it to themselves: "what do I think of people that are in the Welfare system, and would I change my mind if they went to war (Interview I1)?"*

However, this statement was made in the context of planned work related to the two world wars and the beginning of the Welfare State. Thus the House Manager's statement regarding what "people think" about this topic, and how they related to it, might actually have been tied up in considerations of preferred outcomes and success criteria for that project – in other words, what she *hoped people were going to think* in response to her latest work.

Building upon the concept of personal change: did the practitioners think that causing a change in the visitor, without some external manifestation of that change, could be described as inspiration, or did they think visitors needed to be inspired to *do* something? One of the most obvious responses to a museum experience discussed by practitioners were creative acts incorporating both the ideas, and potentially also expressing the emotions, of experiences. The Marketing Manager stated:

> *You could see something in our galleries that you might find beautiful, from an art perspective… And that might inspire you to then, either, go and do something, or go to another gallery, or to research something about that artist. Take up sewing. Go to a painting class (Interview I3).*

Furthermore, the Visitor Studies Curator mentioned that she added questions about "generic learning outcomes" to visitor surveys, to try and establish when visitors may have been inspired to enrol on courses or attend further events as a result of a museum visit (Interview #5).

One description of creativity in relation to museums concerned "taking an idea from a museum home with you". The Learning and Engagement Officer 2 and Public Relations Volunteer stated:

> *LEO2: There's that sense of inspiration is actually having people visit, and feel that they've actually, they've gained something from that and want to gain more, take something away and actually explore it further. That's the idea of inspiration, isn't it?*
>
> *PRV: I would agree. Inspiration is taking something, then you want to find out more. You want to take it away and explore on your own. And you want to come back, as well (Interview I2).*

This concept began to point towards the final piece of the definition of inspiration that began to emerge during the initial consultation with museum practitioners: the idea that inspiration does not happen "in a flash", unlike the clichéd idea of how inspiration works. Instead, inspiration might be more likely to build slowly as the rational ideas that make up an 'inspired thought' were laid down one upon the other. Curator 2 summed this up when she stated about inspiration:

> *I do think it is a very hard thing to quantify though, because thinking about when I've gone to an exhibition and I've been inspired, nobody else would know about it. I might have shared it with them later, but usually these things happen quietly… I think inspiration does start with small seeds, but it can go and influence your output later on. It could be many years in the kind of formation, before it might show itself (Interview I6).*

Curator 1 also referred to the same concept of chains or layers of ideas:

> *Inspiration, at its most basic, for me, is when I, personally, get an idea, or enriched by an idea, that generates another idea. But also it is a better understanding… And the idea may lead to something but may not, either. It doesn't have to generate a next step, that generates a new inspiration. It may, and then there's like, a ripple effect. But it may not. And… sometimes the inspiration comes a long time later – not necessarily immediately (Interview I3).*

This supports Johnson's assertion (2010) that true inspiration does not come together in a flash, but is more likely to have been laid down over years. Indeed the Policy Research Officer described inspiration as: "… the gateway drug to the next piece of culture (Interview #5)." This notion of gradual inspiration that can take a long time, sometimes many years, to build, emphasises the importance of a museum building relationships with visitors over time, which became a fundamental concern of ARC3 (see Chapter 7). However, the Visitor Studies Curator once again expressed the difficulty of tracking such long term changes in visitors. When asked if her organisation conducted any evaluation work specifically related to "inspiration", she replied:

> *We don't… Erm… I think it's something that… we know that what we do makes people inspired to make choices in their lives… But it's hard to measure. Short of tracking someone's… Someone comes into a museum at maybe intervals… But we can't do that. It's really difficult (Interview I5).*

Of course, there is an obvious ulterior motive for museum practitioners to get behind the idea that it takes multiple museum visits for "inspiration to grow" – namely that they would like repeat visits to their museums. This is discussed more in the Conclusion of this chapter.

4.3 Stakeholder analysis

Table 3 shows the results of the researcher's reflections upon the relationships each of the practitioners might have with a project to find evidence of inspiration from Social Media. It contains estimates of power, proximity, value and action criteria from Bourne's Stakeholder Circle (2009).

Table 4 shows the researcher's reflections upon the stakeholders' attitude towards a potential system for providing evidence of inspiration from Social Media. The researcher considered how much the practitioners seemed to support the idea of a system for managing evidence of inspiration, and how receptive they were of its aims and objectives, ordered once more by potential impact. Both current and potential attitude were considered.

Name (Ordered by impact index)	Power	Proximity	Value	Action	Index
Public Relations Volunteer	2	3	4	4	13
Director (retired)	3	3	3	4	13
Marketing Manager	3	3	3	3	12
Learning and Engagement Officer 2	2	2	3	3	10
House Manager	1	1	2	3	7
Digital Manager	1	2	2	2	7
Policy Research Officer	1	2	2	2	7
Learning and Engagement Officer 1	1	1	2	2	6
Visitor Studies Curator	1	2	1	2	6
Curator 1	1	1	2	1	5
Curator 2	1	1	1	2	5

Table 3 Reflections upon museum practitioners' relationships to a Social Media analysis project

Both tables illustrate a consideration upon the part of the researcher that there was more potential interest and support for the project from practitioners in customer-facing, marketing and communications roles. The practitioners consulted during Interview I2, for example (Learning and Engagement Officer 2 and Public Relations Volunteer), while still learning about Social Media at the time, both appeared convinced by its potential.

Name (Ordered by impact)	Actual support	Potential support	Actual receptiveness	Potential receptiveness	Impact
Public Relations Volunteer	3	4	4	5	16
Learning and Engagement Officer 2	3	5	3	5	16
Marketing Manager	3	5	2	4	14
Museum Director (retired)	2	4	2	4	12
Digital Manager	2	3	3	4	12
House Manager	2	3	2	3	10
Policy Research Officer	2	3	2	3	10
Learning and Engagement Officer 1	2	3	2	3	10
Visitor Studies Curator 1	2	3	2	3	10
Curator 1	2	3	2	3	10
Curator 2	2	3	2	3	10

Table 4 Museum practitioners' disposition towards a potential system for managing evidence of inspiration

Learning and Engagement Officer 2, for example, discussed a particular event that she considered had been successful in attracting crowds in part:

> *… because of the people who were there were also particularly active on Facebook. …. [Describes two of the organisations who came who have active social media presences] … so they were very good at promoting their own events, and much of the audience came from the social networks of those who were involved (Interview I2).*

The Public Relations Volunteer was similarly attracted by the perceived potential of Social Media as a communications channel between their museum and visitors, though she was more circumspect about the effort involved in communicating successfully via it:

> *Public Relations Volunteer [PRV] …..one of the most important things is: remembering it's not analogue [asynchronous] it's a two-way conversation., and it's about seeding conversations on Facebook, it's not necessarily about pushing out your message. In fact it's not about pushing out your message.*
>
> *Learning and Engagement Officer 2: It's more about getting people to engage.*
>
> *PRV: It's about get engaged… It's about*
>
> *Researcher: Or even getting people to talk to each other..? You've kind of facilitated it?*
>
> *PRV: And when you do want to push out some information then they're more receptive about pushing it out for you than if you've just gone: "right, here's our message" and there's no engagement. Just "here's our message". But that's the time-consuming bit, it's literally saying "hi – how's your day going? It's a rainy day. What do you like doing on a rainy day?" That sort of seeding – which I think we're starting to do…(Interview I2)*

Another example came from Interview I1, with the House Manager and Learning and Engagement Officer #1. They discussed using Twitter to advertise an event, and whether or not evidence that people attended the event because of Twitter publicity was important:

> *House Manager (HM): We know it [Social Media] converts people and we don't necessarily need that data to be reassured that what we're doing is the right thing.*

Because we understand it's added value, it's not just about bums on seats and money for the till, it's much more than that. But for the people or the other staff that aren't on board yet and haven't used it, we understand that those statistics [relating Social Media activity to actual visits] are the ones that they need to get them to that next level of buying into what we're doing. That's what they ask all the time.

Learning and Engagement Officer 2 [LEO2]: I can say, you know, at a meeting, we had a family fun day, it was glorious weather, but we were scheduled to do it inside, didn't have many people, so we dragged it outside, put a Tweet on to say "we're under the walnut tree , doing craft activities" and that had an impact on getting people in. I can say that, but where's my evidence?

HM: But that's because we know our jobs well. So for example, last weekend on [mentions specific event]… we made a conscious decision that we were too snowed under and had other priorities, so we were going to run [the event] but we weren't going to actively promote it too much and we were going to be quite low-key. Therefore we used Social Media to promote it, rather than trying to get thousands in, we just thought, if we get the word out we'll get some quality visits that we wouldn't usually get from the local community, and we know that that worked because that's the main outlet that we used .

Researcher: How many people came?

LEO2: We don't know the final figures, but around 300… I spoke to front of house and they said the numbers had really increased. Because it's the end of season the numbers had been dropping, but they said we really had a spike.

HM: That's because we understand the tools… (Interview I1)

Again: it is clear that these practitioners see the potential of Social Media, and also would see some value in being able to prove that value to colleagues. It should also be noted that both these practitioners were users of Social Media in their personal lives (they were both Digital Natives – from a generation that had always had access to computers), which potentially accounts for their feeling that they had to convince more sceptical colleagues of the value of using such tools. However, their assertion that, as experts, such evidence would be for others, because 'we already know our jobs well' is of particular interest, and is discussed more in the conclusion of this chapter.

Another group that reflection upon the interviews indicated might be key stakeholders was those practitioners from more managerial roles. The fact they scored so highly in the Stakeholder Circle analytical structure may partially be due to their 'power' rating, though given the framework also has a 'proximity' rating that counterbalances this factor, this is likely not the case. The Digital Manager provided an example of the level of buy in that he perceived in managerial staff (he refers to a Social Media analytics and management tool called Sprout Social):

> *The venue managers can just go on Sprout and pull a report any time of day. So, you know, each venue has their own small admin group, where, for instance here there's at least three people that have access to this, and all the Social Media channels, and can update them whenever they want. They know the password to get into Sprout Social and just print out a PDF report there and then, you know? And Sprout's really good that way – you can just take out, like, a day, or a year, whatever you want to do. And what I do is I report to the Extended Management Teams, the Senior Management Team, and I update all the managers present at those meetings on how to do that. So most managers are aware of it. Again, they're all kind of, slightly, "that's someone else's responsibility, and I'm quite happy just to see the report", you know. But they get that information, so they get an Infographic, that gives them how many followers, blah blah blah, in the graphic. So the museum managers love that kind of information, you know? So it's quite useful, up to a point, you know (Interview I5)?*

It is not entirely clear from the above, however, what exactly it is about the infographics of Social Media activity that the managers in question liked. Did they just read them as an indications of general progress, for example? This question was returned to during the subsequent Action Research phases.

With regard to those practitioners who it seemed, upon reflection, might have a more limited stake in a system to provide evidence of inspiration: the two curatorial staff consulted indicated that the proposed system would be of limited applicability to their work; this was most likely due to the focus they placed upon the museum collection as the primary influence upon their work. Curator 1's assertion that 'objects spoke through her' has already been mentioned above, and the following statement by Curator 2 also indicated how she saw her role as researching objects first, then unlocking information about them that she thought visitors would be interested in:

> *Obviously you're working with objects that you have in your collection. As you're researching them, you maybe find things of interest about them that you think the public will be interested in; usually little snippets of information, perhaps historical information about who's in the painting or how it was acquired by the museum, the donor. I think these things can help bring paintings alive for people (Interview I6).*

Perhaps the most unexpected finding when reflecting upon the interviews via the stakeholder analysis process is that the Visitor Studies curator ranked low in both tables. Her initial reaction to the description of the aims of the project, from a more knowledgeable position regarding the potential mechanics of the system than the other practitioners, regarded the difficulty inherent in measuring inspiration due to its subjective nature, though the Marketing Manager also raised the same point regarding subjectivity. As discussed above, Visitor Studies curator did, however, mention the difficulty of tracking users across multiple visits: something that Social Media might have the potential to help with: this is discussed more in section 4.4.2 below, and became one of the key ideas underpinning ARC3 (see Chapter 7).

4.4 Potentially valuable uses for the definition of inspiration

As discussed in Section 4.1 above, reflections upon the interviews, and an initial assessment of what the valuable uses for an Information System to manage evidence of inspiration for a museum might be, were undertaken with reference to the 'project blast off' phase of Robertson and Robertson's *Volere* requirements analysis framework. Volere mandates the consideration of two aspects of a project to build such a system: its vision and work context. These are discussed in Section 4.4.1 below. As a result of thinking about such a potential system in this way, it was also possible to start considering, at a very high level, the Action Research Cycles of prototype development that would take place during the remainder of the research.

4.4.1 Vision and work context of a potential Information System

The initial problem statement that emerged as a result of the Literature Review and consultation was:

> *Museums exist to inspire the public, but because inspiration is a difficult concept to recognise and account for, museum staff may not know which of their activities are successful in inspiring people. The museum may also not receive full credit for the value it provides. The purpose of this Information System is, therefore, to indicate, to museum staff and other stakeholders, when visitors may have expressed instances of inspiration in their Social Media content.*

At this early stage (emerging from the Literature Review), some of the advantages it was thought that the potential system could provide were:

1. Aiding audience development, both planning and delivery.
2. Extra feedback from visitors for museum staff about the impact of their activities, helping them to improve those activities.
3. Event evaluation information for funders, helping them judge what return they may have gained from their investment.
4. Evidence for the public regarding the importance of museums to society, helping museums define and justify their position in society, and helping the public realise the importance of the role of museums.

Reflecting upon the interviews certainly offered some support from participants for the first three of these ideas. Interview #2 highlighted the problems of understanding current and potential audiences that Social Media data might have a role in solving:

> *Learning and Development Officer 2 [LEO2]: I'm actually quite keen that we do get more information about who is actually coming to the building, and more importantly, what motivated them to go there in the first place, and what on earth would bring them back?*
>
> *Public Relations Volunteer: How did you find out about us is an important one.*
>
> *LEO2: Exactly, and not just the people who come through the door, but the people who aren't coming through the door, as well… I can have at least three or four*

guesses as to why. The reasons may be patently obvious, but I would like them actually there as evidence… (Interview I2)

With regard to actually using Social Media to engage with specific audience members, build relationships and encourage repeat visits, the practitioners from Interview #1 said:

House Manager [HM]: A lot of what we've been doing, actually, is post visit stuff. Inviting them into that community rather than being the one-off visitor. So we search for the [museum], find when they've been staying: "here's a picture of my son dressed up". I'm mostly Twitter: I do post on Facebook but that's where I mostly look. So: "great photo, we'd love to use it, did you enjoy your visit? We'd like to hear what the kids think." And then they'll talk to us for hours. So for me it's post visit for now. We're not quite there pre-visit.

Learning and Engagement Officer 1: Again – Instagram, it's very much a similar story. I do a search for [MuseumName]. If see any photo that's been taken here I'm: "great job. What did you think of your visit?" and start a dialogue there. So it works exactly the same way post visit. But I think the greatest thing about interacting post-visit is someone making recommendations to friends…

HM: It's almost like they become ambassadors. You get blog posts written about you (Interview I1).

On the subject of event impact upon audiences, Curator 1 described how, while there was no record of the impact *all* of her work had had upon her museum's audience, she was asked to provide information about interactions on an ad-hoc basis:

I mean no-one's come and said "right. Let's do a survey of what you've done in the last eleven years, and how many people has it touched", and scientifically done it. But we do record… certainly every curator records the audiences they engage with. So I supply lists of addresses of people that I've engaged with, of networking, all the events that are, er, carried out by me… (Interview I4)

Shortly afterwards, Curator 1 also discussed how visitor feedback could be passed back to her via the tour guides in the museum that guided visitors to her exhibitions:

Curator 1: They have their own log of every tour they conduct, who attended, how many people, and if there is any comments, anything that stood out that they think

should be recorded, they will… And that's accessible by, you know, by the service. So, um, when I've done exhibitions, and they've done the guiding for these exhibitions, whether themed tours or, you know… relating to these exhibitions or a general exhibition tour, I get them to give me copies of all their logs, so that I can use that for the… er… what do you say? The report that assesses the exhibition and its impact, etcetera.

Researcher: And then that then feeds into the next exhibition?

Curator 1: Of course… Because a lot of it highlights issues (Interview I4).

There seemed to be clear potential for Social Media data to feed into both of these types of process.

Museum fundraising and investment were topics that arose during Interview #3 in particular, where the idea that funding bids would have more weight if there were a tangible sense of the impact that the bidding museum had upon the target audience. This topic was discussed more in the context of Impact Case Studies, however – though the Museum Director seemed convinced that previous bids for funding had been successful due to being able to make convincing claims, backed with academic evidence, regarding the impact his organisation's events had had upon their audience.

Figure 3 contains the work context diagram that the researcher produced after reflecting upon the interviews, and also after conducting some ad-hoc analysis of some of the Social Media content surrounding the museums where the interviews had taken place. The flow of data between the work area and adjacent systems indicate where it was thought the Information System's boundaries lay. Note: Robertson and Robertson state that it is important to think of the area affected by the project as a 'work area' rather than 'the project's system' at this stage in an Information System's development, as thinking about the project in systemic terms before properly defining the work involved can cause opportunities to think laterally and creatively about the work being undertaken to be missed, and de-emphasises the role that people will take in delivering the project's benefits (Robertson and Roberston, 2013).

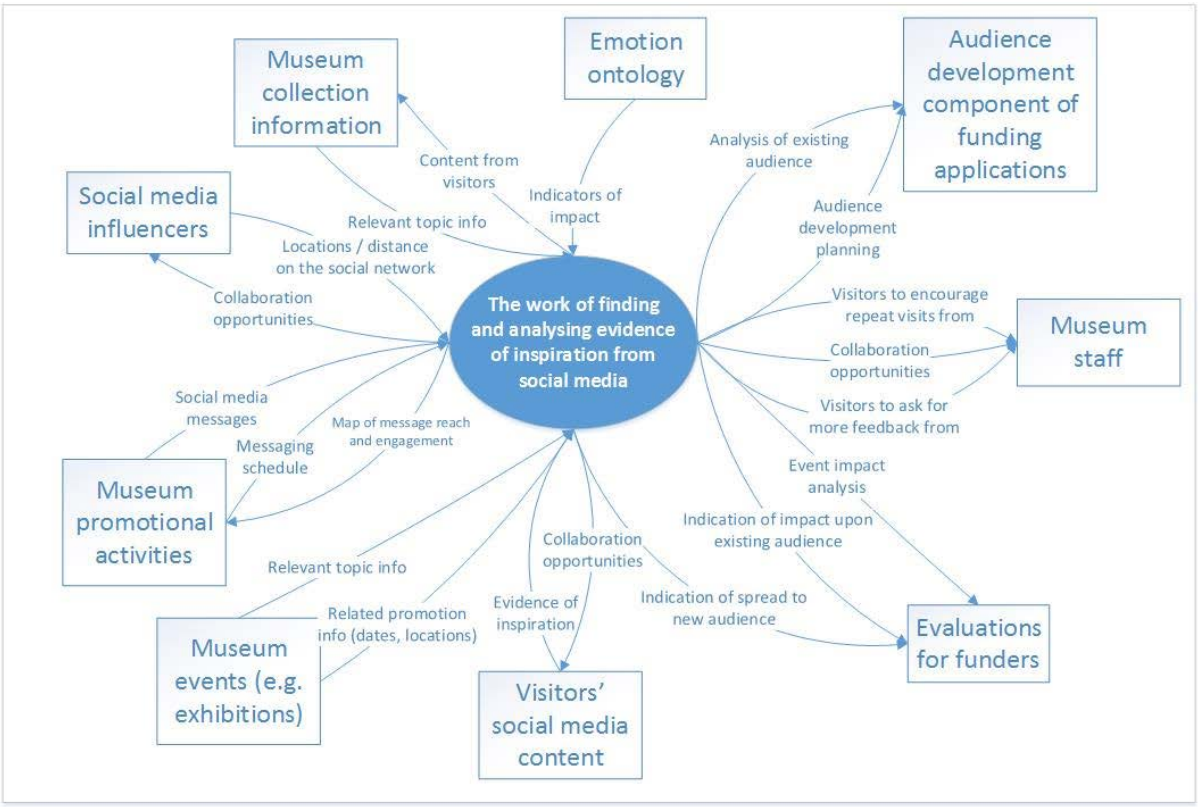

Figure 3 Context diagram of a proposed Information System for managing evidence of inspiration

The surrounding systems that input information into the project's 'work area' as shown by the diagram were (working clockwise from the bottom):

1. Visitor's Social Media content, which was the main source of data for the prototypes.
2. Information about museums' events (such as exhibitions).
3. Museums' promotional activities (e.g., marketing messages).
4. Individuals and organisations in key positions to provide valuable support for museums on the social network: for instance, active Twitter users or popular bloggers who regularly discussed topics relevant to museums' themes. (Such individuals are often described in marketing terms as 'influencers')
5. Information about museums' collections (potentially stored in digital collection management systems).
6. An 'emotion ontology' used to search for content and group it by the emotions described (Sykora et al., 2013)

Opportunities for delivering business value to museums were discovered by tracking the arrows that flow from the central work area, which showed potential information outputs, their users, and what such information might be used for. For example:

1. Information about audiences could flow into the audience-development component of a funding application.
2. Information from Social Media indicating the impact of a specific event upon existing or new audiences could be used in an evaluation report for funders, such as the UK Department for Culture Media and Sport, or the Heritage Lottery Fund. All such funders require evidence of the impact their funding has had upon the public.
3. Information about the visitor community could be used operationally by museum staff (e.g., in marketing or planning future activity).
4. Information about influential experts and enthusiasts that were active on Social Media could be used to find collaboration partners, sources of knowledge, sources of support, etc.
5. Information about visitors with specific interests could be linked directly back to collection data that related to those interests.

4.4.2 Planning the AR Cycles

Three mappings could be made from the analysis of the Work Context that took place onto the three AR Cycles that followed. They were:

1. Information flows relating to audience development mapped onto ARC 1 (see Chapter 5).
2. Information flows relating to the inspirational impact of events upon the public (e.g. those relating to Social Media content created about museum events) mapped in the main onto ARC 2, though had some relevance to ARC 3 (see Chapter 6).
3. Information flows relating the building of community (e.g. those relating to influential users and collaborations with visitors) mapped onto ARC 3 (see Chapter 7).

As stated above, thinking about each of these cycles (in particular ARCs 2 and 3) in any more detail at this stage was unnecessary, as the point of the AR method was to learn from the experience of conducting the research, and re-plan constantly as progress was made.

4.5 Conclusion

Reflecting upon the interviews led to the following key conclusion about the weltanshauungen (or worldviews) of the museums practitioners: namely that the practitioners approached their work with the types of professional attitude that were to be expected from skilled people fulfilling the role of experts. However, this may have led to a lack of reflection on their part upon their own subjectivity. For instance:

1. Occasions where practitioners describe perceiving emotional reactions in visitors should be set against the statements from those same practitioners that they are explicitly attempting to cause emotional reactions in visitors: the House Manager (for example) may have remembered particularly strong emotional reactions in visitors specifically because these indicated that her work in trying to cause such a reaction had been successful, but this may not have been a common visitor reaction. Thinking about her work in a positive light (which is perhaps a common, typical mode of behaviour), may have caused the House Manager to over-state the role of emotion in her museum, therefore.
2. The statements made by both practitioners in curatorial roles to the effect that they could let objects tell their own, unmediated stories. That is not to say that they are not being thorough in their approach to telling the story of the objects they work with, but (as discussed in the Literature Review) exhibiting objects in a museum is a form of mediation, and with all mediation comes a degree of subjectivity and bias, and neither curator accounted for this explicitly when discussing their relationship to their museums' collections.
3. The idea that an 'expert practitioner to lay-person visitor' relationship was revealed in some of the practitioner comments, while undoubtedly justifiable in terms of the degree of knowledge about a museum's collection, also has some implications regarding how feedback about audience reactions to exhibitions and so on might be accepted by museum staff in general.
4. The concept of 'inspiration being laid down over time' would result in a series of repeat visits. In a context of limited finances and funding opportunities, such an outcome would be greatly desirable, so museum practitioners would be very likely to respond positively to such a concept.

The key implications of such a lack of reflexivity on the part of museum practitioners in relation to this research are:

1. That museum staff might ascribe inspiration to visitors without recognising it in themselves, despite evidence that they are inspired by their own museums (such as the Marketing Manager's statement regarding how inspired she was by her museums' stories of female emancipation). This became more evident during ARC2, described in Chapter 6.
2. That museum practitioners might frame the use of evidence regarding audience behaviour in ways that supported their pre-existing ideas about their work: i.e. that they would be prone to *confirmation bias* – i.e. searching for evidence to support their theories, rather than searching for unexpected results that refuted them (Oswald and Grosjean, 2004).

However, practically speaking, the initial consultation phase achieved its core purpose by both:

1. Confirming that the definition of inspiration as it stood at the end of the Literature Review resonated with museum practitioners and had some relevance to their work:
2. Building upon the definition of inspiration by emphasising several points that the Literature Review also covered, but which had not been seen as core enough to the concept of inspiration to become part of the definition.

The other part of the core purpose of the initial consultation that was fulfilled was that some initial, high-level structure could be applied to the remainder of the research work, in respect of:

1. A high-level vision for an Information System that could help a museum work with potential expressions of inspiration from visitors' Social Media in useful, valuable ways.
2. An idea of the 'work context' of such a system, particularly in relation to museums' use of Social Media.

These two outputs from this phase enabled the general topics for the three cycles of AR undertaken during the remainder of the research to be considered for the first time.

To finally summarise how the proposed definition of inspiration, as perceived by museums practitioners, changed during the course of the interviews: at the start of the initial consultation with museum practitioners, the museum-friendly definition of inspiration was:

An experience containing a balance of rational thought and emotion.

By the end of the consultation, the definition had been changed to:

An experience, or set of experiences, containing a balance of rational thought and emotion, resulting in the production and expression of fresh ideas.

The new additions to the definition were:

1. The idea that inspiration could slowly build up as a result of a number of different experiences over time.
2. That inspiration led to a creative output involving fresh ideas.

At this stage, the notions of both creativity and change were still conflated into the final part of the definition, however. The subsequent Action Research Cycles, therefore, caused the definition to change still further; for a complete overview of how the definition evolved throughout the research, see Table 23 in Chapter 8.

5 ACTION RESEARCH CYCLE 1: ASSESSING THE POTENTIAL FOR INSPIRATION IN AN AUDIENCE

5.1 Introduction

ARC1 investigated a method for discovering the potential interests of audience members. As such, it related in particular to the cognitive aspects of the definition of inspiration as it stood at the start of the cycle.

ARC1 also suffered from two major problems. The first related to one of the major issues that can effect AR, namely that the direction taken was influenced too much by the needs of the collaborating partners, and deviated too greatly from the underlying research questions it needed to answer. To exacerbate this issue further, the research was also influenced too greatly by the potential opportunities afforded by the technology used, which also caused issues other than the central research questions to be addressed. The result was a prototype that:

1. Tracked the changes in an organisation's Twitter followers on a daily basis, with the intention of trying to map 'follows' onto real visits and museum events.
2. Enabled the analysis of 'follower overlaps' between cultural organisations in a loose network.
3. Analysed keywords in the profiles of followers to generate clusters of followers around topics of potential interest to those followers.

Upon reflection, only the third of these functions can be related to the core research theme of 'inspiration' – in particular the cognitive aspects of inspiration defined in the two previous chapters. Hence this chapter will focus upon that aspect of the research exclusively, and leave out discussion of the other two features of the prototype.

The second issue with this ARC was that the original set of collaborating staff and volunteers worked for a museum that underwent a major organisational change while the work was in progress. This resulted in those staff leaving their posts. This issue with the ARC was addressed partially by evaluating the ARC1 prototype with the same set of collaborators with whom ARCs 2 and 3 were conducted. They provided some insight into relevance and value of the parts of the prototype that

did relate to inspiration, but the prototype's performance was not evaluated in the same degree of detail as was achieved with the prototypes created for ARCs 2 and 3.

5.2 Diagnostic phase

The diagnostic phase of ARC1 began with the working definition of inspiration as it stood at the end of the consultation. This was:

> *An experience, or set of experiences, containing a balance of rational thought and emotion, resulting in the production and expression of fresh ideas.*

The main exchange with the initial collaborators that overlapped with the topic of inspiration concerned the concept of audience segmentation, and in particular how the proposed sets of audience segments the museum staff had access too might not have been relevant to their museum and its content:

> *Researcher [Res] - Where are you with things like audience segmentation, stuff like that? I mean, is it something you have experience of? Trying to break the audience down a bit?*
>
> *Public Relations Volunteer [PRV] - In my day job yes, but in this job, no. Erm… Not particularly. It's not something I've looked at. And obviously I know it's important, but not…*
>
> *[… Res - Describes another heritage organisation's audience segmentation scheme, discussed in a previous interview with other practitioners.]*
>
> *Learning and Engagement Officer 2 [LEO2] – I can get those.*
>
> *Res – Can you?*
>
> *LEO2 – Yes. From the Arts Council.*
>
> *Res – They've got them, have they?*

LEO2 – Yes. Yes… And it's more motivational. Is it things like: "you're a… something… like an extrovert fun-loving DJ, or something"? Much more in terms of…

Res – Introversion and extroversion is sort of one of the higher-level things that people get broken down on, yeah.

LEO2 – But I'll have a look at that, because… let me just take a note.

PRV – That would be useful, if you could get that, would be interesting for me to see as well. It'll be useful for targeting (Interview I2).

From this exchange it was clear that the staff were aware of some of the uses and potential value of being able to segment an audience, though the example LEO2 gave of an 'extrovert fun loving DJ' did not seem relevant to their particular museum. Might analysis of the potential interests of sets of Twitter followers point towards some more relevant segments?

Reflection upon this aspect of the diagnosis of the problem space was structured (as suggested by the SSM) by considering the *structures* and *processes* related to the potential interests of current and potential museum audience members. The structures were the museum, similar organisations in the museum's cultural network, current and potential audience members, Twitter, Twitter accounts of the museum and related organisations and "Twitter biographies" – the Tweet length (140 characters or less) pieces of text that Twitter users can potentially provide to describe themselves.

The processes that potentially related to audience segmentation were:

1. Following accounts on Twitter: the process of indicating an interest in a fellow user, such that Tweets (short posts) by that user appear in your timeline. Following an account effectively opened up a channel of communication from that account.
2. Describing yourself in your Twitter biography: Twitter users are given a 140 character-long space to describe who they are, though it is not compulsory to use this.
3. Segmenting an audience 'by special interest', targeting events and related communications at specific audience segments (see Literature Review Section 2.4.4).

5.3 Action Planning phase

As noted in the introduction to this chapter, much of the work undertaken in ARC1 was either too heavily influenced by the technology related to the Twitter platform, or was directed away from the core research questions by aspects of the initial collaborators' problems that were not relevant to the nature of inspiration and the use of information from Social Media data. The description of the Action Planning phase has been edited, therefore, to only focus upon the relevant aspects of ARC1, namely those related to the potential to use Twitter follower 'biographies' clustered around concepts as part of an audience segmentation process. The key question that emerged from the Diagnostic Phase (initially in an unstructured form) was: could data from Twitter be used to help with audience development planning? In particular, could the data be used to help consider the 'make-up' of a potential museum audience in more detail?

The most pertinent non-functional requirement related to the fact that this research concerned the feasibility of using Social Media data for smaller, regional museums. An assumption was taken that it would be unlikely that such museums would be willing or able to pay for expensive de-restricted access to Twitter data, meaning that the prototype needed to work within Twitter's API restrictions (see the Action Taking phase for more details).

As discussed in the Methods chapter (Section 3.4.3), User Stories were the mechanism used to map unstructured requirements such as those listed above onto features of the Information System prototype. The User Story for the system prototype shown in Table 5 resulted. The description of this User Story followed a format listing the role of the user who would benefit most from the story, the name of the intended system function and the single most important benefit of the function (Schwaber, 2004). This User Story was then referred to throughout the Action Taking and Evaluation phases.

#	User Story Title	Description
1.2.5	Segmentation of audience	As a *Learning and Engagement Officer*, I need to see which parts of my audience are interested in certain topics, so that I can refer specifically to parts of the audience when planning events that might interest them.

Table 5 ARC1 User Story related to audience segmentation

5.3.1 Weltanshauungen from which the problem could be approached

The SSM also stresses the importance of taking into account the *weltanshauungen*, translating as 'worldviews', 'frameworks' or 'outlooks', from which the problem situation might be approached. To consider the problem of audience segmentation by potential interest in various topics properly, and ensure that potential solutions were thoroughly addressed, the problem situation was considered from multiple weltanshauungen, namely:

1. *Chronological*: the problem situation was framed in terms of looking to the future (i.e. how might certain segments be attracted to a future event?), or by looking at the past (i.e. how did audience segments change over the period an event was running?)
2. *Museum-centric*: the problem situation was framed in terms of the topics relevant to the museum's content.
3. *Audience-centric*: the problem situation was framed in terms of the audience members themselves, and their potential interests.

5.3.2 Techniques from the 'knowledge base'

Following Hevner et al (2004), the 'hard' systems aspect of ARC1 (i.e. development of a prototype) drew upon a 'knowledge base' of technical activities. The technique used in ARC1 that related to audience segmentation by special interest was *generation of Twitter biography clusters (or clustering)*: i.e. the thematic segmentation of the Twitter followers 'biographies' (i.e. the short descriptions linked to Twitter user accounts) enabled by linking specific keywords they contain to particular concepts. Clustering was made possible by using the following techniques:

1. Breaking the text of the 'biographies' down into NGrams (i.e. phrases containing N individual words) (Jurafsky and Martin, 2009), then assessing the frequency at which those NGrams occurred across the corpus. The increased repetition of more commonly occurring NGrams indicated potentially meaningful concepts.

2. Use of online knowledge bases: in particular ConceptNet (Speer et al, 2014) and WordNet (Princeton University, 2010) to find lists of concepts with which to link the keywords in Twitter 'biographies' to.
3. Generation of concept hierarchies: ConceptNet and in particular WordNet organise concepts in hierarchies from the general (at the top) to the specific (e.g. 'painting' is a type of 'art'), hence bigger clusters can be formed by linking hierarchically-related concepts together (Lee et al, 2007).

5.4 Action Taking phase

All three ARCs investigated the constraints placed upon the meaning and value of the 'soft' human activity systems of museums by the 'hard' system prototypes developed during each ARC. As a result, work was undertaken on the 'hard' system prototypes first, before modelling of potential 'soft' systems was undertaken, in order that any technological constraints were better understood.

5.4.1 Hard system prototype development

The starting point for 'hard' system prototype development related to audience segmentation was User Story 1.2.5 shown in Table 5. One technology that was chosen to facilitate rapid development was the graph database Neo4J (Neo4J, 2013), an application which allows data to be managed in a directed graph format that was highly appropriate to generating clusters of Twitter 'biographies' around topics of potential interest. A companion tool to Neo4J was Gephi (Gephi.org, 2015), a system that allows complex, rich visualisations to be generated using data from such graphs. Some examples of these visualisations are shown in the Evaluation section. The prototype system developed to deliver the features and benefits of this User Story is described in detail in Appendix 1

As established during the Action Planning phase, this research investigated the feasibility of using Social Media information in smaller museums with potentially lower resource levels, hence the prototype operated within the standard Twitter API restrictions. Non-paying use of Twitter's API restricted the number of calls made for various types of data. The main part of the API used in ARC1

was ‘follower’ data, i.e. lists of the museum’s followers, and the followers of similar organisations in their cultural network, were retrieved from Twitter.

Two separate pieces of work were undertaken to investigate User Story 1.2.5:

1. Clustering Twitter user ‘biographies’ in the graph around concepts of interest to the museum that the Twitter users had mentioned in their ‘Twitter biographies’. The segments in question were defined by consultation with the Museum1 staff, and were:
    a. Arts-related interests, e.g. painting, writing, design etc.
    b. History-related interests, e.g. history itself, historical architecture, conservation.
    c. Teaching and education, e.g. teachers, students, educational establishments such as universities and colleges.
    d. Business and commerce.
    e. Family, e.g. those who had explicitly stated they were parents or grandparents.
2. Attempting to find unknown concepts of interest by extracting key concept terms from the corpus of user ‘biographies’ automatically.

The first piece of work leveraged the sophisticated Regular Expression (RegEx) engine in the Neo4J graph database to create links between Twitter users and known concepts. The database’s built in query language (Cypher) and various RegExes were written to create links to biographies containing morphemes of the stems of related words (Jurafsky and Martin, 2009). For example, the query in the code below creates links between biographies that mentioned writing-related terms – author, copywriter, writer, novel and novelist - and a specially-created ‘keyword’ node named ‘Author’. The result is a cluster of ‘writing-related’ users around the ‘author’ node. The author node was then further linked to a ‘creativity’ concept, allowing a larger cluster of biographies mentioning creative terms to form.

```
// Author linking logic / regexes
MATCH
  (kw:BiogKeyword),(writerTwitterUsers)
WHERE
  kw.Name = "Author" AND
```

```
    (writerTwitterUsers.Description =~ "(?i).*\\bauthor\\b.*" OR
    writerTwitterUsers.Description =~ "(?i).*\\b(copy)?writer\\b.*" OR
    writerTwitterUsers.Description =~ "(?i).*\\bnovel(ist)?\\b.*")
CREATE
    (writerTwitterUsers)-[:BIOG_CONTAINS]->(kw)
```

It is important to note that the term 'Twitter biography' was commonly used to describe the short description field for a Twitter account within Twitter's own documentation (Twitter, 2014E), and in Twitter's Privacy Policy (Twitter, 2015A) and also throughout the Twitter developer community. See the Conclusion of this chapter for a reflection upon the implications of using this phrase.

Creating clusters 'manually' (or at least, only semi-automatically) in this way begged the following question, however: what if there were other unknown clusters of potential interest to the museum, alongside arts, history, education etc, that were awaiting discovery? This issue was investigated by using a combination of the following technologies and techniques:

1. An inverted index of the biography data (Baeza-Yates and Ribeiro-Neto, 1999), which enabled the frequency of terms to be measured. The terms were unigrams, bi, tri and quad-grams (i.e. terms of 1-4 words in length) with stop words removed, including stop words from the start and end of the tri-grams – in other words "peak district" (a UK National Park located in Derbyshire) and "heart of the peak" were both counted as a potential concepts, but "of the peak district" was discounted.
2. Searching for each of these potential terms (i.e. terms with more than five usages in the whole corpus of 'biographies') in the ConceptNet 5 knowledge base (Speer et al, 2014) and retrieving a count for the number of senses of the term that were contained within it.
3. Creating a 'Growing, Self-Organising Map' in the graph database (Lee et al, 2007) using the list of concepts that did exist in ConceptNet, combined with information about the hierarchical relationships between concepts - in particular concepts from WordNet (Princeton University, 2010) that were contained within ConceptNet.

The second part of the work in particular resulted in a complex database of clusters that are discussed in more detail in the Evaluation Section.

5.4.2 Soft System model development

Investigation of the possibilities of the 'hard' computing system generated knowledge about the potential opportunities and constraints afforded by the prototypes that was carried forward into modelling activity based on SSM. The SSM modelling was an iterative method for structuring the researcher's reflections upon the problem space and the development of the "hard" system, which resulted in system models of the sort shown in Figure 3.

The initial modelling activity in SSM is to create *Root Definitions* (RDs) for models, each based upon a different weltanshauung. It is vital, when considering a problem situation, to approach it from multiple weltanshauungen if opportunities to think of the problem holistically are not to be missed. The thirty year retrospective article that introduces both Checkland (1999) and Checkland and Scholes (1990) recommends basing RDs on a P, Q, R structure, where 'P' is the basic achievement the system aims for ('what' the system will do), 'Q' is the means by which P is achieved ('how' it will do it) and R is the overarching purpose that makes the achievement necessary ('why' do it at all). For ARC1, the four RDs shown in Table 7 were produced for the four weltanshauungen defined in the Diagnostic Phase.

Three models were considered initially for ARC1, one for each of the Weltanshauungen. Only model 1.3.1, shown in Figure 3, will be discussed here, as that was the most pertinent to the topic of clustering Twitter follower 'biographies' according to 'special interest' keywords that was most relevant to the definition of inspiration. Figure 3 shows the RD that the model supports, and then a CATWOE mnemonic of factors that must be considered in every model. Modelling by considering CATWOE (Customers, Actors, Transforming Activity, Weltanshauung, Owner and Environment) is central to SSM.

Four points of note about the system model for ARC1 RD 1.3.1 shown in Figure 6 are:

1. The SSM suggests that, to reinforce the point that the model is of a 'soft', human system, and not a 'hard' technical system, the diagram should be 'hand drawn' if possible, using irregular-shaped 'boxes'. (In the case of this research, a computer package was used but with a 'handwriting-like' typeface).

2. The environmental aspect of CATWOE for this research made more sense when broken down into the 'virtual' environment (i.e. the 'Twitter world') and the 'real' one (e.g. the museum and its real activities).
3. All system models show inputs to and outputs from the system.
4. All system models in SSM require a 'monitoring and control' component – these are shown in the three blocks to the bottom left of the main system block. According to SSM, these always consist of a monitoring activity, defined criteria to monitor the system with, and a controlling action to change the system if the monitoring suggests it necessary.

Two distinct types of activities emerged, both of which relied upon inputs of Twitter follower data:

1. The 'pre-event' type (activities labelled 1, 2 and 3) could use follower data to create an audience development plan for an event.
2. The 'evaluation' type (activities 4, 5, 6, 7 and 8) would occur during and after the event.

#	Weltanshauungen	RD
1.3.1	Chronological	A system to help plan for and evaluate a museum event (e.g. an exhibition) by analysing the interests expressed in potential audience member's Twitter 'biographies' before, during and after the event, in the expectation that the clusters around topics of interest formed by these biographies will change in response to the event being planned and evaluated.
1.3.2	Museum-centric	A system to grow a museum audience by conducting a series of inspirational events. The events are planned by judging where the stated interests of the current and potential audience overlap with museum content, and (in part) evaluated by analysing changes to the audience. The intention is to help increase the museum's popularity and its importance to the community.
1.3.4	Audience-centric	A system that creates a vivid, compelling vision of audience involvement in museum activities for the audience itself, using a digital artwork made from Twitter data for display both in the museum and online. This is in order that museum visitors and virtual audience members feel further compelled to join in with museum activities and feel part of a community centred upon the museum.

Table 6 Weltanshauungen and Root Definitions for ARC1

ARC1 RD 1.3.1

A system to help plan for and evaluate a museum event (e.g. an exhibition) by analysing the interests expressed in potential audience member's Twitter 'biographies' before, during and after the event, in the expectation that the clusters around topics of interest formed by these biographies will change in response to the event being planned and evaluated.

C - Museum staff and event organising partners
A - Staff / partners responsible for event evaluation
T - Twitter follower data (collected in a time-serialisable fashion) ---> Reports for audience planning
Event evaluation reports
W - An organisation's events attract new Twitter followers with related interests
O - The museum's manager
E - (Real) a museum event occurs (e.g. an exhibition)
(Virtual) the museum has a Twitter account with a changing set of followers

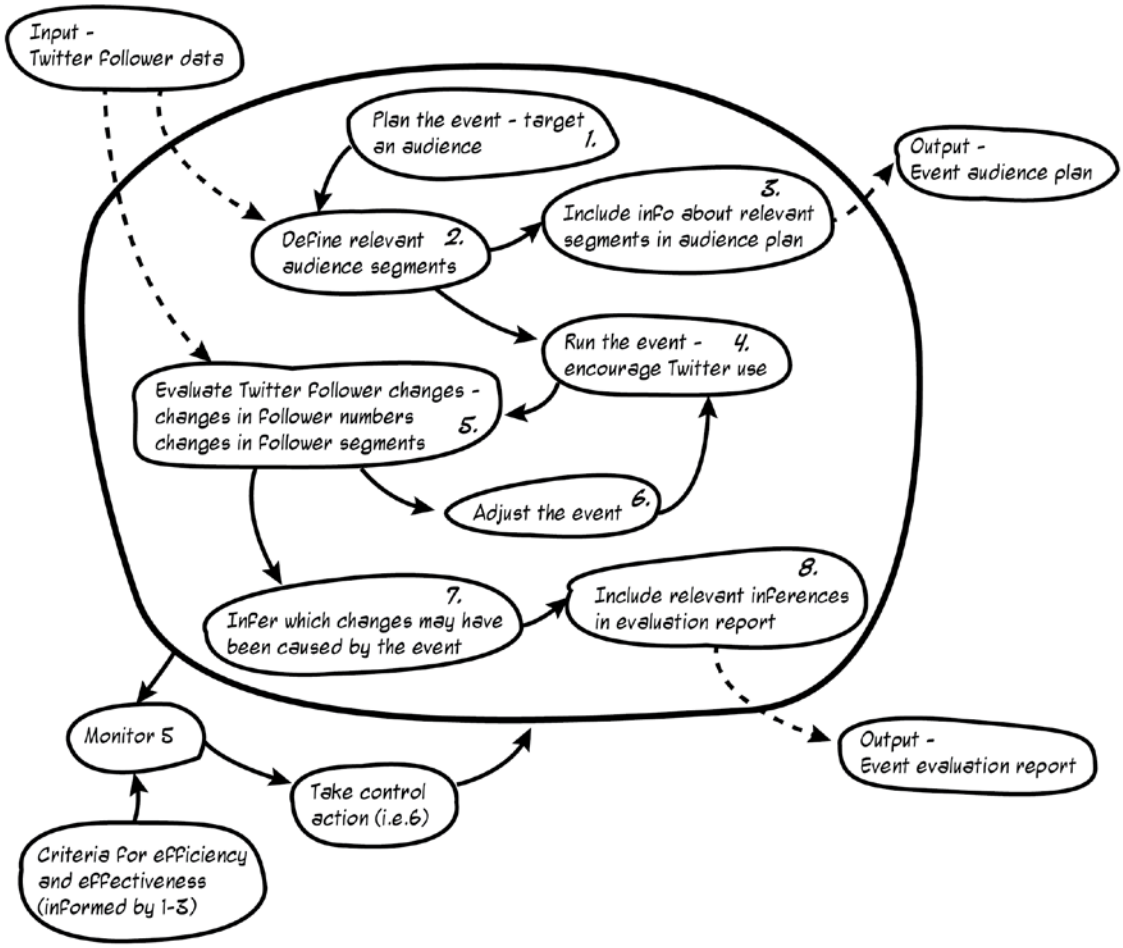

Figure 3 Soft System Model for ARC1 Root Definition 1.3.1

During the event, activity 5 becomes part of the monitoring activity (towards the bottom left of the diagram) and (because Twitter data could be retrieved in near real time), there was at least a technical feasibility that an event could be changed while it was running (i.e. the control action). After the event, Twitter follower data (in particular the *delta*, or changes to the data that occurred during and after the event) could become input to an event evaluation report.

5.5 Evaluation phase

The 'hard' system prototype, the data it retrieved, analysed and presented, and the soft-system models were all evaluated with the Head of Museums (HoM) and Social Media Coordinator (SMC) from Derby Museums during Workshop W1 (on the 29th August 2014) the Evaluation Workshop EW (on 14th July 2015). The hard system's evaluation is discussed in the following subsection, while discussion of the evaluation of the soft-system models is covered in the second half of this section.

5.5.1 Evaluation of the 'hard' system prototype

With regard to the development of the hard system prototype following issues were noted:

1. The functionality of the Twitter API and its usage limits were the greatest constraint upon the system. API usage restrictions only allowed relatively small numbers of followers (i.e. less than 75,000) to be returned. The initial data download, which captured all the biography information for the first time, was the most constrained by the API limits, hence the decision was taken not to refresh information during the data capture period while in the prototype phase. A production system would require follower data such as 'biographies' to be updated more regularly, because Twitter users can update their 'biographies'. The need to run these updates would thus constrain the system even further.
2. Experiments using ConceptNet to automatically generate clusters around key terms used in Twitter 'biographies', and hence find unanticipated topics of potential interest to followers, were not entirely successful. A key reason for this was that some of data sources for ConceptNet 5, in particular DBPedia (DBPedia, 2015), contained information that created many false-positive clusters; because DBPedia data is in turn based upon Wikipedia data,

ConceptNet contained many records related to bands, films, books and song titles based upon everyday phrases often also used in Twitter biographies. As a resource generated by professional linguists and lexicographers, WordNet on its own was more effective for linking biography keywords to.

Evaluation of ARC1's 'hard' system prototype also involved a review of the following pieces of information:

1. A bar chart showing the size of Twitter 'biography' clusters around concepts relevant to the museum the first set of collaborating partners were from (Figure 4).
2. A Gephi visualisation of the 'biography' clusters around art and design-related concepts from followers from the Derby cultural network (Figure 5).
3. A Gephi visualisation of the 'biographies' linked to nature-related concepts, clustered around the organisations that each follower in question followed (Figure 6).

During the initial collaboration, museum that the collaborating staff were from took part in Twitter's #MuseumWeek promotion, and registered a large increase in followers during that period. This is most likely because the #MuseumWeek hashtag started to 'trend': i.e. it was used heavily enough for Twitter to promote it, thus enabling more Twitter users find the Tweets that contained it, and start following the creators of those Tweets. Examination of these new followers indicated that a significant proportion (52 of 106 – or 49%) were likely to be 'follow-spam': i.e. Twitter users who followed individuals to promote advertising, or in the hope that they would be followed back, in order to build up a following that might be financially valuable (Williams, 2008). Examples are shown in Table 7.

Figure 4 shows the size of follower segments generated using keywords from Twitter 'biographies'. The numbers of followers are shown as a proportion (percentage) of the overall total of followers in the network (11,711). The results are overshadowed by the "no segment" column, made up of those followers whose descriptions do not contain any of the keywords used for segmentation, an inevitability when Twitter users only have 140 characters with which to describe themselves. This chart of follower segments related to potential areas of interest is just one example of several that could be output using the data in the graph database – it was also possible to subdivide the data to show only the followers of each specific organisation, and compare that with the overall network, for example.

Description
I'm setting a goal to follow as many as possible. Please don't mark me as spam :) Getting peeps to folo me so I can folo back makes it easier :) Thankyou c:
UK Rail Pass http://t.co/pmEsNThLVO UKRailPass http://t.co/spWMkzMeI9 #UKTravel #UK
I know anything about online monetizing! Ask me.
Research for a project and news. Thank you for your time.
How to get Amazon lightning deals !!! Lightning Deal Buy http://t.co/HvnQQnoZc6 #LightningDealBuy #LightningDeal UK UK UK http://t.co/85NsgSCI62 UK UK

Table 7 Examples of Twitter "follow spam" found during ARC1

Staff from Derby Museums were also shown two further visualisations, shown in Figures 5 and 6. These visualisations were created by importing subsets of the data from the graph database produced by ARC1's prototype into the Gephi visualisation tool (Gephi, 2015). The visualisation in Figure 6 shows very similar data, in terms of structure, to that underlying the bar chart in Figure 4, but with the actual clusters themselves displayed, rather than the size of the clusters quantified.

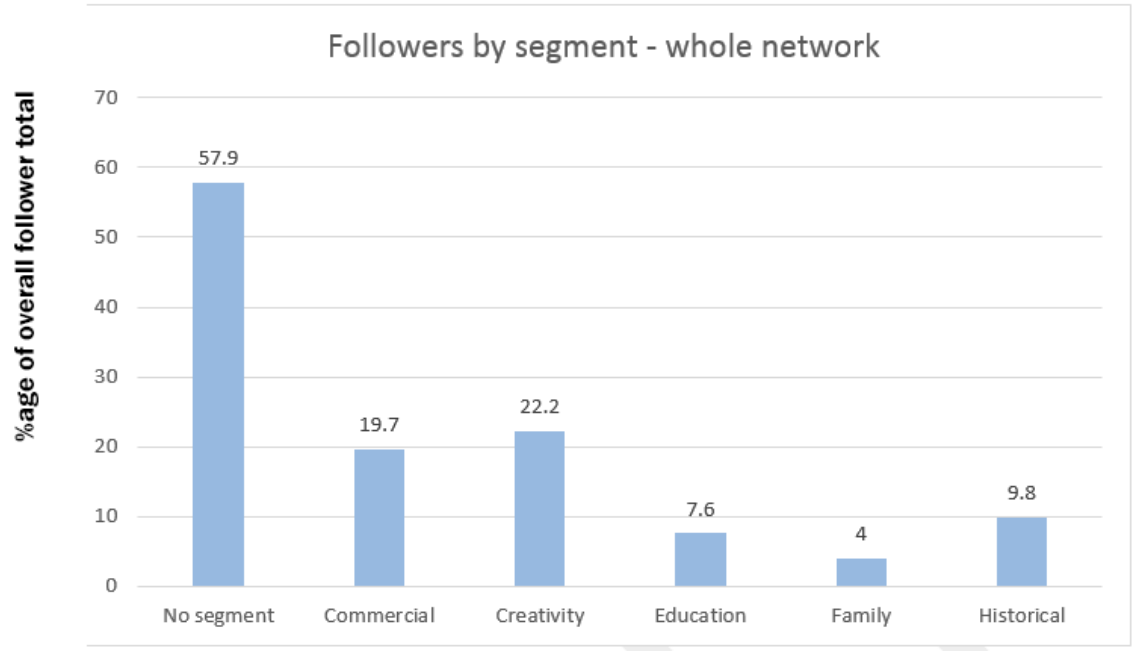

Figure 4 Total sizes of biography 'special interest' clusters around topics of interest to the initial collaborators

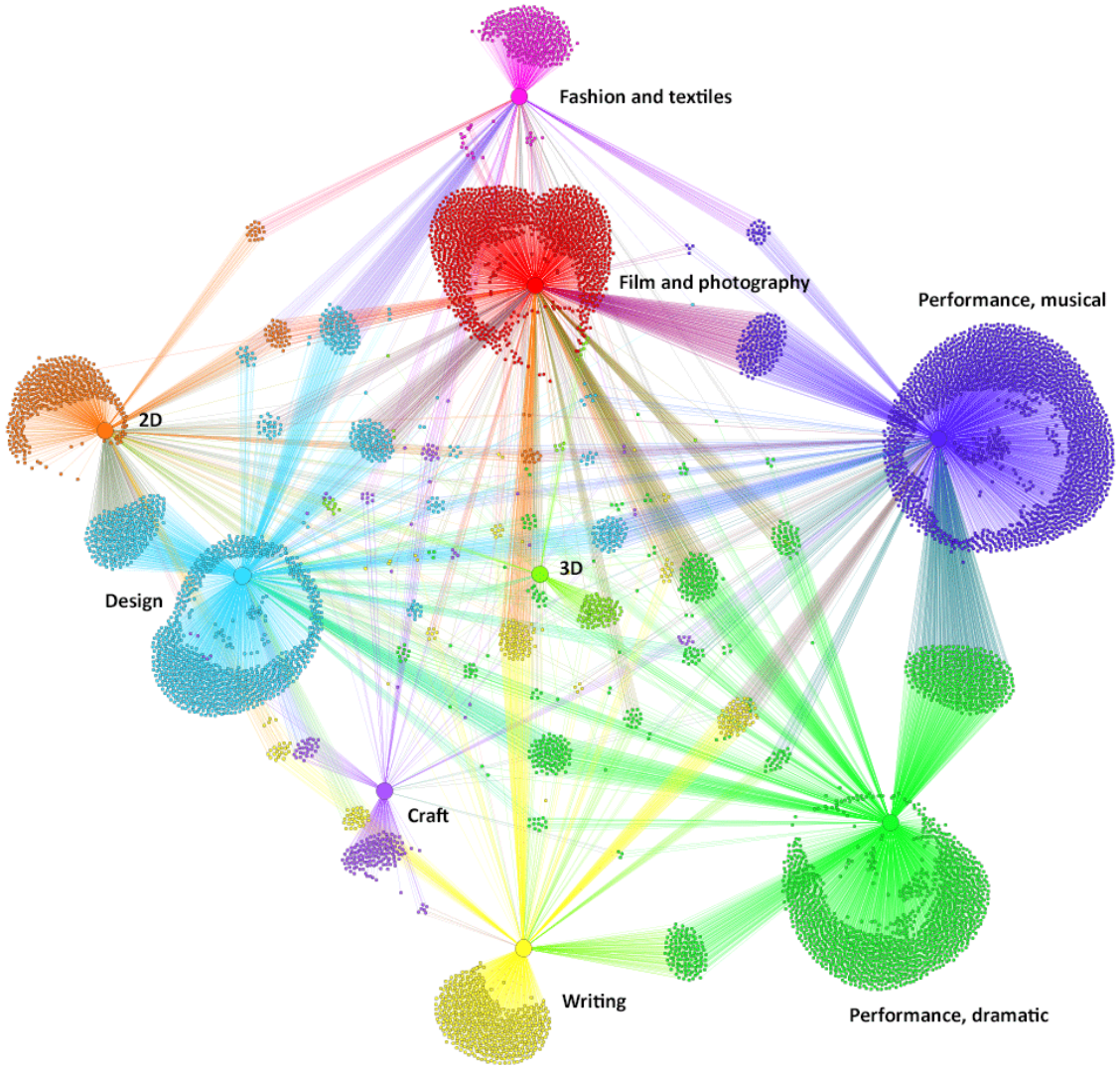

Figure 5 Graph visualisation of follower 'biography' clusters around art-related topics

This was a visualisation of the subset of the entire set of 'biographies' that contained keywords relating to art and design, further broken down into subcategories curated by the researcher. The curation was further enabled by generating an index of terms from the Twitter user 'biographies' and ordering the terms by frequency, in order that the most common, obvious terms be considered. One obvious aspect of the visualisation was the size of the clusters relating to performing arts, film and photography, which was due to the presence of Derby Quad, Derby Theatre, Sinfonia Viva and Deda Derby in the cultural network alongside Derby Museums. In terms of the usage of this visualisation, the Gephi tool enabled interactive browsing of the data: one could click on each node

to retrieve information about it. This interactive visualisation proved popular with the Derby Museums staff, in particular because it enabled the exploration of the clusters in-between the major clusters (e.g. a small cluster of 'Theatre design related biographies' between the "Design" and "Performance Dramatic" clusters). The museum staff were also intrigued by the potential to cluster Twitter user 'biographies' around similar classifications to those by which the objects in their collection had been classified (e.g. their Social History and Industrial Classification).

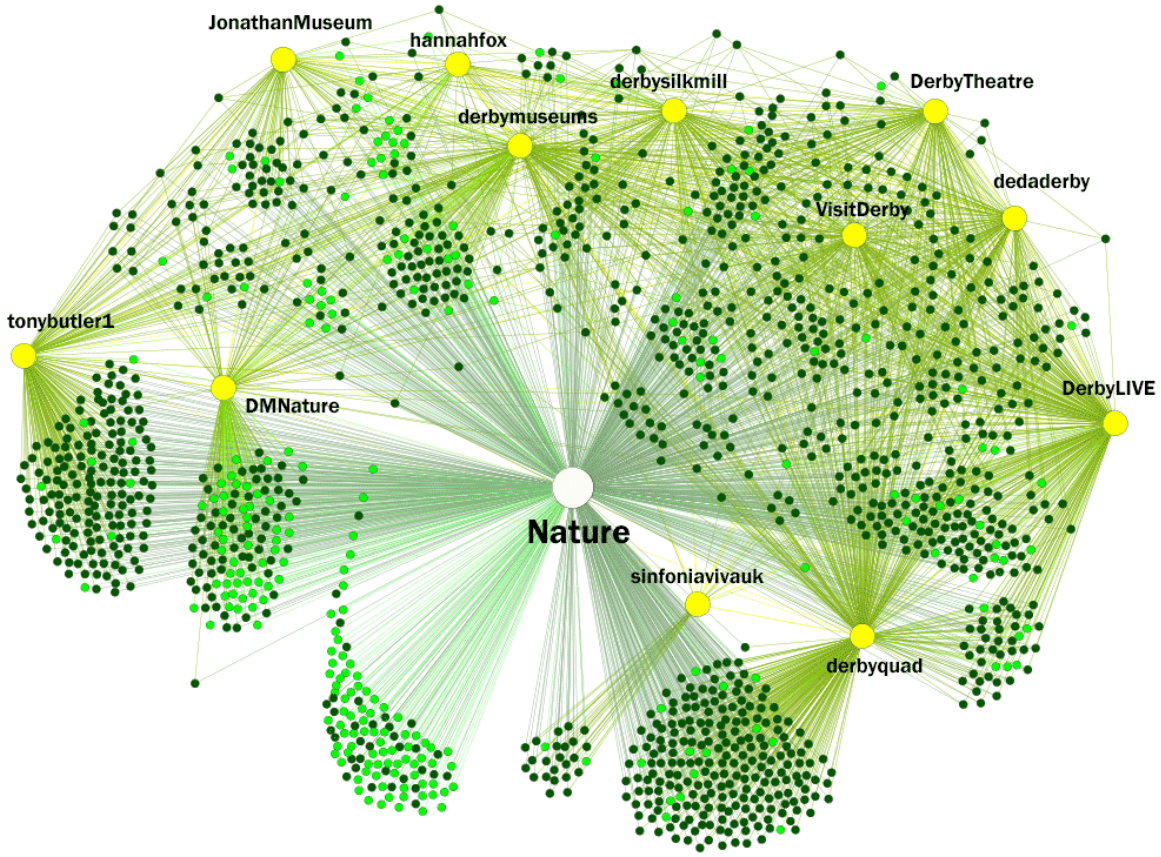

Figure 6 Graph visualisation showing all biographies containing nature related keywords, clustered around the organisations in the Derby cultural network that the biographies' creators followed

Figure 6 shows another Gephi visualisation. This showed the subset of Twitter user 'biographies' containing 'nature-related' keywords, but in this instance clustered around the organisations in the Derby network of cultural organisations that the biographies' creators followed. Also, those Twitter

users that were 'new to the network' – i.e. those that started following during the data collection period – were highlighted in a lighter green.

Two aspects of the visualisation in Figure 6 were of specific interest to the Derby Museums staff:

1. There was a large number of 'new followers' of the DMNature account. This account was created specifically for Derby Museums' redeveloped Nature Gallery, which was relaunched during the data collection period - indeed the choice of nature as a relevant topic was due to this event having occurred.
2. The clusters of Twitter user 'biographies' around the other cultural partners (e.g. the large cluster of @derbyquad followers towards the centre bottom) represented, in the eyes of Derby Museums' staff, *potential future followers and visitors to Derby Museums*. A discussion occurred regarding how Derby Museums might tap into this 'potential', with opinions varying regarding the pros and cons of contacting the users in those clusters directly, or working with the cultural partners they were already following to contact them (see Chapters 8 and 9).

One very important point to note regarding these outputs from the prototype is that, due to the disruption experienced during ARC1, the information retrieved by linking keywords in 'Twitter biographies' to concepts such as 'art' and 'nature' was not evaluated for levels of precision and recall, and the underlying reliability of any statistics generated with the prototype was not assessed. This work would have to be done satisfactorily before any statistics generated by this prototype could be relied upon.

5.5.2 Evaluation of the soft system models

The evaluation of the soft system model was exclusively undertaken with Derby Museums, as it occurred after the aforementioned changes among the initial collaborating staff.

The soft systems model described in Section 5.4.2 was evaluated alongside the information about clusters of follower 'biographies' around potential topics of interest output by the prototype. The following issues arose:

1. Derby Museums already conducted formal audience planning and analysis activities, towards which the information from the ARC1 prototype could potentially contribute useful information (Derby Museums, 2015).
2. Derby Museums had a Human Centred Design approach to exhibition and other content development that mandated involving audiences in planning and development activities (Derby Museums, 2014A). A system such as the one shown in the prototype could help find candidates for such collaborative activity.
3. 'Current affairs' were a missing set of concepts that could be input into the system. Derby Museums' staff provided the example of a fox exhibit in their Nature Gallery, and its relationship to the potential relaxation of hunting laws in the UK, as a type of 'hook' into a discussion with visitors held via Social Media.
4. Uses for evaluation data were discussed: often, detailed evaluation data might not be required by a funding body for a specific project, but would instead be attached to subsequent funding applications.
5. Day-to-day evaluation was also important for museum management and could help general process improvement among staff.

5.6 Summary

It was clear from both the Diagnostic and Evaluation phases of ARC1 that audience segmentation by special interest was a process that museum staff considered beneficial, both before events for targeting communications to potential audience members, and after events to see how segments may have changed.

However, the greatest risk of a prototype such as the one created here, that uses Social Media data, is the ease at which 'clusters around concepts related to keywords in Twitter 'biographies'' was conflated, by both the collaborators *and* the researcher, into 'clusters of audience members with specific interests'. All those collaborating upon this ARC found it very easy to fall into the trap of discussing "all the painters" or "all the photographers" when referring to clusters, when the clusters represented something quite different, conceptually (namely "all the 'biographies' containing a photography-related keyword). The statement "I enjoy photography" might indicate anything between "being a full-time professional photographer" to "being someone who buys a photography

magazine from time to time", or could indeed be completely untrue, hence thinking in terms of 'clusters of photographers' could be dangerously misleading.

Twitter, therefore provided an opportunity to collect data about *potential* museum audiences, but also constrained this data collection process in ways that it is important for researchers to understand and acknowledge. Some issues of note regarding Twitter's impact upon the data were the type and volume of data that the API allowed access to, the dependency upon context inherent in this data, the potential for the third-party API client library (Imart, 2015) to affect data collection, and the potential for collected data to go out of date. The most telling restriction, however, is the length of a Twitter 'biography', or indeed the use of the 'biography' label for a 140 character description of an individual. This latter issue conflates with the serious issue discussed previously – the misleading idea that this data comes from Twitter users' 'biographies' potentially encourages far more information to be read into this data than it is safe to.

These conclusions indicated that it is undesirable to attempt to answer key questions about audience engagement by only looking at Social Media data in isolation. The system created for ARC1 may have a valid purpose in helping find potential audience members to work upon other types of evaluation with, but using it to gain any deeper insight than that (particularly without testing the reliability of the data with an annotated test reference set that has been further tested for inter-coder reliability) would *not* be recommended. This issue is discussed at length in the following chapter, and in Chapter 9.

6 ACTION RESEARCH CYCLE 2: CAPTURING EVIDENCE OF INSPIRATION CAUSED BY MUSEUM EVENTS

6.1 Introduction

ARCs 2 and 3 were both undertaken in collaboration with a second set of partners: staff from Derby Museums, and in particular their Head of Museums (HoM) and Social Media Coordinator (SMC). Also of note is the fact that their business plan mentions the term 'inspiration' as one of nine items listed under their core values:

> *Inspiration – we work with creativity and passion and see our heritage and stories as the inspiration for everything we do (Derby Museums, 2012:2).*

Both ARC2 and ARC3 involved two events held at the Silk Mill (one of Derby Museums' sites):

1. *The Derby Mini Maker Faire*: a two-day-long exhibition and fair, held between 25th and 26th October 2014, in which "makers" - designers, developers, crafts-people, hobbyists and learners, interested in science, design, technology and engineering - exhibited their work (Derby Makers, 2015).
2. *MuseoMix UK 2014*: a three day hackathon, held between 9th and 12th November 2014, in which 90 participants prototyped museum exhibit designs created using objects from Derby Museums' collection (MuseoMix UK, 2015).

Both events were open to members of the public as well as participants. The first author also attended both events, and participated in the second, to witness inspiration occurring first hand. ARC2 was thus the core attempt to *capture potential expressions of inspiration* from Social Media content related to museum events.

The prototype produced during ARC2 is also discussed in more depth in Appendix 2. The following workshops were held during the development and evaluation of this prototype (see Appendix 5 for the full list of interviews and workshops).

1. Workshop W3 on 15th October 2014 (Diagnostic Phase).
2. Workshop W4 on 21st October 2014 (Diagnostic and Action Planning Phases).
3. Workshop W5 on 30th October 2014 (Diagnostic and Action Planning Phases).

4. Workshop W9 on 30th December 2014 (Action Planning and Action Taking Phases).
5. Workshop W10 on 16th January 2014 (Evaluation Phase).
6. Workshop EW on 7th July 2015 (Evaluation and Specifying Learning Phases).

The collaborative parts of the Specifying Learning Phase for all three ARCs were rolled into the Evaluation Workshop discussed in Chapter 8. As previously stated in Chapter 3 (section 3.3.3), workshops were recorded but not fully transcribed: the method for investigating the museum practitioners responses to Twitter data was by reviewing the data that the prototype had automatically analysed with them (see sections 6.4 and 6.5).

At a high level, ARC2 concerned the analysis of the text of Tweets related to the two events. The Tweet text was linked automatically to certain keywords related to inspiration, which were taken from the lexicon *FrameNet* (see Section 6.3 below), to enable filtering of Tweets of potential value to the museum practitioners. Sections 6.2 and 6.3 explain how opportunities and problems with the potential to be addressed with Social Media data were revealed, while Sections 6.3 and 6.4 explain how the prototype, and its potential uses, were planned for and developed. Section 6.5 describes evaluation of the prototype. Section 6.6 summarises the ARC, in particular by describing how learning related to the prototype was carried forward for discussion in the Evaluation Workshop.

6.2 Diagnostic phase

The diagnostic phase was conducted by:

1. Holding two workshop meetings with Derby Museum's staff.
2. Reviewing Twitter content that related to Derby Museums.
3. Conducting desk research into the surrounding context of the museum, its staff and the two events
4. Conducting a short review of Tweet Wall software.

The output of these activities was organised into lists of related structures, processes and stakeholders, as suggested by the Soft Systems Methodology (SSM) and Bourne's Stakeholder Circle. These are listed in Sections 6.1, 6.2 and 6.3. Also as suggested by the SSM, a *rich picture* of the opportunity / problem was created (see Figure 7 in Section 6.4).

The most high-level piece of context, one that underpinned the whole of ARCs 2 and 3, was provided by the HoM and the SMC, when they described the five core reasons why Social Media was used at Derby Museums. These reasons were described by the HoM and SMC during Workshop W4:

1. **Marketing:** described by the HoM as "Straight marketing… in order to get people through the door". One issue related to this is the difficulty of attributing visits to Social Media publicity, particularly because, in the eyes of the HoM, those visitors more prevalent on Social Media: "the under 30s, don't fill in questionnaires" which could be used to link a visit to publicity.
2. **Increased public profile:** described by the HoM as: "local… so: 'you can't get rid of the museum! I hear they're doing some great stuff!' They don't visit, but they know we exist. Because they see us."
3. **Increased profile among stakeholders:** the HoM described being particularly please when a Tweet about their museum was Retweeted (i.e. copied and shared) by the Chief Executive of a major funding body. In fact, *stakeholder* was largely used synonymously with *funder* by the HoM.
4. **Disseminating knowledge about the collections:** this purpose was low enough on the list of the staff's priorities that it was actually suggested by the researcher (based upon the Literature Review), but the staff agreed that spreading an "understanding of history or art" was something they used Social Media for.
5. **Sharing practice with fellow museums:** described as "Sector Engagement" by the Head of Museums. This was something both staff claimed to do a lot.

ARC2, like the other ARCs, also used the working definition of inspiration as an initial reference point:

> *An experience, or set of experiences, combining rational thoughts and emotions, resulting in the expression or enactment of fresh ideas.*

6.2.1 Structures

The following structures were relevant to the problem situation for ARC2.

- *Derby Museums*: the host organisation for both events, Derby Museums had as its stated purpose: "… to inspire people to become part of a living story of world class creativity, innovation and making (Derby Museums, 2012: p2)". The Derby Silk Mill, the location for both events, exemplified this vision by including local people in the development of the museum (Derby Museums, 2015B).
- *Derby Museums' staff*: Derby Museums encouraged their staff to use Social Media for their work, hence staff produced much of the Social Media content studied.
- *Fellow organisers*: the two events studied involved key partners; they were Derby Makers (Derby Makers, 2015) and the organisers of MuseoMix UK 2014 (MuseoMix UK, 2015).
- *The participants*: both events had participants; i.e. individuals and groups who were not from partner organisations, but who were working there or otherwise actively participating.
    - At Maker Faire, key participants were *makers*, i.e. individuals or groups running stalls and workshops to display their skills, educate visitors, promote their activities and sell items.
    - At MuseoMix, the participants were paying guests who were taking part in three days of development activities and group work, for fun and personal experience.
- *Visitors*: both events were also open to the general public.
- *Followers from afar*: there was also evidence of individuals tracking the progress of the events using the internet and Social Media.
- *The Twitter Social Media platform*: Twitter was used to create content and link it to the events.
- *Twitter API*: the Twitter API subsystem was used to retrieve both follower and Tweet information about the two events.
- *The Berkley FrameNet project*: from UCLA Berkeley (FrameNet, 2010). FrameNet was originally considered a structure relevant to the Diagnostic Phase, but evaluation of the Rich Picture (discussed in detail in the Evaluation section) established that this was a mistake. It is noted here in order that the 'pre-evaluation' version of the Rich Picture discussed below makes sense, but it is actually covered in more detail in Section 6.4.1.

The researcher attended the Maker Faire event in the role of visitor, and attended the MuseoMix event in the role of participant. Problems arose regarding distinguishing between 'participants' and 'visitors', which are discussed in the Evaluation (Section 6.5).

6.2.2 Processes

The following processes related to ARC2:

- *The Derby Mini Maker Faire* (DMMF): held on the 25th and 26th October 2014 at the Silk Mill in Derby, DMMF had a Twitter hashtag that participants and visitors were encouraged to use. The event also used a Tweet Wall which was displayed on screens during the event.
- *MuseoMix UK 2014* (MMUK): held on the 9th – 12th November 2014, MMUK was part of a wider MuseoMix event that also included four events in France. Hosted at the Derby Silk Mill, but organised by a third party, MMUK14 had a co-ordinated Social Media campaign involving Derby Museums staff and others, using Facebook, Tumblr.com and the Twitter hashtag #MMUK14.
- *Attendees' inspiration*: as the central attempt at capturing potential expressions of inspiration, ARC2 considered the psychological processes of inspiration within the participants, visitors and staff as part of the system under investigation. The main structure used to help consider this was FrameNet.
- *Tweeting*: museum staff, other event organisers, participants and visitors added Tweets about the two events (identified using the related hashtags) before, during and after each event.
- *Accessing Twitter via the API*: Twitter data could be accessed and downloaded programmatically using the Twitter API. Both follower and Tweet information was accessed in this way.

Many of the processes outlined above also relate to the concept of *engagement* (see Literature Review Section 2.2.3). Derby Museums' staff also used the term engagement in a manner nearly synonymous with *inspiration* in both their daily work and their documentation, for instance, their Digital Engagement Strategy (Rippleffect, 2010). This is discussed at length in the Evaluation section.

6.2.3 Stakeholders

Two of the stakeholders worked on ARC2 directly:

- *The Head of Museums*: had an influence in all directions, in particular 'outwards' as he was a well-known and influential museum professional. He was also keenly interested in the project, and in the potential of Social Media more generally.
- *The Social Media Coordinator*: her role was to influence outwards towards the museums' audience. Her interest in the project stemmed from a desire to help discover new methods for Social Media analysis.

There were other stakeholders that had interests in ARC2:

- *Other museum staff*: in particular the Silk Mill Development Manager and the Executive Director of Derby Museums, both were interested in the benefits to museum audiences of participation in museum events.
- *The event organising partners*: the Derby Makers and MuseoMix UK both had an interest in any evidence that their events had caused inspiration.
- *Event sponsors*: were potentially interested in the positive impact of events, because any positive exposure for the events would spread positive awareness of the sponsors.

6.2.4 Rich picture of the problem situation

As recommended by the Soft Systems Methodology (Checkland, 1999; Checkland and Scholes, 1990) the problem situation was visualised using a Rich Picture (Figure 7).

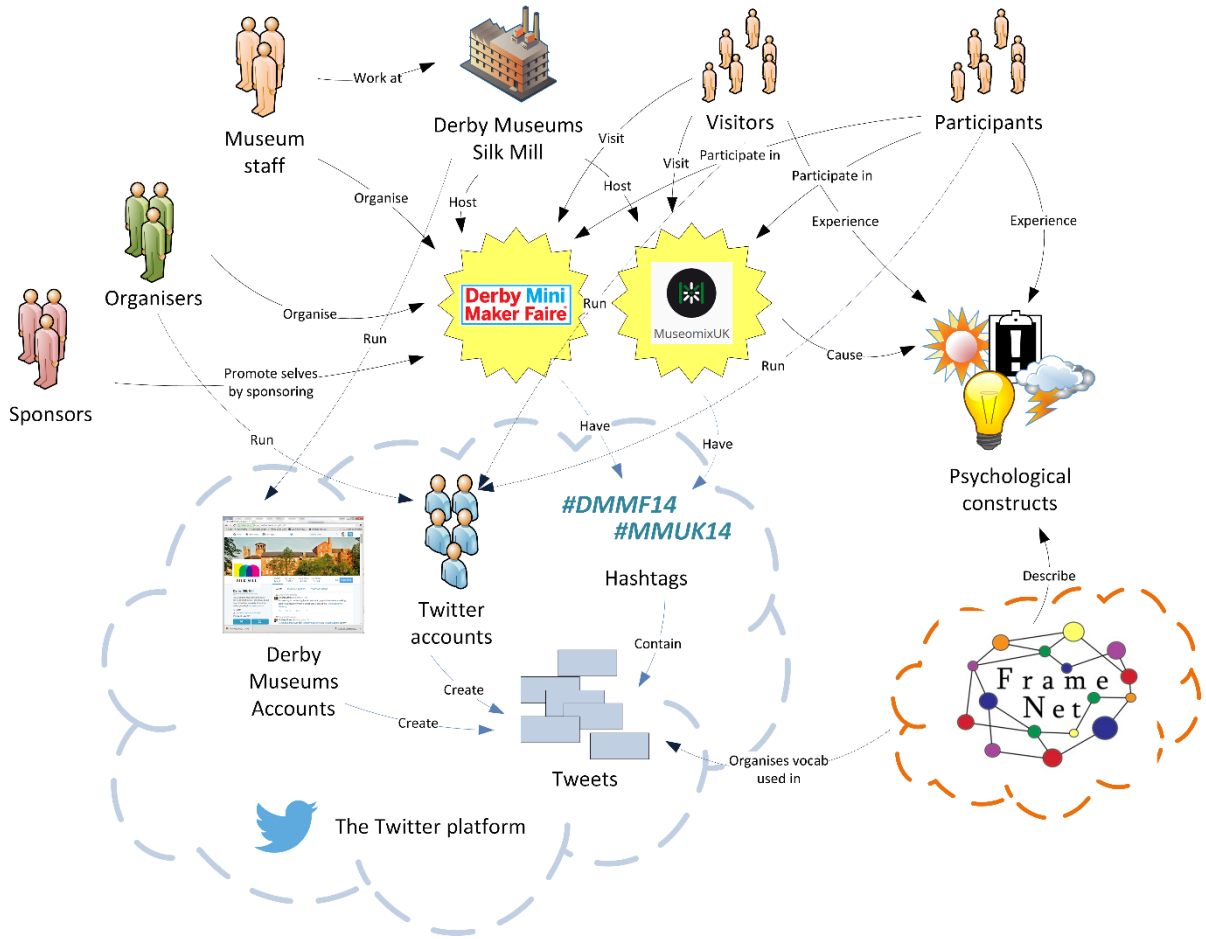

Figure 7 Rich Picture illustrating problem situation for ARC2

The Rich Picture showed the following elements of the problem situation:

1. Two events (shown in stars) were hosted at Derby Museums' Silk Mill, and organised by museum staff and others. Sponsors aimed to promote their organisations positively by sponsoring those events. The events also had participants, who were actively involved in the event, and visitors, who came along to witness them.
2. As with ARC1's Rich Picture, 'reality' was also mirrored to an extent by Twitter (shown inside the blue cloud). All the major stakeholders in the problem situation (the museum and its staff, organisers, sponsors etc) had Twitter accounts that they used throughout the events, as did many of the participants and visitors. In a change from ARC1, the two events also had presences in the Twitter world, in the form of the hashtags used to link Tweets to the events. Unlike ARC1 (which focused on data from Twitter 'biographies', not Tweets), the Tweets produced in relation to the events also had a place in the problem situation.

3. All of the human actors in the problem situation experienced internal ideas and feelings, labelled *psychological constructs* in the Rich Picture. The psychological constructs of participants and visitors were particularly relevant, as it is was their descriptions of thinking about the museum and its objects, creating ideas and / or artefacts, and feeling emotions that formed the potential expressions of inspiration that ARC2's prototype was intended to retrieve.

As discussed previously, FrameNet was originally noted as a structure in the problem situation, and was shown in a separate cloud (as it is an online resource). It was initially included to illustrate a bridge between the cognitive, creative and emotional psychological constructs experienced by participants and visitors, and the method of expression – i.e. the Tweets created about the events. During Evaluation of the Rich Picture, it became clear that this was an instance of the solution being expressed as the problem, and as such made little sense to the museum staff. (This is discussed further in the Evaluation).

6.3 Action Planning phase

Due to the response to the previous years' Maker Faire, the HoM was confident that there would be the potential to collect a lot of Twitter content:

> *HoM: So we'll, we'll be, we'll be, erm… looking at responding to people during the day. That's why there's going to be two of us, because last year there was just me, and [SMC] was working behind the café. And, er… we were just, it was just bonkers. Totally nuts. That, if people were mentioning us, they were maybe mentioning us, maybe using the HashTag, we had to look at two different things, and it was sort of: "do we Tweet this or do we Tweet that?" Um… We got a lot of direct Tweets from other Maker Faires as well (Workshop W3).*

One key part of early planning was considering how to encourage visitors to both events to Tweet about their experiences of those events. To this end, "Tweet Walls" - e.g. systems that display Tweets containing certain HashTags using screen layouts that are designed to be projected – were discussed, and strategies for encouraging their use considered:

Researcher [Res]: … so what I'm, what I'm thinking is, how do you get as many of the people who actually just come here, who bought their phone with them, to get stuff on that wall, as possible? 'Cos everyone who puts something on that wall, you've got evidence that they were in the building.

SMC: Yes.

Res: So that is, that is something that you can…

SMC: If I see a Twitter Wall, I Tweet. Just as I see it.

Res: One way I was thinking of was all the Makers, all the Makers are going to want people to come and see their thing, aren't they?

SMC: Yes.

Res: So if you make sure that they know that all the pictures they Tweet of their things can go on this [the Tweet Wall], then that's a free advert for them. If you also get them to tell, if they're busy making something, can someone Tweet this please? Picture of this? And then that person who's by their thing does as well. So sort of spread the word… (Workshop W4)

The researcher then explained the fundamental purpose for encouraging people to Tweet using a HashTag: namely in order to collect data with the potential to be used in an automated textual analysis experiment:

Res: But for me, the key is… try and get the Makers to get people to Tweet. And just… try and get as many people who pass through the building to use the wall as you can. And then, and then that will, ought to stuff the HashTag full of data that we can get hold of, and then it ought to be obvious from the timing of Tweets and any pictures we can get out, that those people were in the building…

HoM: Yes.

Res: Engaging with stuff that was going on. And at that point it can be…

HoM: So then it's in here…

Res: … it can start contributing to one of these surveys of, you know, probably the marketing one, really.

HoM: Those people we will know were here?

Res: And a degree of that, of people understanding, learning stuff…

HoM: So we could look at, er… We could look at analysing those Tweets that were done during Maker Faire, and looking at… some of the language in them, could we?

Res: Yeah yeah.

HoM: Would that be useful? So if we were analysing them for… to see if people were enjoying themselves? Is there a way of saying "these people are happy? These people are not happy?" So looking at happy / not happy Tweets, from the people who were there, during?

Res: Or angry, excited…

HoM: Yeah yeah. Whatever the…

Res: Bored.

SMC: You just said during. Can we do that before…

Res: Before, during and after?

HoM: So during would be the people who were actually here. So the people who were actually being part of Maker Faire. "Those people who were participating on Twitter… 85% of them were happy… at being in the space. At being, participating in Maker Faire". Yeah? And that's about, that's then about… a… erm… Analysing whether people are happy participating in the event. Not whether they are… Happy with Twitter.

Res: Yeah.

HoM: Happy with the event.

SMC: Yep.

HoM: So then we'll then saying that, you know, stat… "x number of people were… you know, really enjoyed themselves". And if that many people did who were into Twitter, you can probably say, well, that's 300 people out of 2000 that came, then x number of people were probably happy?

SMC: Yeah (Workshop W4).

The exchange above is displayed at length because it contains insight into the HoM's expectations of the system. It would be dangerous to read too much into the particular figures used at the end of the exchange as they were 'finger in the air' ideas from someone who was completely speculating about what the system might find. However, these high estimates of figures do potentially indicate that the staff had an extremely optimistic outlook not just about the potential system, but also about the potential response to the Maker Faire. This is discussed more in Chapter 8 Section 8.2, and in the Discussion Section 9.2.

Once the Workshop recordings had been analysed and partially transcribed, the rest of ARC2's Action Planning Phase consisted of the researcher structuring reflection upon the workshops into:

1. The high-level requirements for the 'hard' system prototype, structured by formatting them into User Stories (Section 6.3.1).
2. The weltanshauungen (worldviews or outlooks) from which to approach potential information systems incorporating evidence of inspiration caused by museum events (Section 6.3.2).

Desk research was then conducted into relevant computing techniques and resources to apply to the prototype, taken from the computing science 'knowledge base', as defined by Hevner et al's discussion of Design Science (2004) (see Section 6.3.3, and Methods Chapter Section 3.3.2).

6.3.1 Requirements and User Stories

The following high-level requirements started to emerge by considering the Action Planning workshops and the Rich Picture of the problem situation:

1. The prototype needed to capture, analyse and display potential expressions of inspiration from within Twitter data created at the two events:

a. Both events were attended by the researcher. Both were also successful – they were heavily attended, with a lot of activity and enthusiasm on show by both visitors and participants. Both the researcher and the museum staff believed that they had witnessed a lot of inspiration occurring. How might descriptions of the inspiration that participants may have felt be retrieved?

2. Which stakeholders would benefit from access to such potential descriptions of inspiration?
    a. Who needed to know about it?
    b. What forms would those stakeholders need information about potential inspiration to be delivered in, for it to be useful?
3. Might such descriptions of potential inspiration help with planning future events, thus aiding staff in their future attempts to inspire visitors?

#	User story name	Description
2.2.1	Evidence of inspiration related to museum activity	As a *member of museum staff*, I need to know which objects and knowledge from my museum have inspired people, and how, so that I can understand what these objects mean to audiences better, and can thus plan future museum activities more effectively.
2.2.2	Evidence of inspiration related to event impact	As a *sponsor*, I need to know how inspiring the events I have sponsored have been, to ascertain whether my sponsorship has been worthwhile, and make better sponsoring decisions in future.
2.2.3	Evidence of inspiration to plan better events	As an *event organiser*, I need evidence of the aspects of my event that have inspired people, so that I can plan future events to be even more inspirational.

Table 8 ARC2 User Stories

As described in the discussion of ARC1's Action Planning, in order to begin developing the 'hard' system prototype, these unstructured requirements and questions were mapped onto a set of high-level User Stories (described by following the convention of 'user role', 'feature', 'benefit' described in ARC1 Section 5.3.1, and shown in Table 10). This helped to design the prototype system as a set of sub-systems that were easier to develop and test (as described in Appendix 2).

The discussion below was recorded during Workshop W9, and provides some deeper insight into the role the staff thought inspiration might play in the relationships with visitors:

HoM - Any change of behaviour is fine by me.

Res - But is there a spectrum of fine-ness? Would you be able to say "this person painted a picture as a result of visiting the museum" is better than "they just signed a petition"?

HoM [starts to draw a rough diagram] - OK – yes. So you've got – I'm just sort of thinking how you'd do it… So the first one is maybe – well, it's all a change in behaviour, isn't it? Now the first one is just, um, doing one thing, which might be: "I decided not to throw my bottle in the normal bin, I put it in the recycling. I saw a tweet about sustainability from DMNature" or something, and now I'm doing that, I did that once. That's one thing. Then it's a long-term change. "I always put my bottles in the recycling now."

SMC - Now? Since…?

HoM - Since seeing that Tweet, and going to that thing, I now do that. So there's doing it once, which is sign a petition, or it's doing it in a sustained way, so it would be sign a petition, write a letter…

SMC – Share it?

HoM - Share it with your mates, on Facebook, all that sort of stuff. So the whole load of… That's a sustained change. And then it's a, and then the next thing is a creative change, so "I decided to do an experiment in photosynthesis to work out this thing", or "I decided to paint a painting" or go to a pottery class. And then it's a whole life change… I decided to change my career (Workshop W9).

Figure 14 shows a version of the diagram drawn by the HoM during this exchange, and shows his 'continuum of inspiration' idea. This model was referred to throughout the Action Taking phase (in relation to the Soft System Model RD2.3.3 – shown in Figure 11 – in particular) and discussed further in the Evaluation section.

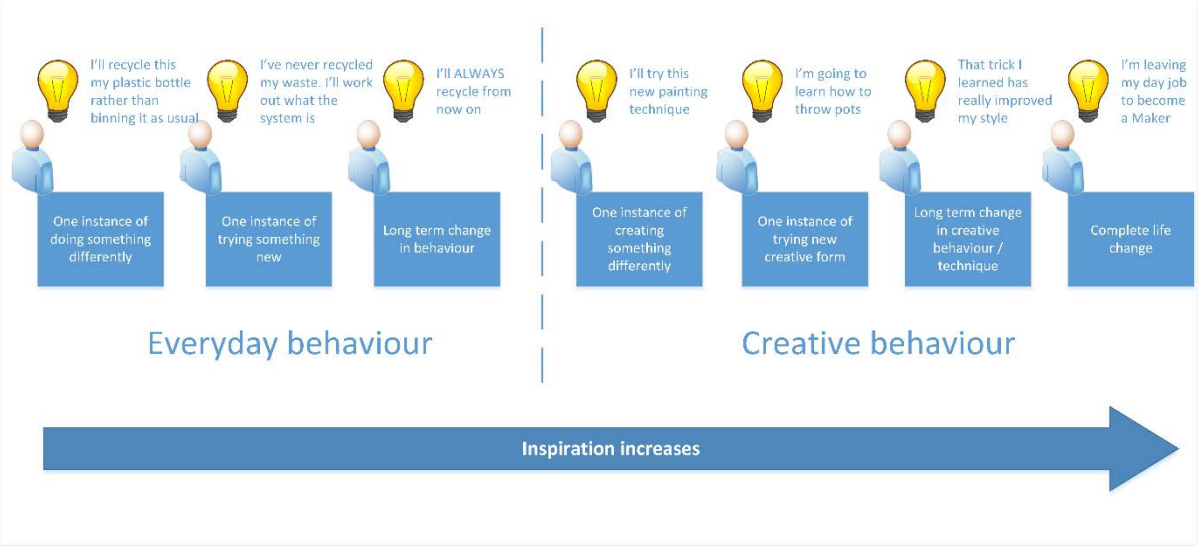

Figure 8 Model of "continuum of inspiration" proposed by Derby Head of Museums

6.3.2 *Weltanshauungen* from which the problem could be approached

The following weltanshauungen were considered when reviewing ARC2's problem situation:

- *Event centric*: the problem situation could be approached by thinking about the events. Any potential expressions of inspiration found might help to gauge the success of the events and learn lessons to help plan future events.
- *Museum centric*: the problem could be approached by focusing upon the museum (and its staff). Potential expressions of inspiration related to the events would be a way of evaluating the performance of Derby Museums in relation to its objective of 'working with creativity and passion'.
- *Visitor centric*: the focus of the problem situation could be on the visitors to the events and the ways in which they had potentially expressed inspiration the events had caused.
- *Participant centric*: the focus of the problem situation could also be on the participants, looking at how they might have expressed emotion, and caused others to express it, potentially.

As discussed, problems arose regarding the distinction between 'visitors' and participants' which are discussed in the Evaluation section.

6.3.3 Techniques from the knowledge base

The final part of the Action Planning phase was to review the knowledge base of appropriate computing techniques. Techniques appropriate to ARC2 were:

1. Accessing Tweet data through the API, then clustering it in a graph database: the latter of these techniques was carried over from ARC1.
2. Semantic or thematic role analysis: a method for analysing the potential meaning in texts by considering the 'roles' of the 'agents' in the text, and the 'theme' related to their agency. E.g. in the sentence: 'John opened the window', John is the agent in the role of opener, and the 'opened thing' is the window (Jurafsky and Martin, 2009). Analysis like this was appropriate to the topic of inspiration, based on the aspect of the working definition that suggests inspiration must lead to the production of a new idea, or tangible product.
    a. Semantic / thematic role analysis is closely related to the concept of *semantic frames*, which is the central concept underpinning FrameNet (Baker, 2014; Fillmore, 1976). One of the key uses of FrameNet is for *semantic role labelling* of pieces of text (Giuglea and Moschitti, 2006).
    b. FrameNet is arranged around psychological structures (the Frames), which are used to interpret potentially complex experiences and situations (Fillmore 1976). FrameNet provides a source of ready-made models of situations, defined as Knowledge Patterns (Clark et al, 2004), several of which are similar to the situation of 'being inspired'. There was potential, therefore, for FrameNet to be a useful resource when analysing Tweet text for evidence of inspiration.
3. Sentiment analysis: a related, but slightly different approach to assessing the potential meaning of text, which focuses on the text's emotional content (Sykora et al, 2013; Thelwall et al, 2010). As the working definition of inspiration for this research developed during the literature review and initial consultation phase contained a strong emotional component, techniques for analysing emotion were also considered.

The Action Planning phase concluded with the decision to attempt to use the FrameNet lexicon (discussed in more detail during the next section) as a way of automatically analysing the Tweets' content in ways that related to the concept of inspiration. The intention was to ascertain if the definition of inspiration developed in consultation with museum practitioners could be used to find relevant and useful Tweet content.

6.4 Action Taking phase

ARC2's 'hard system' prototype was developed to establish the opportunities provided by, and constraints imposed by, Twitter's Social Media platform and the automated NLP technique identified for retrieving Tweets containing potential expressions of inspiration (specifically – Semantic Role Analysis using FrameNet).

6.4.1 Hard system prototype development

Tweets related to these events were collected by using the Twitter API to search for the publicized event hashtags (#DMMF14 and #MMUK14), mentions of the formal event names, and mentions of Twitter users accounts linked to the events. The Tweet data was imported (one node per Tweet) into the Neo4J graph database, the same application used in ARC1.

One of the key development tasks was to select relevant information from the FrameNet lexicon to link to the Tweet data. The FrameNet entities used were:

- Frames: the definitions of experiences and situations around which FrameNet's knowledge is structured. For example, the Frame *Becoming_aware* relates to the experience of discovering something.
- Frame Elements (FEs): the parts of each Frame that describe the processes and actors in a given experience or situation. For example, *Becoming_aware* contains the FEs *Cognizer* (the individual gaining awareness) and *Phenomenon* (the thing they are becoming aware of).
- Lexical Units (LUs): the terms, retrieved from annotated text, that relate text back to a particular Frame: for example, *Becoming_aware* has the LUs *discover*, *find*, *learn* etc.

Using FrameNet to retrieve potential expressions of inspiration from Tweets became a process of linking Tweet text to Frames via their LUs, then analysing the relationship between Tweet and Frame by considering the FEs that might be contained in the Tweet. To find potentially relevant Frames, keywords (and their synonyms) were extracted from the working definition of inspiration as it stood at the end of the consultation (see Chapter 4):

An experience, or set of experiences, combining rational thoughts and emotions, resulting in the expression or enactment of fresh ideas.

These keywords and their synonyms, along with the term 'inspiration' itself, were used to search FrameNet using its built-in search engine. Figure 9 shows the data from the *Subjective-influence* Frame, returned by a search for the keyword *inspiration*. Potentially relevant Frames were reviewed with Derby Museums' staff, along with some Tweets returned by searches for LUs from those Frames.

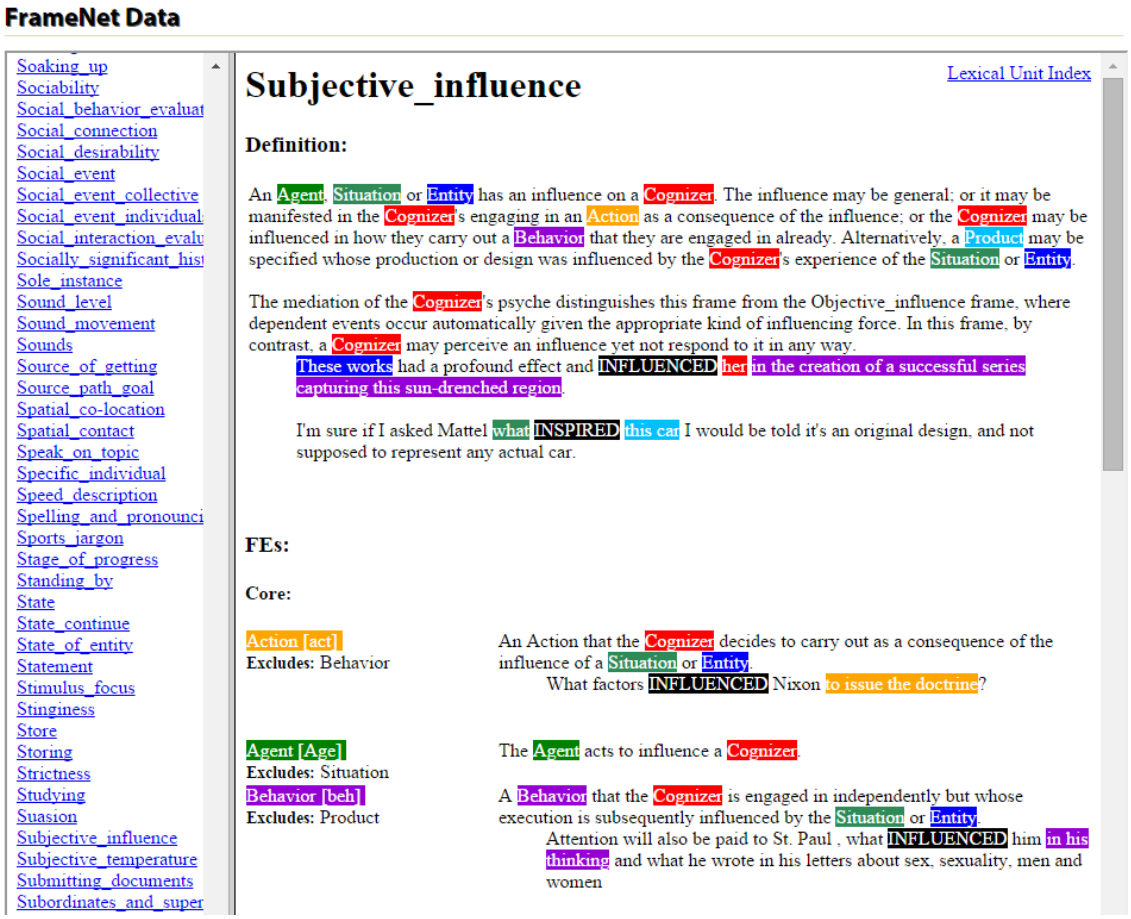

Figure 9 Screengrab of the FrameNet "subjective_influence" Frame

Frame data is provided in XML documents, which enabled import into Neo4J with a simple script. Relationships between Tweets and the LUs they contained were created using word-bounded searches for the stem LUs with their various suffixes applied, by utilizing Neo4J's built in RegEx search function (as per the concept linking exercise in ARC1, see Chapter 5 Section 5.4.1). For example, the derivations of the LU *inspire* from the Frame *Subjective_influence* were found and

linked using the search term: *inspir(e|es|ed|ing)*. Linking Tweets to LUs meant that all Tweets containing at least one LU could be retrieved from the dataset. A rough analogy can be made between this process and the process of coding units of content in a Content Analysis (Krippendorf, 2004); the automatically-generated links between Tweets and LUs are analogous to codes, while the Frames themselves provide the concepts towards which the 'codes' are generalised. One of the points of the evaluation described in Section 6.5, therefore, was to assess the effectiveness of this 'automated coding process', though this was subsidiary to the main purpose, which was to work with museum staff to see if their understanding of the concept of inspiration helped them relate to Social Media data in ways beneficial to their work and their relationships with visitors.

Frames may involve both Core Frame Elements and optional ones, for the sake of simplicity during this feasibility study, only Core ones were considered. The number of FEs per frame indicated each Frame's complexity: most of the Frames were simple (i.e. two FEs: the sentient and a phenomenon of some kind), but the *Subjective_influence* Frame (returned by a search for the term *inspiration* itself) was more complex, with a potential seven core FEs related to the sentient, the types of stimulus that could influence them, and the types of outcome resulting from stimulation. In contrast, *Subjective_influence* also has the fewest LUs. The two emotional Frames had the greatest proportion of related LUs, though this was not reflected in the proportion of Tweets that were linked to them (see the Evaluation section).

Searching for keywords related to the initial definition of inspiration returned nine relevant Frames from FrameNet, listed in Table 9. The nine frames were categorised into three categories that mapped onto the initial definition of inspiration; *cognitive* Frames that mapped onto concepts related to having new thoughts and ideas; *emotional* Frames related to the experience of feelings; and *creative* Frames related to producing and making things. These distinctions were evident in the descriptions of the Frames themselves: all but one of the Frames contains a *sentient* FE; in cognitive Frames such as *Becoming_aware* and *Cogitation*, the sentient was called the *Cognizer*; in emotional Frames the sentient was the *Experiencer*, and in creative Frames the sentient was the *Creator*.

Redundancy occurred as some Tweets were related to more than one Frame, which occurred because some of the LUs were repeated across different frames; for instance, the LU "find" (and variations such as "find out" and "find myself") belonged to the Frames *Becoming_aware*, *Coming_to_believe* and *Coming_up_with*. Redundant Tweets were annotated multiple times. On rare occasions, the decision regarding whether a Tweet constituted evidence of inspiration changed depending upon which Frame it was being annotated in relation to, indicating (unsurprisingly) that the Framing of the Tweet can occasionally affect its interpretation.

Relevant Frame name	Type assigned	Sentient Type
Becoming_aware	Cognitive	Cognizer
Cogitation	Cognitive	Cognizer
Coming_to_believe	Cognitive	Cognizer
Coming_up_with	Cognitive	Cognizer
Creating	Creative	N/A (optional)
Emotion_directed	Emotional	Experiencer
Experiencer_obj	Emotional	Experiencer
Intentionally_create	Creative	Creator
Subjective_influence	Cognitive	Cognizer

Table 9 FrameNet Frames selected for ARC2 Prototype

6.4.2 Soft system model development

System model development proceeded in the same fashion as ARC1 (see Chapter 5 Section 5.4.2): one model was created per weltanshauung, containing the information mandated by the CATWOE mnemonic (Customer, Actors, Transforming Activity, Weltanshauung, Owner and Environment). System inputs and outputs, monitoring, monitoring criteria, and control activities were also included. One RD for each of the four weltanshauungen were defined, each containing a 'what', 'how' and 'why' for the system (see Table 10).

Models were produced for RDs 2.3.2 and 2.3.4, but these were not distinct enough from the other models to merit discussion here. RD 2.3.1 (for the *event-centric* weltanshauung – see Figure 16) was the closest to the *primary task* of using Social Media data for marketing and evaluation, and hence very similar to the matching primary task RD (RD1.3.1) from ARC1. This suggested the feasibility of merging the information from both the ARC1 and ARC2 prototypes into one, whereby links to potential expressions of inspiration might be used as an extra reporting dimension, or an information filter of some sort alongside other measures developed during ARC1.

Initially it seemed as if a key difference between the primary-task models for ARC1 and ARC2 was that ARC2 systems could only be used during and after the event for evaluation tasks; fundamentally, it seemed as if the event must be running in order to inspire people, unlike in ARC1 where potential expressions of interest in topics made by audience members could be analysed beforehand.

#	Weltanshauung 'label'	Root Definition
2.3.1	Event-centric	A system to evaluate the success of a *museum* event by capturing and presenting potential expressions of inspiration caused by the event, in order to indicate if the museum might be inspiring visitors to and participants in its events.
2.3.2	Museum-centric	A system that inspires visitors to and participants in its events, by organising events that incorporate activities involving interesting and stimulating knowledge and material objects, in order to connect with the visitors and participants in ways that give them fresh ideas, new behaviour, and even new skills.
2.3.3	Visitor-centric	A system that inspires visitors with new, exciting ideas and knowledge by holding events and exhibitions. Visitors are inspired in the hope that their behaviour will change in some positive way.
2.3.4	Participant-centric	A system that inspires creative individuals, by encouraging them to participate in creative events where they have new experiences and learn new ideas and skills. This is in order that the participants improve their well-being by gaining a stronger sense of creative purpose.

Table 10 Weltanshauungen and Root Definitions for ARC2

Like ARC1, there was a possibility that feedback from the system might be used to alter the event while running, however, as shown in the control action in Figure 10. Unlike in ARC1, the 'event-centric' system for RD 2.3.1 was also modelled to show outputs from the system feeding back into it; for example:

- In the model for RD 2.3.1, participants and visitors created their Tweets as part of the system itself, rather than using Twitter data as an input (as per ARC1). Modelling the system in this way emphasised that much of the content was likely to have been created at / during the event.
- Potential expressions of inspiration could be used during the event as an input back into the system, resulting in changes to the event. At first glance, it seems as if this would perhaps be more likely to occur in a longer-running event – some museum exhibitions run over several months, even years, and some displays are named 'permanent' (though this often means 'running for several years'). Thus the reaction to potential expressions of inspiration could

take the form of alterations to longer events. However, during both events studied during this ARC, the related Social Media was shown to participants (using 'Tweet walls' in both cases), and with the MuseoMix event in particular this effected the behaviour of the participants, so could also be modelled as an input back into the system.

The assumption that 'the event needed to be running for the system to work' was undermined when considering the model first produced by the Head of Museums, and discussed in the Action Planning section above. The system model for the 'visitor-centric' root definition (2.3.3 – shown in Figure 11) covered the first part of this continuum of inspiration by showing how a museum visit might lead to a change in behaviour, though not necessarily a creative change.

One issue stood out in relation to this model: unless visitors willingly offered information to the museum about how their visits changed their behaviour, finding such information from Social Media, while technically possible, would involve downloading data about the personal lives of visitors. This personal data would have been uploaded to the related Social Media platform by the visitor (i.e. they would have publicised it), but finding it would still require monitoring their Social Media to a degree that it could be considered invasive (see Chapter 8 Section 8.4.3 and Chapter 9 Section 9.3.3). However, the idea that inspiration is not a 'one-hit' process (first raised during the Literature Review Section 2.2.1, and again during the consultation – Section 4.2.2), and thus might only be ascertainable as longer-term relationships built with visitors, became one of the main ideas carried into ARC3.

ARC2 RD2.3.1

A system to evaluate the success of a ***museum*** event by capturing and presenting potential expressions of inspiration caused by the event, in order to indicate if the museum is delivering one of its core services: namely inspiring visitors to and participants in its events.

C - event organisers and museum staff
A - event participants, event organisers and visitors
T - Visitor / participant Tweets about the event ---) Indications that inspiration might be occurring
W - expressions of inspiration by visitors and participants is (extremely) valuable information when evaluating a museum event
O - museum management / senior event organisers
E - (Real) - a museum event
(Virtual) - Twitter content (Tweets) related to the event / linked with HashTags

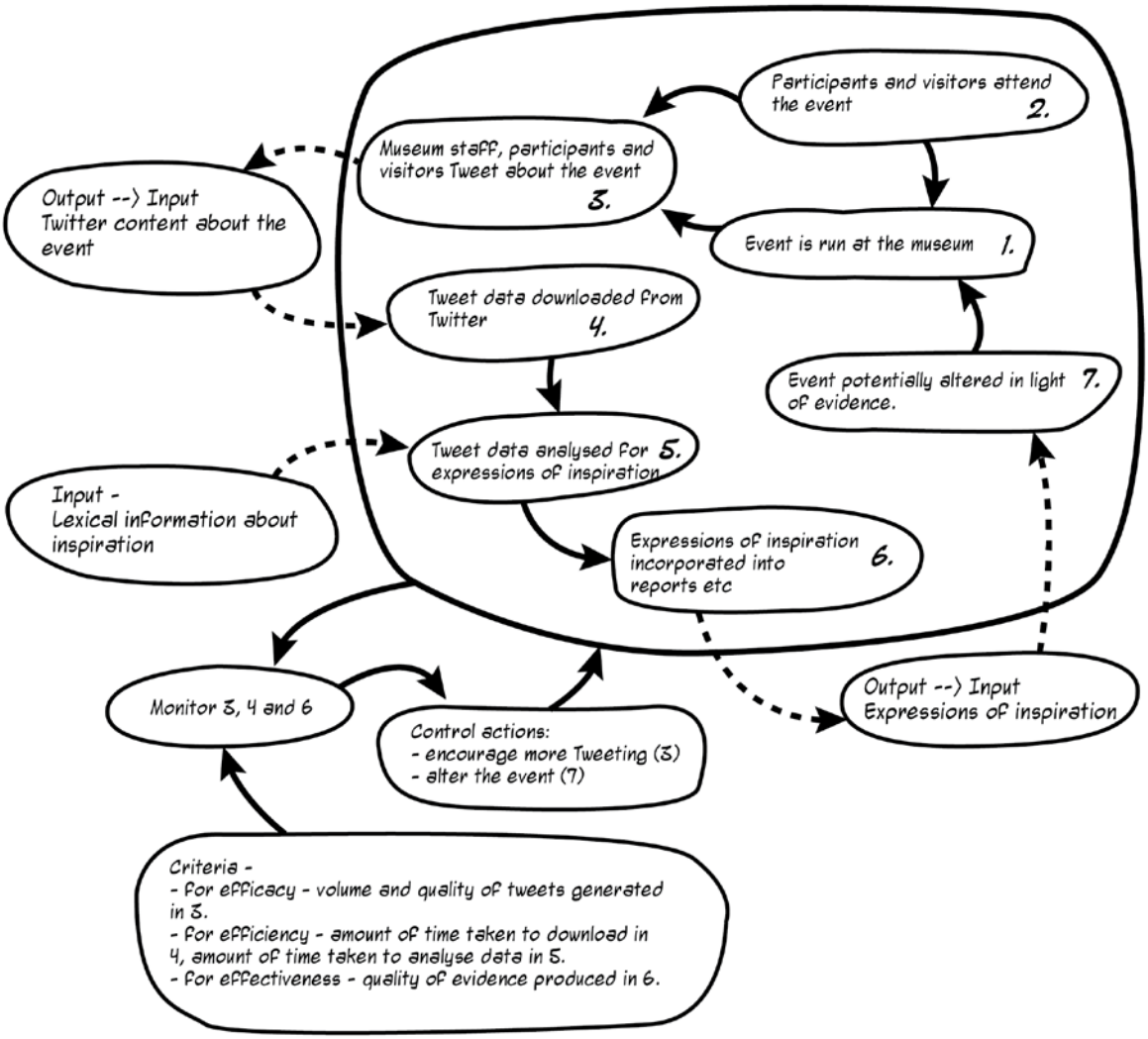

Figure 10 Soft System Model for ARC2 Root Definition 2.3.1

ARC2 RD2.3.3

A system that inspires visitors with new, exciting ideas and knowledge by holding events and exhibitions. Visitors are inspired in the hope that their behaviour will change in some positive way.

C - visitors to the event / society as a whole
A - visitors, museum staff and other event organisers
T - Visitors hoping for an inspiring (or at least entertaining) experience ---) Positive changes to visitors long term behaviour / habits
W - museums can present their visitors with inspiring new ideas and knowledge that can cause them to change their behaviour
O - museum management
E - (Real) - a museum that holds inspiring events
(Virtual) - the Twitter social media platform, and an event hashtag to relate Tweets to the event

Figure 11 Soft System Model for ARC2 Root Definition 2.3.3

6.5 Evaluation phase

Unlike the previous ARC, as ARC2 involved Information Retrieval, a key part of the Evaluation phase involved working with staff from Derby Museums to annotate a *test reference collection* of Tweets (Baeza-Yates and Ribeiro-Neto, 1999). This involved reviewing a subset of the Tweets collected and judging which ones might contain a good expression of potential inspiration. Through this process, the ideas and perspectives of the museum staff regarding inspiration further emerged and were considered. In other words, the practice of eliciting the knowledge required to set up the test reference collection also resulted in valuable data regarding how museum practitioners thought about inspiration and its relationship to their work.

6.5.1 Evaluation of the 'hard' system prototype

To test the effectiveness of linking Frames to Tweets in order to retrieve expressions of inspiration, two data annotation exercises took place: the first was conducted by the researcher alone, while the second also involved the museum staff.

During the first exercise, each of the 1165 Tweets linked to a Frame was assessed to ascertain:

- Whether, in the opinion of the researcher, the Tweet contained a clear expression of inspiration.
    - A measure of confidence regarding this choice was obtained by re-assessing a subset of 20% of these Tweets. This is discussed in section 6.5.2 below.
- Whether the Tweet contained any or all of the FEs for the related Frame.
- Whether the correct sense of the related LU was used in the Tweet.

The second annotation exercise used a set of 400 original Tweets extracted from the dataset using .Net's random number generator. Evidence of whether a Tweet was linked to an LU was hidden, and the museum staff were asked to annotate each Tweet with a yes / no answer to the closed question: "does this Tweet contain an expression of inspiration?" As the museum staff were volunteering their time, long discussions to achieve consensus regarding each Tweet were not

practical, so instead the staff were asked to annotate the Tweets independently in four subsets of 100, with discussion about some of the differences of opinion between each set. The degree of consensus was recorded after each subset's annotation. Scores for precision and recall (Baeza-Yates and Ribeiro-Neto, 1999) were then taken using an average of the two sets of opinions. For a further indication of how much bias may have affected the annotation, the researcher conducted the same exercise, his answers were compared, and F-measures (to indicate Information Retrieval performance) were generated for both "staff only", "researcher only" and "staff with researcher" results.

Table 11 shows the results of linking Tweets to Frames via LUs, and the results of applying a filter to restrict the results to 'original Tweets only' (Retweets usually contain a copy of the text of the original Tweet, so Retweets could potentially skew the results). The table also shows the proportion of 'relevant' Tweets that the researcher considered contained clear expressions of inspiration. The key finding is that the relevant Tweets linked to LUs (as annotated by the researcher) represented a very small proportion of the overall total of Tweets (6% of all the Tweets, 12% of all the original Tweets with Retweets discounted). This figure fails to account for the accuracy of the recall of the system, however (i.e. how many Tweets may contained clear expressions of inspiration, but which were not linked to Frames); this is discussed further when the F-Measure of the system is assessed.

Event	**Maker Faire**		**MuseoMix**		***Totals***	
	Total	%age	Total	%age	Total	%age
All Tweets	1006	100	5652	100	6658	100
Original Tweets	469	46.6	2643	46.8	3112	46.7
Originals Linked to LUs	210	20.9	955	17.6	1165	17.5
"Relevant" Linked to LUs	73	7.3	330	5.8	403	6

Table 11 Summary of Tweets collected for ARC2

Table 12 details how Tweets were linked to the various Frames. The two creative Frames had the highest proportion of links to Tweets (19% and 21% of the total number of linked Tweets). The Derby Museums staff confirmed that they expected to see this, as they thought that both the events had involved a lot of creative behaviour. The two emotional Frames had the greatest proportion of LUs, though this was not reflected in the proportion of Tweets that were linked to them: only 19 of the 186 LUs in the *Emotion_directed* Frame were contained in the Tweets (10.2%), while 29 of 127

(22.8%) of the *Experiencer_obj* Frame's LUs were found in Tweets about the events. The creative Frames had much broader overlaps with vocabulary used in the Tweets (64% of LUs used in both Creating and Intentionally_create), but even they contained a large proportion of LUs that weren't used. This indicated that the Tweets contained a differing vocabulary to FrameNet, supporting Baker's assertion that, at the vocabulary level at least, FrameNet may not be suitable for analysing Social Media text at present (Baker 2014). However, the issue that many of the Tweets contained non-textual media (discussed below) was also a factor.

Frame name	**Category**	**# Core FEs**	**# Lexical Units**			**# Tweets linked to frame**					
						Maker Faire		**MuseoMix**		**Both**	
			Total	**%**	**#Linked**	***Total***	**%**	***Total***	**%**	***Total***	**%**
Becoming_aware	Cognitive	2	*32*	7%	16	*21*	10%	*82*	9%	*103*	9%
Cogitation	Cognitive	2	*20*	5%	7	*6*	3%	*78*	8%	*84*	7%
Coming_to_believe	Cognitive	4	*21*	5%	7	*17*	8%	*49*	5%	*66*	6%
Coming_up_with	Cognitive	2	*17*	4%	6	*10*	5%	*49*	5%	*59*	5%
Creating	Creative	2	*11*	3%	7	*49*	23%	*172*	18%	*221*	19%
Emotion_directed	Emotional	4	*186*	42%	18	*16*	8%	*109*	11%	*125*	11%
Experiencer_obj	Emotional	2	*127*	29%	26	*28*	13%	*158*	17%	*186*	16%
Intentionally_create	Creative	2	*14*	3%	9	*55*	26%	*184*	19%	*239*	21%
Subjective_infuence	Cognitive	7	*12*	2%	6	*8*	4%	*74*	8%	*82*	7%
Totals			*438*		*102*	*210*		*995*		*1165*	

Table 12 Summary of Tweet relationships to Frame Lexical Units for ARC2

Table 13 contains a summary of the outcome of the researcher's initial annotation exercise, in which the original Tweets related to each Frame were assessed to see if, in the researcher's opinion, they contained a clear expression of inspiration (redundant Tweets were not removed in this sample). Thus an overall total of 35% of the 1165 Tweets linked to Frames were considered *initially* to be 'relevant' (i.e. to contain a potential expression of inspiration) by the researcher. However, re-analysis of these Tweets indicated that these statistics are *unreliable* (see Section 6.5.2 below).

Frame name	**Category**	**Total Original Tweets**	**Total considered containing expression of inspiration**	**% of linked Tweets considered to contain expression of inspiration**
Becoming_aware	Cognitive	103	32	31%
Cogitation	Cognitive	84	36	43%
Coming_to_believe	Cognitive	66	20	30%
Coming_up_with	Cognitive	59	22	37%
Creating	Creative	221	85	38%
Emotion_directed	Emotional	125	21	17%
Experiencer_obj	Emotional	186	53	28%
Intentionally_create	Creative	239	92	38%
Subjective_infuence	Cognitive	82	42	51%
		1165	**403**	**35%**

Table 13: Tweets containing potential expressions of inspiration, by Frame

Another aspect of the evaluation concerned the potential for deriving information from Tweets by extracting Frame Elements from them. For example, the following Tweet related to the *subjective_influence* Frame:

> *Brilliantly simple & effective #Engineering learning by @JWSYE at #DMMF14 @MakerFaireDERBY #STEM could take to @DerbyUK schools to inspire*

In FrameNet, the *subjective_influence* Frame had the basic description:

> *An Agent, Situation or Entity has an influence on a Cognizer. The influence may be general; or it may be manifested in the Cognizer's engaging in an Action as a consequence of the influence; or the Cognizer may be influenced in how they carry out a Behavior that they are engaged in already. Alternatively, a Product may be specified whose production or design was influenced by the Cognizer's experience of the Situation or Entity (FrameNet, 2010).*

By marrying the two pieces of information above, it the researcher attempted to fill the FE slots from the Frame with relevant pieces of information from the Tweet. From the researcher's understanding of the Tweet:

- The Agent was *@JWSYE*.
- The Situation was *@MakerFaireDerby* (also referred to as *#DMMF14*)
- The Entity was *#Engineering learning*.
- The Cognizer was the creator of the Tweet.
- The [potential] Action was *take [taking] [the brilliantly simple & effective #Engineering learning] to @DerbyUK schools to inspire*.

All of the FEs for the *subjective_influence* Frame bar the Cognizer were therefore present in this one Tweet, and a human being could extract them. However, Tweets (such as the one in this example) often have syntax that deviates from common standards of English – seemingly because the author is struggling to make a point within the 140 character limit. Given this situation, a system for extracting such FEs automatically from Tweets, would seem a very complicated proposition.

Another issue related to the structures of Tweets, their links to Frames, and their mapping onto FEs arose during the annotation exercise conducted with Derby Museums' staff; namely that "Tweets" are not always entirely textual, they can contain links to media of some sort. With Tweets containing media links, the meaning of the filler of a Frame's FE slot could sometimes only be ascertained by

referring to the accompanying image or video, such as with the Tweet below, related to the *Intentionally_create* Frame via the *set-up* LU:

Setting up! #thesampleroom #MMUK14 @derbysilkmill http://t.co/tz8FHeIK6i

The linked image (shown in Figure 18) enabled the *created_entity* FE slot of the *Intentionally_create* Frame to be filled (with the filler "a museum exhibit"), though it would be difficult to automate the process of filling this slot with such image-based content. That relevant information could be overlooked by focusing exclusively on text when using Twitter as an evidence source was also noted by Tufecki (2014). Making a decision about potential expressions of inspiration based purely on text, when often there were images or videos that contained valuable evidence, made no sense to the museum staff. As a result, the decision was taken to allow them to view any linked media in order to support their yes / no decision, as the exercise needed to remain relevant to their understanding and evaluation of the events, but this adversely affected the recall of the system.

Figure 12 Screengrab of Tweet illustrating evidence of inspiration contained in non-textual medium

Also of interest during the annotation were the points at which consensus broke down between the two museum staff and the researcher about what constituted evidence of inspiration. The following Tweet was an example of a lack of consensus between the two staff and the researcher with regard to evidence of inspiration:

> ******* from @LeicsMusStud gave a keynote presentation about neurophysiology and museums this week at @msphdconf #MMUK14 #sampleroom*

The creator of this Tweet had chosen to make the connection between the keynote presentation they described and the MuseoMix event by including the #MMUK14 hashtag. The lack of consensus regarding whether this provided evidence of inspiration occurred because:

- The Tweet clearly showed the occurrence of creative, intellectual activity (i.e. a keynote speech at a conference), thus it tended towards being evidence of inspiration.
- However, it was not clear why the Tweet's creator thought that a link existed between the conference keynote speech and either MuseoMix and / or Derby Museums.

Furthermore, while trying to reach consensus, several theories were put forward regarding why the link existed: e.g. Derby Museums were involved in research that might apply to the topic of the keynote, which might have resulted in the museum being mentioned. This sort of 'educated speculation' about why such connections might have been made is an example of how the mental model the analyst holds about a given situation might lead them to 'fill in the blanks' caused by the general sparsity of information that Twitter's 'micro-format' causes.

Once annotation was complete, precision and recall measures for the effectiveness of linking Tweets to Frame LUs as a method of retrieving evidence of inspiration were made. A precision measure of 0.67 was recorded, alongside a much lower recall measure of 0.35, resulting in an overall F-measure of 0.46. Recall was low not only because some of the expressions of inspiration relied upon linked media for sense to be made, but also because the museum staff were more generous in labelling Tweets as "containing an expression of inspiration". Both these issues resulted in a large number of false negatives (i.e. Tweets that the staff labelled as "containing an expression of inspiration" but which did not contain an LU linked to a relevant frame). The two members of staff were asked to annotate the data separately and their answers were compared. To attempt to judge the degree to which the staff's judgement of what constituted inspiration might be biased, a separate F-Measure was taken against the researcher's annotation of Tweets. This faired worse, with a precision score of 0.39 and a recall of 0.35, resulting in an F-Measure of 0.37. This indicated that the two museum staff

were biased more positively than the researcher, with one staff member annotating 181 of 400 Tweets as containing an expression of inspiration, and the other 257/400. By contrast, the researcher annotated 130/400. Potential reasons for and ways of coping with this positive bias are discussed in depth in Chapters 8 and 9.

During the evaluation session for ARC2, the museum staff were shown Table 12 and a visualisation of the graph of Tweets clustered around the various Frames (Figure 13). As with ARC1, the staff were shown an interactive visualisation in the Gephi visualisation tool itself, so that the nodes of the graph could be clicked to show relevant pieces of data. Despite discussing the low F-Measure of the IR system and the unreliability of the quantities upon which Table 12 were based, the staff still considered them to be a useful indicator of how 'creative' the events had been, as this information matched their expectations: indeed it is safe to say the researcher witnessed them *confirming their biases with this data*. Indeed, the Head of Museums saw these raw quantifications of Tweets linked to Frames as being more useful than the visualisation. This may in part have been due to the focus during the evaluation upon the Tweets clustered towards the centre of the graph, which contained links to LUs from multiple Frames. Given that the discussion with the museum staff had emphasised the definition of inspiration as being a combination of cognition, emotion and creativity, it was not surprising that the focus should have been on these small clusters, as they are where Tweets linked to a combination of Frames were. However, browsing a selection of the Tweets resulted in some disappointment, exemplified by the Tweet below:

> *#MMUK14 Getting more excited by @museomixuk - even the emails are making me happy!*

This Tweet contained two links to emotion LUs: excitement (an instance of surprise) and happiness, but also contains the creative word 'making', which is a false positive in this instance – the Tweeter's emotion being the filler of the "Created Entity" FE slot for this Frame (i.e. "making me happy"). This illustrated how rarely a small piece of text such as a Tweet might contain the correct balance of three types of Frame required for the Tweet to contain a meaningful expression of inspiration. That is not to say that such a balance is completely out of the question, however, as shown by this example, also taken from one of the central clusters of the graph:

> *Just had inspiration of how to make the #SenseOfPlates prototype much better! Wonder if I'm right… #MMUK14*

This Tweet links to *subjective_influence* (inspiration), *creating* (make) and *cogitation* (wonder), and clearly appears to contain an expression of having an inspired idea. At this level, the visualisation

worked as a guide towards good examples, in a decision support capacity, but the prototype system's low F-Measure inevitably undermined the value of the system's statistical output, regardless of its perceived usefulness to the museum.

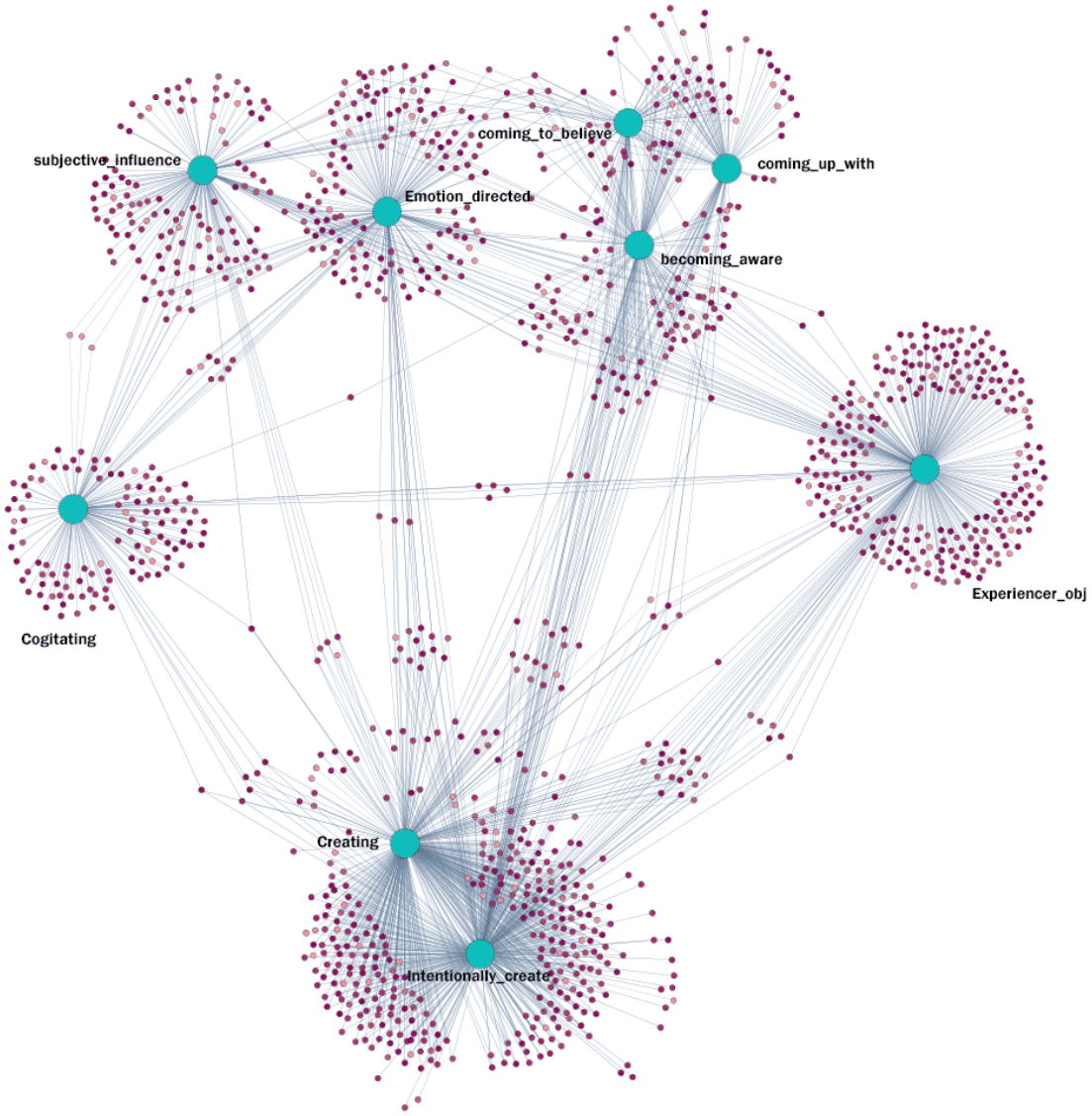

Figure 13 Graph visualisation of Tweets clustered around FrameNet Frames via related Lexical Units

6.5.2 Re-evaluation of the Information Retrieval System

Because the researcher's subjective opinion was required in order to assess whether a frame contained an expression of inspiration, an understanding of how reliable the researcher's opinion

was (i.e. a reliability measure) was required. Fully robust reliability measures require inter-researcher re-evaluation, however, this research was constrained by its nature as PhD research – i.e. the researcher was working alone. Therefore an intra-researcher approach was taken, namely the researcher re-visited a sub-set of the Tweets (a 20% sample chosen at random using Excel's number randomising formula), after a period of 14 months had elapsed.

An understanding that the reliability of the annotation was likely to be low was already informed by the consensus measure taken when the museum staff undertook their annotation exercise, and it was clear that their opinions regarding which Tweets contained potential expressions of inspiration varied greatly, and even more so with that of the researcher. However, this measure only applied to the IR evaluation exercise: a similar task had to be undertaken to establish the validity of the stats related to the overall relevance of retrieved Tweets (shown in Tables 11, 12 and 13).

Frame	Sub sample size	# Agreements	Total +ve (1)	Total –ve (0)	0-0	0-1	1-0	1-1
Subjective_influence	20	17	31	9	3	3	0	14
Coming_up_with	13	8	9	17	6	5	0	2
Cogitation	19	16	15	23	10	3	0	6
Coming_to_believe	12	9	7	17	7	2	1	2
Becoming_aware	18	13	13	23	9	3	2	4
Creating	46	32	40	52	19	10	4	13
Intentionally_create	42	30	40	44	16	11	1	14
Emotion_directed	25	23	12	38	18	1	1	5
Experiencer_obj	32	26	26	38	16	6	0	10
	227	174	193	261	104	44	9	70

Table 14: Number of agreements per frame and nature of agreement

Basic counts of the level of agreement between the researcher's annotations at the two different times are shown in Table 14, but a more robust measure of intra-coder reliability was provided by applying a confidence measure to this set. Krippendorf's Alpha was chosen as this is a heavily-used method for measuring *inter-coder* (i.e. more than one coder) reliability in Content Analysis. While it is important to remember that the approach described here is not *coding*, and Krippendorf's Alpha is designed to extend to multiple coders annotating multiple codes across many different units of content, it is also perfectly possible to use it to gain a confidence measure on a binary yes / no decision with just two annotators (or in this case, one annotator annotating twice with time elapsed in-between). The key advantage was that Krippendorf's Alpha accounts for the effect of random chance in similarities between annotations (Krippendorf, 2004:221). The alpha was generated using

the rest of the data in Table 14, namely the total number of positive annotation results (where the researcher considered that the Tweet *did* contain an expression of inspiration), and counts of the times when there was agreement between both annotations (that a Tweet did *not* contain an expression – labelled an 0-0 result, and times when it did – labelled 1-1), and counts of the disagreements (0-1 and 1-0 outcomes). It is worth noting the low number of 1-0 results (i.e. occasions where the researcher noted an expression of inspiration in the first annotation, but not in the second) compared with 0-1 results (when a Tweet was annotated positively the second time but not the first) – namely 9 to 44. This indicates that the researcher was a lot more positive, and saw more expressions of inspiration, the second time.

One example of this occurring concerns this piece of Tweet text, which was annotated as *not* containing an expression of inspiration at first, but containing one when reliability was assessed:

> *"we wanted to do something in French, we took inspiration from Flight of the Concordes" #MMUK14 @derbysilkmill http://t.co/jofJS9MfTt*

The image that this Tweet links to contains a picture of part of a crowd watching one of the presentations by a team at MuseoMix. Therefore, (aside from the keyword 'inspiration'), the Tweet contains some evidence that creative work was being presented. This is *mostly* provided by the image, however, with the text predominantly consisting of a reference to a TV comedy show. This is a good example of the confusion and ambiguity that can be caused by the sparsity of Tweet text, and the need to rely on the context provided by other forms of media, links to supporting information and so forth.

The totals of disagreements were then combined with the overall number of positive results to generate Krippendorf's Alpha for the comparison between both sets of annotations, resulting in an alpha measure of 0.52, which, while considerably better than chance, is far below the .800 recommended as a rule of thumb for complete coding reliability, and even considerably below the 0.67 result recommended for tentatively reporting preliminary results where it is acknowledged further work is required (Krippendorf, 2004:227). This low result was actually hypothesised given the lack of consensus between museum staff and the researcher observed during the IR evaluation, and is discussed further in Chapters 8 and 9.

Another issue that came to light concerned a number of instances where Tweets were linked to Frames without the Tweet in question having anything to do with the Frame itself. The most important example of this is the Frame *coming_to_believe*, which, while containing numerous relevant LUs, actually describes a deep-seated change in behaviour (indeed, belief) that none of the

Tweets contained any evidence of. This ties into the idea that to note a change in belief would require the longer-term relationships with visitors to be tracked, and indicates a severe unlikelihood that such a change would be expressed in the instance of one Tweet.

6.5.3 Evaluation of soft-systems

The evaluation of potential 'soft' information systems related to ARC2's prototype started with a review of the Rich Picture of the problem situation (see Section 6.2.4), and also a discussion of the spectrum of inspiration diagram, based upon a diagram drawn by the Head of Museums during the initial discussion of FrameNet (Figure 14). The following key issues were noted:

1. Including FrameNet in the Rich Picture made no sense to the museum staff. This was because FrameNet was part of the solution to the problem, not part of the problem itself. Focusing upon the concept of "psychological constructs" related to inspiration, and how visitors expressions of their experience of these might be included in their Tweets, helped make more sense of the Rich Picture.
2. The distinction between 'visitors to' and more hands-on 'participants in' creative events was both confusing and undesirable for the museum staff. Firstly, the museum staff thought that a visit *was* 'participation' in an event. More importantly, the key outcome that the museum wished for *all* visitors was 'participation' of some sort –visits in which the visitor remained completely unengaged were considered a failure. Creating a class of entirely passive 'visitors' was seen as accepting an undesirable outcome.
3. Finally, when re-assessing the 'spectrum of inspiration' diagram, a discussion took place about the 'clichéd idea of creativity' that was used to illustrate the examples of 'creative behaviour' - namely that all examples came from the creative arts. The Head of Museums stated: *"…we were discussing recently what creativity was, and how creativity is about how you take the evidence around you and you come up with something new. And that could be in any walk of life (Workshop EW)."* Alternative examples such as engineering, gardening or accountancy were suggested.

An important finding of the soft-systems review was how well the Frame classification (i.e. by Cognitive, Emotional and Creative) fitted with the museum's own pre-existing model of visitor's engagement, which they already used for exhibition planning and development. The following

exchange between the Head of Museums (HoM), the Social Media Coordinator (SMC) and the Researcher (R) took place during the evaluation of ARC2's prototype:

> *HoM – So is this where it's worth mentioning the way that we try and engage people? We try and engage people through their head, their heart and their hands. And this – the psychological constructs, we can see, within there, how we engage people in those different ways. So this might be…*
>
> *SMC – "I think this is brilliant".*
>
> *HoM - "I think this is brilliant", "I love that", "I want to do that".*
>
> *R - Or "I did this"?*
>
> *HoM – Yeah, or "I did this". So the way we look at the Tweets, we want to prove that we are engaging people in these ways, and that we have inspired people to be… do these things (Workshop EW).*

This was the point at which the 'head, heart and hands' model, potentially based upon a long-standing 'tradition' from teaching and learning related to the core categories of Bloom's Taxonomy of Educational Objectives (Bloom et al, 1956), was first discussed by the museum staff, and its influence upon Derby Museums' approach to exhibition design became more evident. For instance, the museum also had an appreciation of the way in which emotion 'comes first' of the three aspects of their engagement strategy, and this had informed their design strategy, even to the point of hiring exhibition designers from the creative and visual marketing sectors, and by relying upon modern technology:

> *HoM - It's about the importance of the object, and if we display the object really really well, people will look at it and go "that's lovely" or "that's really interesting" or "but what IS that?" So actually, we don't always need to tell them what it is, because most people have got one of these [gestures towards smartphone] and they've got Google, and they'll go home and they'll look it up, or they'll go to the library and find out. We just give them a basic bit of information, but the first thing for them to do is to think "that's amazing, that's lovely, that's great. I want to know about that"*
>
> *R- So it's heart first and then head?*

HoM – Yes (Workshop EW).

This strategy of Derby Museums reflects the thinking about emotion and inspiration described by Gross (1998), Pinker (1998) and Connolly (2002), whereby emotion is 'faster' than cognition, or feelings occur before thoughts (see Literature Review Section 2.2.1). This is discussed in more depth in Chapter 8 Section 8.1, when the learning points in relation to inspiration from all three ARCs are discussed. However, further thought regarding this idea also led to the proposal that the 'head, heart and hands' model could not only be used for event and exhibition planning but could also:

- Help balance the programme and schedule of events.
- Help evaluate events by briefing evaluators with the expected balance of a particular event, in order that they could measure and account for any differences between the expected and actual balance of the event in question.

These ideas were documented in the system diagram labelled ARC2 RD2.3.5, shown in Figure 20, which is described from the weltanshauung of a museum manager who requires a scheme with which to organise museum work. The production of this Soft System model indicates how Social Media information might support a cycle of planning and evaluation activities (see Chapter 8 Section 8.3.2).

ARC2 RD2.3.5

A system for planning both events and larger programs of events by explicitly considering the three components of 'inspiration'; heart, head and hands. The aims are to create a balanced program of events by explicitly considering all three aspects while programming events, and also to consider the balance of each event individually, thus giving event and exhibitions and organisers a specific 'shape' of balance between the three aspects to aim for. Whether this 'shape' has actually been achieved could also be a method for evaluating the success of the event using social media and other forms of analysis

C - Museum managers and program schedulers
A - Musuem managers, curatorial staff, evaluation and audience planners, marketers
T - Ideas for events and exhibitions ---) Event and exhibition ideas that have been considered and evaluated in relation to a head, heart and hands framework

W - inspiring events need to be aimed at a balance of "head", "heart" and "hands" - though the exact proportions differ depending upon the idea / related content
O - senior management (e.g. museum director)
E - (Real) - a museum planning a program of participatory events

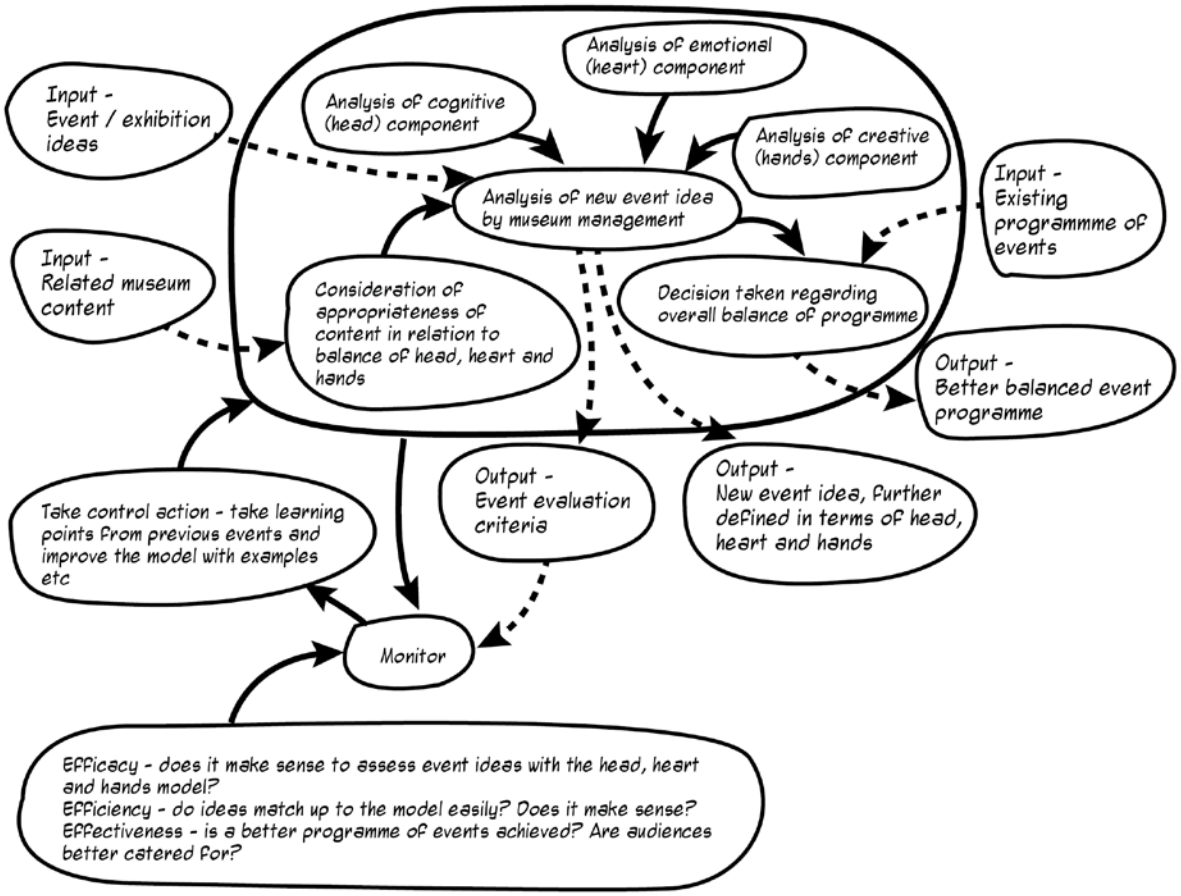

Figure 14 Soft System Model for ARC2 Root Definition 2.3.5

6.6 ARC2 Conclusions

The positive conclusions to emerge from this ARC were:

1. The definition of inspiration evolved in a direction that both:
    a. Brought it closer to the more sophisticated, complex and realistic theories of how emotions and cognition interact.
    b. Matched with a museum's own definition of inspiration / engagement that was currently in use in the field (namely Derby Museum's 'head, heart and hands' model).
2. Most of the Frames found and chosen from FrameNet also fitted into the definition of inspiration closely, and on that level FrameNet was a worthwhile resource.
    a. However the *coming_to_believe* Frame in particular, while it helped to find potentially relevant expressions of inspiration, did not find any Tweets that actually matched the meaning of the Frame.
3. Considering regarding how the museum staff thought about inspiration while evaluating the prototype indicated that 'how inspiring something was' has the potential to be a useful question when evaluating museum events. This is discussed at length in Chapter 8.
4. "How are we attempting to inspire people? (I.e. cognitively, emotionally and / or creatively) – with this event" also has the potential to help with programming, and event design and development. (Also discussed in Chapter 8).

The more troubling conclusions to emerge from this ARC mostly concern the performance of the prototype system. Given the current low F-Measure and reliability measure, however, the prototype is only fit to guide analysis towards qualitative evidence of inspiration in a 'decision support' mode, currently. The reliability measure in particular may indicate that individual Tweets may rarely contain enough information to be a reliable source of data about a complex phenomenon such as inspiration. The intra-coder reliability measure is key to understanding this issue: it provided a robust indication of how easy it was for the researcher to read expressions of inspiration from consistently, and in this instance, not enough consistency was achieved for the text to be considered meaningful. As a result, any IR system measured according to its performance against human annotation of unreliable data must also be considered unreliable. The conclusion drawn from this is that similar systems (such as the 'professional' Sentiment Analysis tools on offer at time of writing) should only be considered reliable if details of the annotation processes that are used to generate

the reference sets with which they are tested, and reliability measures that indicate that the test data was indeed 'meaningful', are made available by the developers of the systems in question.

Positive bias among annotators was also shown to be a factor in reducing the effectiveness of an IR system for evidence of inspiration. Process and techniques to account for bias in evaluation already exist within the museum sector: e.g. the 'peer review' idea embodied in Visit England's VAQAS scheme (Visit England, 2015). These could potentially also be used in the act of training and testing systems for automated evaluation, though again, the overall levels of ambiguity in individual Tweets may hamper this.

The final learning point concerned an assertion made by the Social Media Coordinator that an individual's personal inspiration, if conducted publically, might 'infect' others with inspiration in turn. This became one of ARC3's core ideas.

7 ACTION RESEARCH CYCLE 3: ASSESSING THE IMPACT OF INSPIRATION UPON A MUSEUM'S AUDIENCE

7.1 Introduction

Action Research Cycle 3 (ARC3) drew together the two threads of research conducted in the previous two ARCs. Those threads were:

1. Assessing the *potential for inspiration in an audience*, by analysing followers 'Twitter biographies' and attempting to extract their potential expressions of interests in topics.
2. *Capturing potential expressions of inspiration* related to museum events by using NLP upon Social Media posts, and organising them according to FrameNet Frames that represented the constituent parts of the museum-friendly definition of inspiration.

To tie the two research threads together, ARC3 studied whether the impact of potentially-inspirational museum events upon a museums' online social network could be assessed, and what such an assessment might mean to museum staff. This was achieved by focusing upon specific members of the network who interacted with the museum during events, and the nature of their relationships with the museum. The data captured during in ARC2 was re-used for ARC3, hence the events were:

1. The Derby Mini Maker Faire 2014.
2. MuseoMix UK 2014.

(See the introduction to Chapter 6 for more details).

ARC3 involved the following collaborative workshops with the same Derby Museums' staff (the Head of Museums – HoM - and the Social Media Coordinator – SMC) and also, on one occasion, one of their collaborators:

1. Workshop W3 on 15th October 2014 (Diagnostic Phase).
2. Workshop W4 on 21st October 2014 (Diagnostic and Action Planning Phases).
3. Workshop W5 on 30th October 2014 (Diagnostic and Action Planning Phases).
4. Workshop W6 on 20th November 2014 (Action Planning and Action Taking Phases).
5. Workshop W7 on 3rd December 2014 (Action Planning and Action Taking Phases).

6. Workshop W8 on 12th December 2014 (Action Planning and Action Taking Phases).
7. Workshop EW on 7th July 2015 (Evaluation and Specifying Learning Phases).

Appendix 5 contains the complete list of interviews and workshops undertaken as part of thi research. Appendix 3 contains more background information about the design on ARC3's prototype 'hard' system.

7.2 Diagnostic phase

Derby Museums' staff were particularly interested in the people that had contributed Tweets relating to the two events. The quote below (with the names of visitors redacted), recorded during Workshop W4 while a preliminary review of Twitter data captured in relation to the Maker Faire was undertaken, gives a good indication of the staff's interest:

> *Social Media Coordinator [SMC] – If you look at the list of 199 contributors, there's not many that I recognise that aren't Makers…*
>
> *Head of Museums [HoM] – []… I spoke to him. He was here with his child. If you look at his four photos they'll be pictures of children, and one will have me in the background.*
>
> *SMC – And []… and [] there are visitors.*
>
> *HoM - []… Who's he?*
>
> *SMC – He's a Maker.*
>
> *HoM – Right (Workshop W5).*

The keen interest the staff had in the people that had visited their events raised the following points:

- Many of the more active creators of Tweets containing the #DMMF14 hashtag were "makers" with whom the museum had pre-existing relationships.
- Museum staff and close affiliates also used the hashtag using their personal Twitter accounts.

- Some of the other heavy contributors were visitors to the event, though visitors tended to make fewer contributions than makers and staff.
- While some of the visitors were already known to the museum, many were not.
- The museum staff were aware that a few of the contributors did not attend the Maker Faire, but were using Twitter to track it.

The museum staff wanted to know more about the people that had interacted with their events on Twitter. They were also keen to work through the contributors and mark which ones they knew, and, potentially, the reason why they knew them. In fact, they even proposed doing so themselves:

> *HoM – So some of those people, we know who they are. Some of them… []… well, he lives in Devon. He wasn't here. He was, Retweeting. [] wasn't here.*
>
> *SMC - Do you want us to go through the list and say who's who?*
>
> *HoM – So what, what, where I was going with that was, that if you sent us that spreadsheet, if we look at that spreadsheet, erm… if it had another… if it had another… erm… That spreadsheet there. So if it had another… um… another… er column in it, so if that column then… you know, maybe it would have one for Makers, and one for staff, and one for…*
>
> *Researcher [Res] – Or a choice of things to put in it?*
>
> *HoM – Yeah yeah. We could then go through that and do that, couldn't we (Workshop W5)?*

7.2.1 Structures

As per the previous ARCs, the SSM approach of considering the problem situation in terms of structures and processes was followed (see Methods Section 3.4.3). The structures were:

- *Derby Museums*: is described in ARC 2 Section 6.2. During ARC3, however, the museum was considered more a hub in a network, rather than an inspiration facilitator.
- *The museum staff*: the museum staff from ARC2 also collaborated upon ARC3 (see Stakeholders below).

- *Derby Museums' Twitter network*: a network of several official accounts related to Derby Museums existed. Some of these accounts mapped onto parts of the museum organisation itself (such as the Silk Mill's own account) and related to the museum's key themes (e.g. there was an account related to an important collection of paintings). A network of staff accounts also existed.
- *The museum's community of visitors, participants and partners*: the structures involved in ARC3 were not only 'virtual', however. The cross-over between the virtual and physical was an important aspect of ARC3, so it was vital to the understanding of the problem situation that real partners, visitors and participants were considered.
- *The Tweets contributed to the two events*: the Social Media interactions with the museum related to the two events.
- *The Twitter API*: the technical sub-system used to retrieve the Twitter data.

7.2.2 Processes

- *The two events themselves*: these two events are described in more detail in Chapter 6 Section 6.2. Aspects of these events specific to ARC3 were:
    - The Maker Faire related to a key part of the existing network around Derby Museums, namely the Derby Makers, who held their meetings at the Silk Mill. Derby Museums were involved in setting up the Derby Maker Faire.
    - MuseoMix, on the other hand, was organised by a third party with which the museum had links, but the museum was the host, not the main organiser, hence it was not as closely related to Derby Museums' existing network.
- *Tweeting relating to the events*: as discussed in Chapter 6 Section 6.2, both events had Twitter hashtags used by museum staff, partners, participants and visitors to the events.
- *Data collection via the Twitter API*: the same datasets of Tweets related to the two events collected for ARC2 were reused.
- *Analysis of the list of people who had contributed Tweets*: this work began during initial meetings and continued throughout. Indeed the whole of ARC3 had this task at its core.
- *Deciding which Tweets represented examples of the 'impact of inspiration upon the museum's network'*: running alongside the process of considering the people who had

contributed Tweets was the task of deciding which Tweets had the most 'impact', based upon analysis of their various properties.

7.2.3 Stakeholders

The stakeholders for ARC3 were very similar to those for ARC2, though the attitudes of the key stakeholders for this ARC differed slightly:

- Head of Museums: initially, ARC3 seemed to generate more enthusiasm in the Head of Museums than ARC2, as this strand of the research seemed to match his understanding of the potential of Twitter (in terms of global audiences, for example) more closely than ARC2.
- Social Media Coordinator: as discussed below, ARC3 was perhaps the closest point between the research and the Social Media Coordinator's job, as it covered the relationships between Derby Museums and the people that created Twitter content in relation to those events.

The fundamental idea behind ARC3; i.e. considering the nature of the relationships between museum staff and contributors of Twitter content about the two events, came from the Head of Museums and the Social Media Coordinator. Other than the two museum staff members that worked with the researcher directly on ARC3, the other stakeholders were the same as ARC2 (other museum staff, the board of trustees, organising partners and sponsors of the events).

7.2.4 Rich Picture of the problem situation

Once structures and processes were considered, the problem situation was visualised using the Rich Picture shown in Figure 15. As per ARC2, the Rich Picture illustrated the real world's relationship to the virtual 'Twitter world' (shown in the blue cloud). A key feature of ARC3's Rich Picture are concentric circles around the real and virtual worlds, with Derby Museums at the centre. These indicate degrees of closeness / distance in the relationships between the museum and members of the network of contributors. These classes of people were defined initially by discussing the list of contributors of Tweets related to the Maker Faire. The idea that the events also had a presence in the 'Twitter world' was shown by the stars that symbolised them straddling the edge of the cloud.

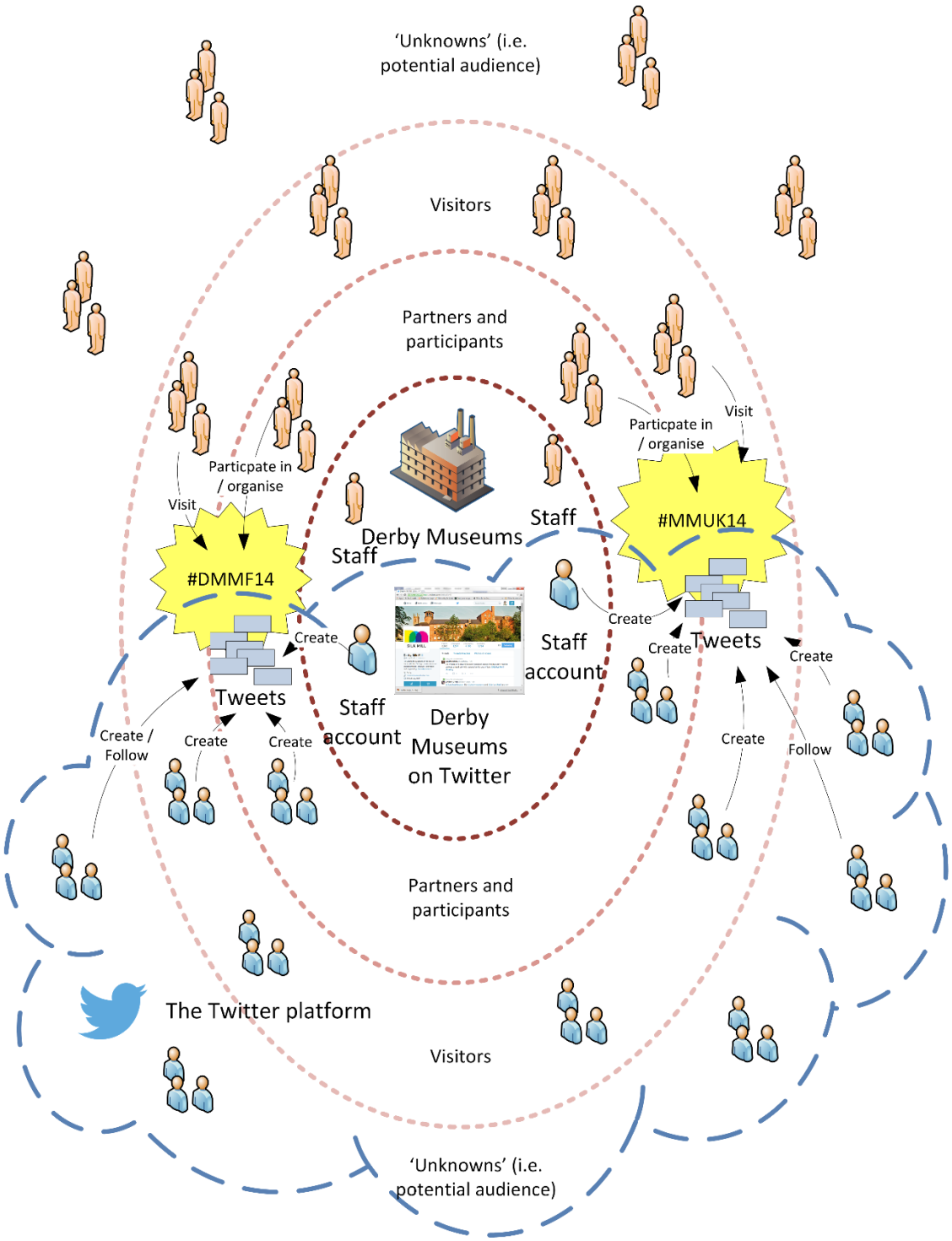

Figure 15 Rich Picture illustrating problem situation for ARC3

The problem situation that this Rich Picture illustrates was summed up with the following questions: firstly, how could Derby Museums better understand the impact that the two events had on their community / potential community? Secondly, how did visitors' reactions to the two events "spread through the concentric rings"?

7.3 Action Planning phase

As with the previous ARCs, Action Planning concerned a combination of planning and designing the 'hard' system prototype, and considering the 'soft' human activity systems that it would impact upon.

7.3.1 Requirements and User Stories

Three high level requirements emerged from the Diagnosis phase. The first concerned an analysis of the relationships between the museum staff and those that interacted with their events via Twitter. Could these types of relationships be classified, and if so, how?

The museum staff also wanted to try and establish how far the impact of / reaction to their events had spread, to see if they could get a sense of whether or not an event might draw people into relationships with the museum, and possibly even lead to subsequent visits. The museum staff wanted an indication of the success of the events, by assessing them in terms of 'the impact of the events upon a network'. To build a prototype to further investigate the problem situation and attempt to meet these requirements, the researcher therefore proposed two variables of potential interest to the museum, *reach* and *community strength*. These variables became fundamental to User Stories in Table 15, which were written to apply some structure to the questions above so that design of a prototype could begin.

#	User story name	Description
3.2.1	Measuring reach	As a museum manager, I need to know the spread of inspiration caused by an event. Were the interactions with people the museum already knew, or with completely new people? Also, where were those people from? Were people tracking the event from afar? I need to know this to help judge how effectively the event introduced the museum to new people, and raised the profile of the museum.
3.2.2	Measuring community strength	As a museum manager, I need to know the degree to which the event strengthened already existing relationships with the museum's community. Were there lots of interactions with people the museum already had a relationship with? Or did the event inspire new audiences? I need to know this so I can begin to judge which types of activity strengthen existing relationships, and which create new relationships.

Table 15 User Stories for ARC3

The following exchange indicates how the concept of *reach* was approached. It incorporates a discussion of 'mentioning' people in Tweets (Twitter terminology for including a reference to their account in a conversation):

> *Res – If you mention someone that you're unfamiliar with, then you are kind of reaching out to them?*
>
> *SMC – Yeah, so that starts to happen in conversations, when people include you. In conversations. And also…*
>
> *HoM – Yes. So: "I went to Derby Museums it was great".*
>
> *SMC – "I went with… I went to Derby Museums with…"*
>
> *HoM – Yeah… Or: "I think you… you should go there 'cos it's great".*
>
> *SMC – Yeah. Which is… we have had some of those.*
>
> *Res – So that's [referring to a specific Tweet] one of your ones. So… sorry – that's one of their [a visitor's] ones that mentions you?*

HoM – Yeah but also mentions somebody we've never heard of.

SMC – This is engagement.

Res – But it could be in reach too? If it's by somebody else, but it mentions you, and they've got a lot of followers…

HoM - And they might be mentioning somebody who we've never heard of.

SMC – Yes.

HoM – So it's… there are some times where somebody's said: "I went to Derby Museums and I saw this… I think you would like it, JoeBloggs" (never heard of them)… erm… "why don't you go?" So there's a few of them that I've seen.

SMC – Yep! (Workshop W6)

This quite complicated exchange illustrates the difficulty in thinking about the concept of 'reaching out' to potentially new audience members via intermediaries from the existing audience: a topic that recurred throughout all the ARCs. The potential overlap with the concept of 'engagement' is also of note. The key thing to note about this exchange, however, is how the staff were beginning to factor the degrees of familiarity with visitors into their thinking about extending their reach.

The museum staff were also interested in being able to assess the degree to which events had *strengthened the museum's community*. The following is a quote that illustrates their thinking about this concept:

HoM – So if… if for example, if these, these are the visitors who came. There's four of them… These four visitors… um… In three month's time… at this point, at the, erm… Derby Mini Maker Faire they're visitors, and in three months' time we take each of those four, erm… we, and we look at their last 200 Tweets, say… This is just a, you know, it could be. Erm… And, erm… This person here mentions… er… The Silk Mill once, we look at that Tweet and they visited again. This person doesn't mention Making, doesn't mention The Silk Mill, and doesn't mention any of the Maker Groups either. 'Cos we could look – we could search for those, couldn't we?

Res – We could also look at who those people were following, as well. So have they started following any of the Makers? Have they started following the Silk Mill? The Maker Faire itself?

HoM – Then we would need to look at them now to see if…

Res – Yeah, and then in three months and…

HoM – Yeah yeah. They might have followed them at the event (Workshop W5).

This exchange describes "strengthening community" in terms of one visit leading to more in future, and a growing relationship not just between the visitor and the museum, but also between the visitor and others in the museum's network (i.e. the 'Maker Groups'). However, it is also significant that this exchange contemplates a potentially invasive investigation of the visitors' Twitter accounts in order to establish an idea of 'strengthening community'. This is discussed further in Chapters 8 and 9.

Upon considering the reach and community strength variables from a technical viewpoint, it was clear that they were "fuzzy" in nature: they were continuous variables that could be thought of in terms of "the degree to which" they were applicable (Kosko, 1994). Reach, for example, could easily be thought of in terms such as "far away" or "very local". Community strength could be "weak" or "very strong".

7.3.2 *Weltanshauungen* from which the problem could be approached

As with the other two ARCs, the problem was approached from a variety of weltanshauungen (worldviews / outlooks / frames of reference) to consider it more holistically. These weltanshauungen were:

- *Event centric*: thinking of the problem situation in an "event-driven" way might enable comparison of events (i.e. completely different events or "the same event" running in different years).
- *Museum centric*: the problem could be considered from the point of view of the museum by thinking about how visitors' reactions spread *from* it *through* the network. This might help consider the direct effects the museum had caused, but could discourage thinking about how people and organisations had inspired each other.
- *Network / audience centric*: it might be possible to examine the problem in a more 'decentralised' manner by considering the network more holistically, as a whole entity in itself.

- *Community-centric*: this weltanshauung was similar to the previous 'network-centric' weltanshauung, though from this point of view the *meaning* of relationships between the museum, its staff, and visitors were emphasised.

7.3.3 The knowledge base

To develop the prototype, relevant computing techniques from the 'knowledge base' were deployed – as described in Section 3.3.2 of the Methods Chapter (Hevner et al, 2004). The particular set of techniques chosen all related to *Knowledge Engineering*, i.e. computing techniques for the design and development of 'intelligent systems' based upon human knowledge. They were:

1. *Knowledge Elicitation* (KE): a group of techniques which investigate human expertise and use it to solve problems or undertake tasks. KE is usually based upon a relationship between *experts* and *analysts*, and uses techniques such as interviews, observation and brainstorming to define, document and otherwise apply structure to expert knowledge (Shadbolt and Smart, 2015; Gavrilova and Andreeva, 2012).
2. *Multi-Criteria Decision Analysis* (MCDA): one aspect of ARC3 that differed slightly from 'traditional' KE was that the research focused upon sets of Twitter data that had already been collected, and aimed to elicit expert opinion regarding which Tweets were 'better' or 'worse' than each other. This comparison exercise had much in common with "Multi-Criteria Decision Analysis" (MCDA), a technique from Operations Research and Management Science (Lootsma, 1997).
3. *Fuzzy Expert Systems*: another main component of knowledge engineering is an *intelligent system* within which elicited knowledge can be encoded in order to automate decision making. An appropriate type of intelligent system for ARC3 (in which the output variables of interest were continuous) was a Fuzzy Expert System, into which the elicited knowledge could be encoded as *fuzzy-logical rules*.
4. *Fuzzy Logic Controllers (FLC)*: systems for drawing conclusions about input data using Fuzzy Logic and rules based upon expert knowledge (see Appendix 3 for more details).
5. Automated testing using a test reference collection: the accuracy of the output from the FLC needed to be compared against an annotated *test reference collection* (Baeza-Yates and Ribeiro-Neto, 1999) in a similar fashion to ARC2's prototype. However, in this instance a test

harness was also developed to enable incremental development of the rule base, as described in more detail in Appendix 3.

The main advantage of using these techniques was that the KE process once again provided an opportunity to consider the potential use and meaning of Social Media data with museum staff. By working with museum staff to "score" Tweets in terms of "how valuable they were", a picture of the potential value of Social Media information to museums could be established.

7.4 Action Taking phase

As before, ARC3's Action Taking phase started with 'hard' system prototype development, enabling the opportunities, and constraints, presented to the museum staff by computerised analysis of Twitter data to be assessed. The learning from prototype development then contributed to soft system modelling, which explored how access to Social Media Information might change the museum's human activity systems.

7.4.1 'Hard' system prototype development

There were two strands of activity related to the development of the 'hard' system prototype for ARC3:

1. The design and development of a Fuzzy Logic Controller (FLC) system.
2. The creation of training and test reference sets from the Twitter data.

The design and development of the FLC is described briefly here and in more detail in Appendix 3. The FLC was based upon a set of rules developed with the staff from Derby Museums. These rules indicated which Tweets they thought were better evidence of increased *reach*, and increased *community strength* for the museum. Hence the system needed to:

1. Read Tweet data from the database.
2. Set the values of input variables for the FLC using the Tweet data.
3. Evaluate the FLC's input variables according to the rules, to produce output values.

4. Store the output variables back with the original Tweet data, so that each Tweet's potential value as a possible source of evidence of increased reach and community strength could be ascertained.

Refer to Appendix 3 for more details about the design. The results of running the Tweet data for the two events through the FLC are discussed in the Evaluation section.

Three datasets were prepared to develop, test and evaluate ARC3's prototype:

1. The datasets of Tweets used were the same as those used in ARC2 (see Chapter 6 Section 6.2):
    a. 1006 Tweets related to the Derby Mini Maker Faire 2014.
    b. 5652 Tweets related to MuseoMix 2014.
2. A *development* or training set of 200 Tweets was selected at random from the Maker Faire set.
3. A *testing* set of 200 Tweets taken from the MuseoMix set. These were scored without the Researcher present.

The development and training sets were 'scored' during two sessions between the Researcher and the Derby Museums staff. 'Scoring' meant using the Tweet data as an MCDA 'performance tableau', whereby the relative significances of the various properties of the Tweets were evaluated (Lootsma, 1997). This in turn meant both discussing which input variables from each Tweet were relevant to reach and community strength, and deciding whether reach and community strength would be Very Low, Low, Medium, High or Very High as a result of the input. See Appendix 3 for a full description of how these datasets were used.

Lists of the input variables from each Tweet that the staff considered relevant to reach and community strength are shown in Tables 16 and 17. During the scoring exercise, the researcher suggested that the museum staff should consider the variables in terms of the *real* museum, its events and relationships with visitors, rather than focusing completely upon the virtual 'Twitter-world'. E.g. reach might relate to the museums' actual geographical reach, as well as the potential size of an audience in Social Media alone. Some pre-processing of variables was also undertaken (e.g. the Boolean variable "TweetedAsEventOccurred" was set by comparing the Date and Time Tweets were created with the dates and times the events in question actually happened). Two other specific pieces of information were also included:

1. Levels of familiarity: these were crucial to the whole ARC and are discussed further below.

2. Location: this was set using a scoring scheme described in Appendix 3.

Antecedent Variable Name	Description	Data Type	Effect upon reach
IsReply	Whether the Tweet is a direct reply to someone. If so, then only the person being replied to, or followers of *both* parties, will have the Tweet included in their personal timelines (where it is more obvious).	Boolean	If True then reach is lowered
IsRetweet *	Whether the Tweet was a Retweet. This affected the meaning of the RetweetCount variable (see notes below).	Boolean	If True then RetweetCount is irrelevant
RetweetCount *	The number of times the Tweet had been Retweeted.	Integer	Reach increases as this variable increases, if IsRetweet is False.
TweeterFamiliarity	How well the museum staff knew the creator of the Tweet (using the scoring scheme described below).	Integer	If familiarity is low then reach increases.
TweeterFollower Count	How many followers the Tweeter had. If the Tweet was not a direct reply, it would appear in the timelines of all the followers who were still active Twitter users.	Integer	Reach increases as this variable increases.
TweeterHas Location **	Whether the Tweet's creator had added meaningful location data to their profile.	Boolean	Indicated whether location data could be included.
TweeterLocation **	The location's distance from Derby (see Appendix 3 for a full description of location scoring).	Integer	Reach increases as this variable increases.

Table 16 Twitter data variables considered relevant to reach

The following notes relate to the chosen reach-related variables.

* Confusion arose among the museum staff and researcher regarding the "RetweetCount variable" as it was applied to retweets themselves. The dataset (as retrieved from the TwitterAPI) contained Tweets that were flagged as Retweets, and the Retweets also had a RetweetCount. For Tweets that were actually Retweets (i.e. which contained the parent tweet in the "retweeted_status" field) this value meant the number of times the original, 'parent' Tweet had been Retweeted. Twitter's API documentation regarding this was unclear, however, and confusion increased further because

Retweets had their own unique identifiers, creation date / times etc. The API documentation described the retweet_count as:

> *Number of times **this Tweet** has been retweeted. This field is no longer capped at 99 and will not turn into a String for "100+" (Twitter, 2015C - researcher's emphasis applied).*

This documentation, therefore, referred to "this Tweet", making no reference to parent Tweets or what should occur in the event of the "Tweet" in question being a Retweet. Indeed most of the statement above concerned changes to a legacy feature that no longer applied. Twitter's FAQs section on the subject (which was unlinked to the documentation above) further elaborated:

> *In v1.1 APIs, retweeted tweets are expressed through nested objects. If you encounter a tweet object that contains a retweeted_status node, the tweet represents a retweet. The embedded retweeted_status is the tweet that has been retweeted and the outer object represents the retweet event itself. Both objects may have duplicative fields with duplicative content, but **when considering data around the original tweet that was retweeted, values from the retweeted_status object should be used. When looking for count values like favorite_count and retweet_count, use the values from the retweeted_status** (Twitter, 2015D – researcher's emphasis applied).*

This subtle change in the meaning of the retweet_count variable depending upon its context impacted upon how information based on data stored in those variables was interpreted. See Chapter 8 Section 8.4 and Chapter 9 Section 9.5 for more discussion regarding this.

** TweeterLocation was an example of "dirty" Twitter data in that the location field of a Twitter user's account was a free text field, and as such was often left blank, contained misspellings or was sometime used humorously by Twitter users. The extra Boolean TweeterHasLocation variable enabled the creation of rules such as:

- If TweeterHasLocation is True and TweeterLocation is VeryLocal Then Reach is VeryLow

This helped ensure that location rules (and other rules based on potentially dirty data) did not fire unless there was a good chance the input data was clean enough to generate a valid answer.

Antecedent Variable Name	Description	Data Type	Effect upon community strength
MaxMentions Familiarity *	The most familiar level of familiarity that Derby Museums had with the people mentioned in the Tweet.	Integer	Community strength increases as this increases, but drops if the MaxMention is 5 (i.e. they work at the museum)
MentionsMuseum Account	Whether the Tweet mentioned one of Derby Museums' Twitter accounts. (I.e. whether Derby Museums were included in the 'conversation').	Boolean	Community strength increases if this is True
TweetedAsEvent Occurred	Whether the Tweet was created during an event (i.e. whether the creator was Tweeting from the event, or about it as it was occurring).	Boolean	Community strength increases if this is True
TweeterFamiliarity	How well the museum staff knew the creator of the Tweet (using the scoring scheme described below).	Integer	Community strength increases as this increases, but drops if the TweeterFamiliarity is 5 (i.e. they work at the museum)

Table 17 Twitter data variables considered relevant to community strength

The following note relates to the community-strength-related variables:

* There were implications regarding one of the values for the MaxMentionsFamilarity, i.e. VeryFamiliar being a special case. These related to VeryFamiliar being assigned to museum staff: staff are by default "members of the museum community", and thus there was no value in recognising them as such.

Perhaps the key issue to emerge when selecting these variables and assigning values to Tweets based upon them was that both the researcher's and the museum staff's knowledge of the subtleties of Twitter functionality were not comprehensive (this is discussed further in the Conclusion to this Chapter). This led initially to logical flaws in the rule base and incorrect scoring of some of the Tweets in the development and testing sets.

Some of the input variables used in the FLC related to the level of familiarity between the museum staff and the creators of the Tweets; an aspect of the data that the museum staff were keen to investigate in detail. Workshop W6 was devoted to the topic of 'familiarity with the audience', during which a sample of 200 twitter user accounts (100 from each event's data set) was examined. The following exchange indicates some of the complexities of this topic. It begins with the Social

Media Coordinator referring to one of the Twitter accounts that had Tweeted about the Maker Faire. See Table 18 below for descriptions of categories two and three:

> *SMC - He's part of a project at this museum. And he's a Derby guy.*
>
> *HoM - But I've not met him, though. Have you ever met him?*
>
> *SMC - No, I've never met him.*
>
> *HoM - But I think he's a two as well because he's part of a project that we're involved in.*
>
> *Res - Doesn't that make him more of a three then?*
>
> *HoM - So as an organisation he's a three. But personally he's a two… But I think this is about an organisation. We're talking about how well the organisation knows him. So he's a three (Workshop W5).*

The exchange reveals two areas of complexity and potential confusion:

1. Twitter accounts do not necessarily represent individuals: they can also represent organisations. (Derby Museums own accounts are examples of this, some are official museum accounts, some are staff member accounts).
2. The staff had never met the person in question, but they were aware that others in the museum had, and were working with them.

It was clear that any categorisation scheme would therefore contain imperfections. However, in the spirit of developing a prototype, a six category 'familiarity scoring system' was developed (shown in Table 18), which tried to account for both organisations and individuals. The museum staff then categorised the 905 Twitter users related to the Tweets in the two datasets, and the familiarity scores were used as input variables to the FLC.

There was some debate between the museum staff and the researcher about the degree to which some individuals belonged to these categories: for example the "familiar" category was considered quite broad in that some individuals worked with the museum on a very regular basis, while others worked with them closely on specific tasks for short periods of time. The potential for moving to a ten category model in order to account for such nuances was discussed, but eventually discounted in favour of the six category model, as the total number of user accounts to be categorised (905) dictated that efficient processing be prioritised over nuance.

Score	Meaning
0	People you don't know at all. Never heard of them, never met them, don't know anything about the organisation they belong to. Organisations you have never previously heard of.
1	People you have heard of but have never met and don't know much about personally (famous people would most likely fall into this category, if you had never met them). Organisations that you are aware of, but don't know anyone who works there personally or any details about what they do.
2	People you have met and can put a name to their face, but don't have anything much to do with. They are not involved in museum projects. Organisations whose purpose you are aware of, and perhaps could put names to faces of some of the people that work there, but have never worked with before or visited.
3	People who are involved in museum projects, and who you know are contributing to museum work, but who you may not haven't actually met, or who you only meet infrequently. Organisations with which you have ongoing relationships, but with whom you only interact semi-regularly (you might go to their conferences but are not in regular meetings with them). Organisations that you've made plans with before, but who you have not directly worked with yet (i.e. you are still working on getting to know them).
4	Someone you know well and work with on a regular basis. You have their contact details and meet with them (or have met with them) regularly to undertake work. (You might describe this category as "unofficial colleagues"). Organisations that you have ongoing or past working relationships with (e.g. people that you contract out to, or that are or have been stakeholders in your projects).
5	Somebody who works at the museum and is officially a part of the Derby Museums organisation. You would usually see and interact with this person and / or the organisational functional they represent on a regular (i.e. at least weekly) basis.

Table 18 ARC3's scheme for scoring the museum staff's familiarity Twitter users

Scoring of the development set provided data that was used to develop rule bases to evaluate reach and community strength (see Appendix 3). Overall, 39 rules were required to achieve passes for the reach scores in the Development set, but only six rules were required for the community strength tests to pass. This was because reach relied upon a larger set of input variables, some of which were

were workarounds to cope with "dirty" Twitter data (e.g.: "location" data). Reach also had an extra output variable; the museum staff had graded it from Very Low to Very High, as opposed to Very Low to High for community strength. The ways in which the chosen input variables influenced the potential values of Tweets for both the reach and community strength output variables are shown in Tables 15 and 16.

One important issue with *community strength*, however, was whether geographical location should play a part, or whether a purely 'online' community was being discussed. Opinions regarding this issue varied and changed, and was confusing to both the staff and researcher throughout. Indeed the biggest issue regarding developing the community strength rules was the inconsistent idea of what 'community' actually meant (see Chapter 9 Section 9.3.2).

7.4.2 'Soft' system model development

The 'soft' system modelling activity for ARC3 considered the system root definition and CATWOE for each weltanshauung, and produced system diagrams (see also Chapter 5 Section 5.4.2 and Chapter 6 Section 6.4.2). However, when first reconsidering the weltanshauungen for ARC3 (outlined in the Action Planning section above) and undertaking modelling, it became clear that not only were the 'museum-centric' and 'network-centric' weltanshauungen very similar to each other, but they were also very similar to those studied during the other ARCs. As a results, the discussion below focuses on the two weltanshauung shown in in Table 19.

Figure 16 shows the system model for the 'event-centric' Weltanshauung. This model was closest to the 'primary task' of attempting to use information from Social Media data to evaluate the impact of a museum's activities, with the outputs lining up with the reach and community strength variables output by the ARC3 prototype.

#	Weltanshauung label	Root definition
3.3.1	Event-centric	A system for proving the impact of a museum event by noting how evidence of visitors' reactions to a museum event spreading throughout a museum's social network, to help account for the museum's impact upon visitors and other members of its network and tell the story of the museum's value.
3.3.3	Community-centric	A system whereby a museum comes to strengthen the bonds within, and understand more about, its social network. To achieve this, the museum both holds inspirational events, discusses them with its visitors, and encourages visitor participation. This is intended not only to bring new visitors into the network, but also to make existing relationships with visitors stronger.

Table 19 Weltanshauugen and Root Definitions for ARC3

The system model for root definition 3.3.3 shown in Figure 17 illustrated a system for strengthening a community around a museum. Inputs to the system were potential community members, alongside information from the museum (event information and more general museum knowledge) which would be added to the system with the intention of attracting people into the community, keeping them there, and drawing them closer to the museum, in a constant process. Two of the system processes (numbers 4 and 5) involved recording the nature of interactions with the visitors and updating the state of relationships, two processes very similar to the annotation exercise conducted by the museum staff during the data preparation work for the 'hard' system prototype. The output from these two activities would enable the monitoring activity, within which the speed of change of the relationship state would provide an efficiency measure in relation to the way in which community was building – more visitors returning to or communicating with the museum more regularly would indicate that a community was building effectively. Fundamentally, the system described in this model is a *Customer Relationship Management* system for a museum.

ARC3 RD3.3.1

A system for proving the impact of a museum event by noting how visitors' reactions to a museum event spreads throughout a museum's social network, to help account for the museum's impact upon visitors and other members of its network and tell the story of the museum's value.

C - museum management, event organisers and funders
A - potentially any of the members of the museum's network
T - A network of museum visitors, partners, etc with an interest in an event ---) A compelling picture of /story about the audience's reaction to an event
W - inspiring museum events affect a museum's network, therefore tracking the inspiration through the network provides evidence of the event's impact
O - museum management / event funder
E - (Real) - a museum with a network of visitors, partners etc holds inspiring events
(Virtual) - the online social network around the museum, in platforms such as Twitter

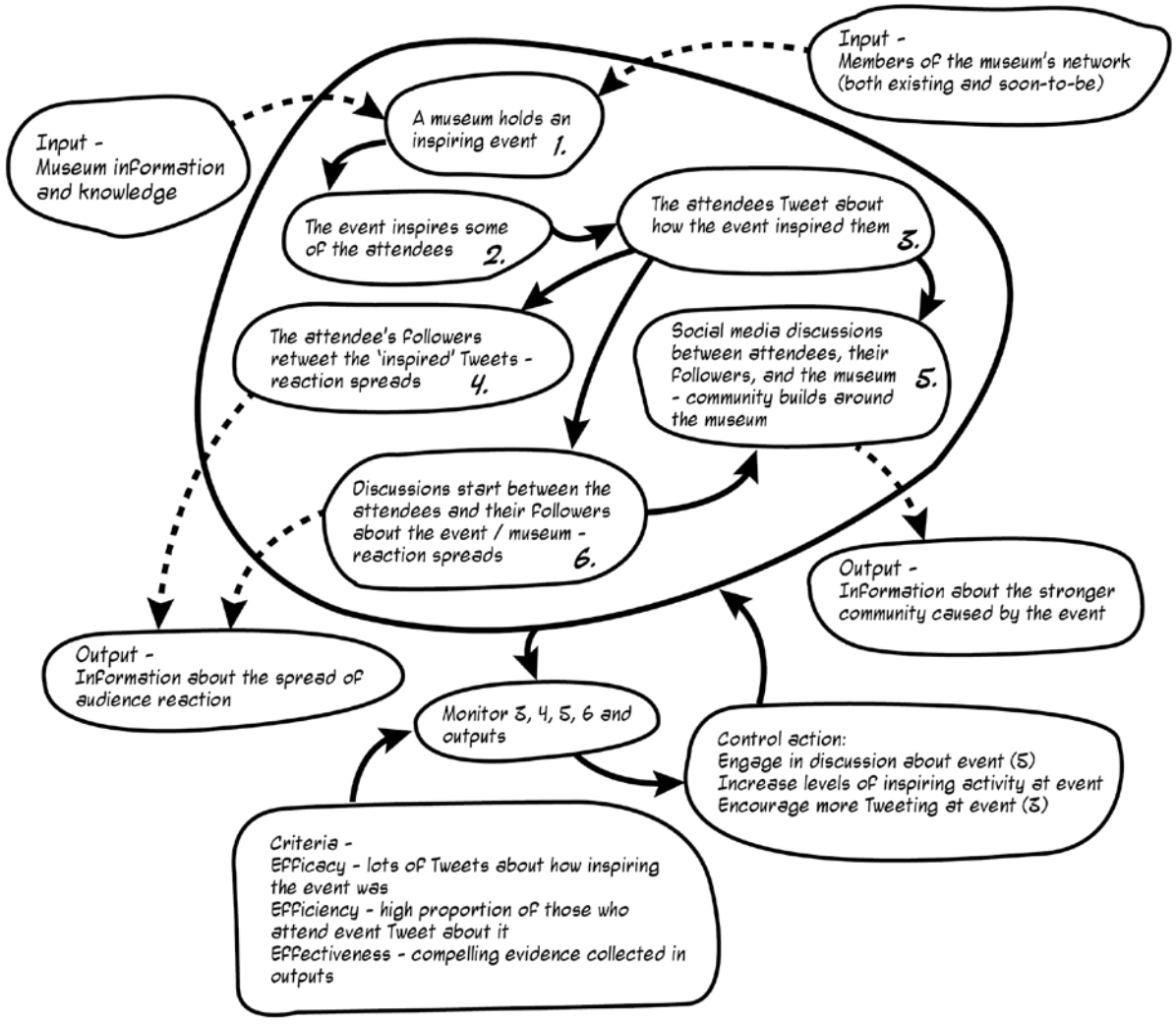

Figure 16 Soft System Model for ARC3 Root Definition 3.3.1

ARC3 RD3.3.3

A system whereby a museum comes to strengthen the bonds within, and understand more about, its social network. To achieve this, the museum both holds inspirational events, discusses them with its visitors, and encourages visitor participation. This is intended not only to bring new visitors into the network, but also to make existing relationships with visitors stronger.

C - museum managers and funders
A - museum staff and visitors (both current and potential)
T - A loosely linked museum social network where relationships with visitors are only partially understood ---) A much more strongly linked network where the nature of the relationships between the museum and visitors is much better understood
W - a museum is an organisation around which a community of regular visitors with an emotional and social stake in the museum can build
O - Funders - to stop the system, one would have to stop the museum
E - (Real) - a museum rooted in a specific 'place' (geographical and / or conceptual) (Virtual) - an online social network. Also a digital presence for the museum (as 'visits' could be visits to a website.

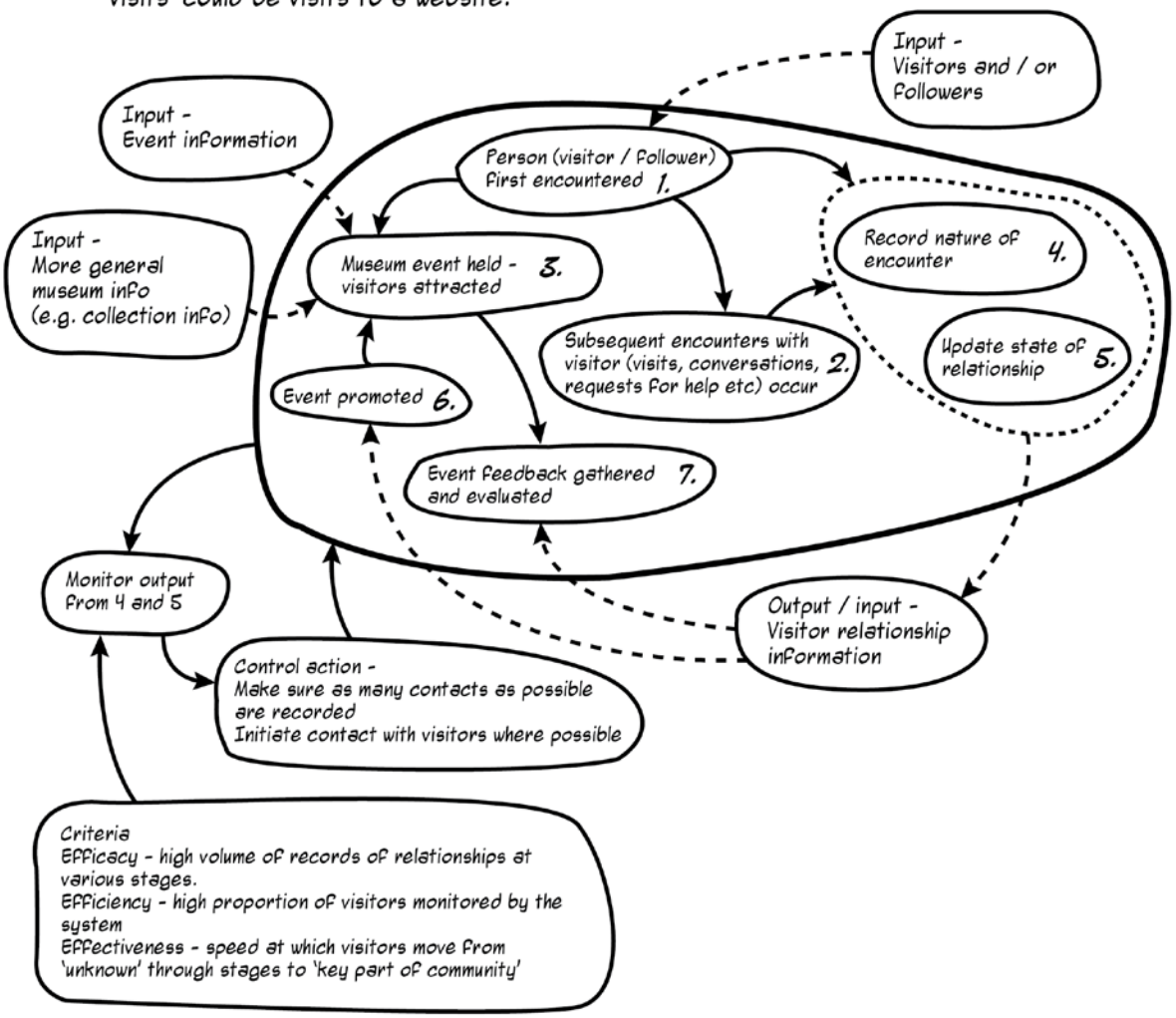

Figure 17 Soft System Model for ARC3 Root Definition 3.3.3

7.5 Evaluation phase

ARC's evaluation focused upon:

1. The 'hard' system prototype – its performance, accuracy, and the technical constraints it placed upon the system.
2. Potential 'soft' Information Systems that information of the sort produced by the prototype could become part of.

7.5.1 Evaluation of the hard system prototype development and functionality

This section considers the performance of the FLC in terms of measuring *reach* and *community strength*, firstly against the test data set, and then against the data set as a whole.

With regard to the familiarity scoring exercise; in total, 905 different users either created or were mentioned in Tweets that were captured in relation to the two museum events. The 'level of familiarity' with each user was scored by the museum staff (see Section 7.4.1), and the outcome is summarised in Table 20. Both Sections 7.5.2 and the Conclusion of this chapter discuss the reliability of these statistics.

Familiarity Score	Category	User totals				Tweet created by totals			
		Maker Faire		MuseoMix		Maker Faire		MuseoMix	
		Total	%age	Total	%age	Total	%age	Total	%age
0	Totally unknown	122	43.73	471	68.86	179	17.79	1460	25.83
1	Very unfamiliar	24	8.6	84	12.28	47	4.67	263	4.65
2	Unfamiliar	19	6.81	23	3.36	26	2.58	109	1.93
3	Average	68	24.37	64	9.36	289	28.73	2052	36.31
4	Familiar	26	9.32	20	2.92	78	7.75	1057	18.7
5	Very familiar	20	7.17	22	3.22	387	38.47	711	12.58

Table 20 Summary of results of Twitter user familiarity scoring exercise

The table shows the numbers of Twitter users from each familiarity category for each event, both as a total and as a percentage of the overall total of users. This enabled comparison of the events. It also shows the total number of Tweets created by users from each familiarity category as a total and proportion of the event total. These stats indicated that:

1. Both events attracted Tweets from a high proportion of *totally unknown* Twitter users (44% Maker Faire, 69% MuseoMix).
2. The Maker Faire attracted a smaller proportion of *unfamiliar* users than MuseoMix.
3. The Maker Faire also saw a greater proportion Tweet activity from *familiar* users than MuseoMix.
4. Both events saw *very familiar* users create a disproportionate number of Tweets (38% of Tweets from 7% of *very familiar* users for the Maker Faire, 13% of Tweets from 3% of *very familiar* users for MuseoMix).

This table was evaluated by museum staff, and the validity of these indications are discussed in the soft-system evaluation section.

Once the Development set of Tweets had been used to create the two rule-bases, the rules were applied directly to the testing set, which had been scored by the museum staff separately, without the researcher's input. Table 21 shows the results of running this test set through the FLC and comparing its output with the museum staff's scores.

Output	**Reach**				**Community Strength**			
	Pass		**Fail**		**Pass**		**Fail**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**
Very Low	54	94.74	3	5.26	35	59.32	24	40.68
Low	41	45.05	50	54.95	1	33.33	2	66.67
Medium	15	33.33	30	66.67	16	44.44	20	55.56
High	2	28.57	5	71.43	27	26.47	75	73.53
Total	112	56	88	44	79	39.5	121	60.5

Table 21 Summary of evaluation of ARC3 prototype performance against scored testing data set

In both instances, performance fell off when evaluating outcomes that the museum staff had annotated "high" quite considerably (in the case of reach, performance fell from a 94% success rate of correctly evaluating Very Low reach, to only 28% of evaluating High reach, for example). This was due to the random process used to select the development and testing sets: as higher scoring Tweets were rarer in the dataset as a whole. Selecting development and testing sets randomly did not allow enough of these types of Tweets to be scored to allow effective design of the rules required to cope with Tweets from these rarer categories.

Another pertinent exercise was a comparison between the development and testing sets, shown in Table 22. During the development data scoring sessions with the researcher present, the museum staff rated over twice as many Tweets as exhibiting high or very high reach as they did when independently annotating Tweets in the testing set (20 when working with the researcher, 7 when working alone). Conversely, they rated less than half as many Tweets as showing high community strength when working with the researcher as they did when working alone (41 versus 102). This may have been due to:

- Differences in the two datasets caused by differences between the events themselves and their audiences.
- A tendency to annotate the Tweets differently when not in the presence of the researcher.

Output	Reach		Community Strength	
	Development	Testing	Development	Testing
Very Low	76	57	102	59
Low	83	91	38	3
Medium	21	45	19	36
High	18	7	41	102
Very High	2	0	0	0

Table 22 Comparison of scores in development and testing data sets

The first of these two possibilities was partially ruled out by applying the rules to the entirety of both datasets and comparing the results (obviously after normalising them due to the MuseoMix set being five times larger). This is discussed more below. The second possibility, however, was supported by the researcher's observation that the overall process of trying to transform thinking about often complicated nuanced concepts such as the nature of relationships with visitors, or the processes of conversing with them via Twitter, into sets of rules based upon Twitter's functionality

and metrics, was extremely complex. This complexity indicates that, similarly to the statistics developed during ARC2, the data is unlikely to have been approached in a reliable way. This is discussed further in the chapter Conclusion and in Chapters 8 and 9.

The two sets of rules for evaluating reach and community strength were then applied to the entirety of both the Maker Faire and MuseoMix datasets and the results for the two events were compared. Unlike the other (Development and Testing) datasets, where expected outcomes had been scored by the museum staff and researcher, then used to compare against the output of the FLC, the results of scoring all the data were obtained by aggregating all the Tweets in each dataset around their output values for reach and community strength using a Neo4J Cypher query with an aggregation function applied.

Figure 18 shows a comparison of the proportions of Tweets scoring differing amounts for *reach*, as percentages of the total figure for each event. The light red bars show Tweet proportions for Maker Faire, the green bars are totals of Tweets from MuseoMix. The X Axis shows the reach scores from low to high. There are peaks near the centres of *very low* (10) and *low* (25), and some smaller peaks near *medium* (50) and *high* (75). MuseoMix also shows a small peak of Tweets with *very high* reach (4.69%, or 265 of 5652 Tweets), though there were a negligible amount for Maker Faire. The bar chart also shows some significant peaks between *very low* and *low* (around a score of 17) and two more peaks between *low* and *medium*. There are also smaller numbers of Tweets across the whole range (from MuseoMix especially). A continuous range of outputs of this sort, with bars in-between the major output variable locations providing a more nuanced spectrum of outputs, is exactly what one would expect from a FLC system that outputs continuous variables.

When comparing the two events, the overall trend was that MuseoMix had a wider reach – its biggest peak was at *low* compared to big peaks at *very low* and between *very low* and *low* for the Maker Faire. There were also more peaks at the higher end for MuseoMix. As an international event, not involving so many of the museum's core community, one would expect reach for MuseoMix to be higher, and this output matched this expectation.

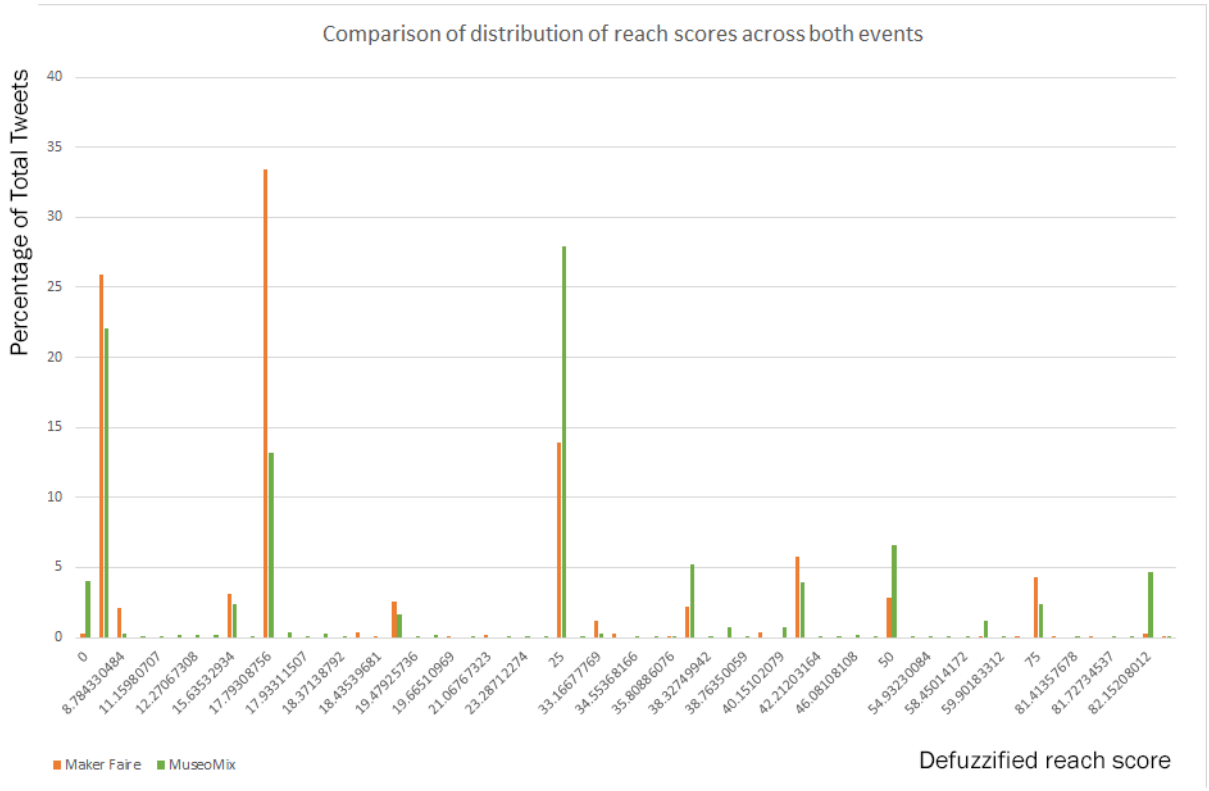

Figure 18 Comparison of reach scores of Derby Mini Maker Faire 2014 and MuseoMix 2014

Figure 19 shows the proportions of Tweets scoring different amounts for community strength. The range of outputs was much lower than with reach, due to the much more straightforward logic and the smaller number of rules. Surprisingly, community strength was also higher for MuseoMix than it was for the Maker Faire, however.

There was a reason for the lower evidence of community strength in the Maker Faire set, however – it was due to the rule that Tweets from *very familiar* users (i.e. museum workers) were considered *very low* in terms of community strength, and a high proportion of the overall Tweets for Maker Faire (387, or 38.4%) were created by these *very familiar* users. Fundamentally, the modelling of this familiarity variable and its related logic, while seeming appropriate when assessing reach, was not as appropriate for community strength. Indeed, it appears there were broader issues related to the notion of "community strength" as a whole (see the soft system evaluation below and also Chapter 8 Section 8.4.2, and Chapter 9 Section 9.3.2).

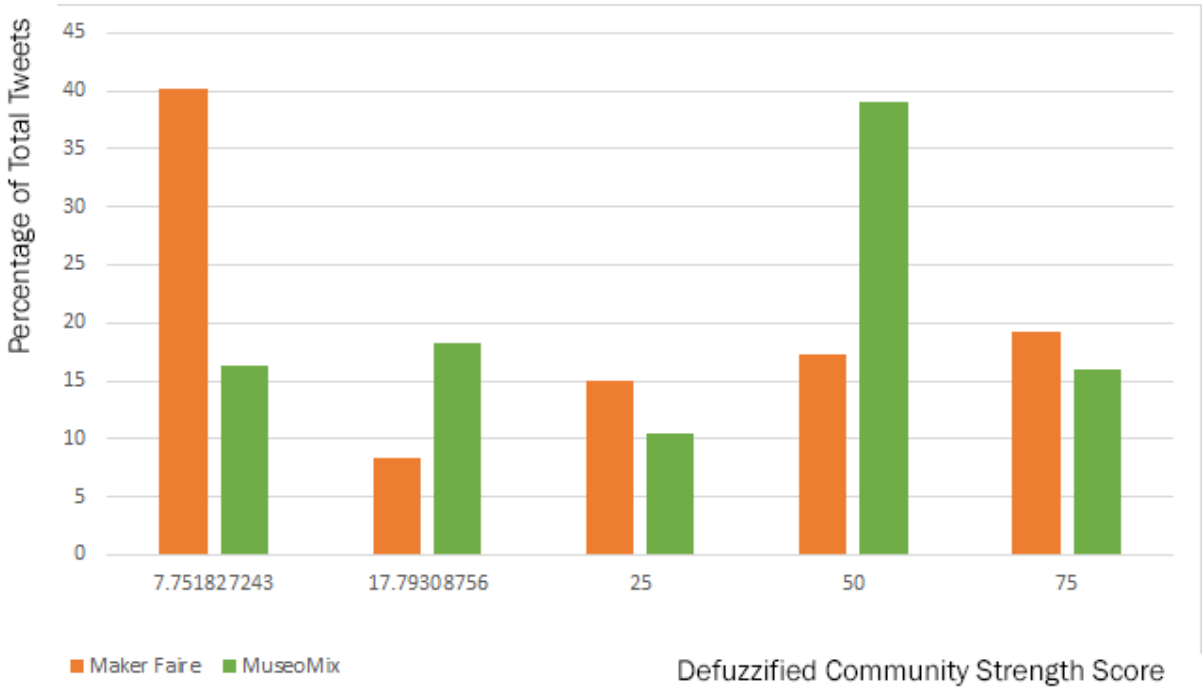

Figure 19 Comparison of Community Strength scores between Derby Mini Maker Faire 2014 and MuseoMix 2014

7.5.2 Evaluation of the soft system

The first aspect of the soft-system to be evaluated was the Rich Picture (see Section 7.2.4). Concerns remained among the museum staff regarding the term 'participant' (used in the second innermost ring) and 'visitor' (the third innermost ring). As discussed in Chapter 6, the distinction between these terms was problematic due to the museum staff preferring all visitors to 'participate'. ARC3's new Rich Picture provided an opportunity to consider this further, concluding that:

- 'Participant' might be better defined as 'participant in some co-productive activity' such as exhibition design. (MuseoMix, for example, was based on the production of prototype exhibits).

The term 'co-producer' or 'collaborator' might therefore have been more appropriate to Derby Museums' problem situation, particularly given that the *familiar* category used for scoring was defined using the term: "someone you work with".

Evaluation continued by considering how information from the prototype might be used. This focused in particular upon the bar chart that enabled comparison of the reaches of the two different

events (Figure 18). Overall, the information that MuseoMix had a broader reach than Maker Faire tallied with the museum staff's expectations. Maker Faire had been organised by Derby Museums for the previous three years, and the Silk Mill was used as a venue by Derby Makers, hence it was a more local event. Examination of the Tweet data underpinning MuseoMix's higher reach also clarified that many of the Tweets for this event that scored highly for reach had been produced by a small number of users with high numbers of followers. This made sense to the museum staff – if an event had collaborators or keen visitors with high follower numbers, who Tweeted extensively from the event, then the chances improved of a wider Twitter audience tracking the event. Confidence in the staff that reach had been well modelled and the rules were sensible (at least for a prototype) was therefore high. However, this statement is made with the proviso (once again) that the staff were generally susceptible to confirmation bias – despite warnings regarding the potential unreliability of the statistics and reconfirming that the system that produced these statistics was an early phase prototype, the staff still considered them to be a fair representation of what they thought had occurred at the two events.

Furthermore, they outlined several potential uses for the information about an event's reach. One related to a similar concept to one that emerged from ARC2, namely that a 'reach target' for an event could be established during planning – i.e. a specific target 'shape' to the output bar chart could be set, and the actual reach compared with it after the event. Unlike ARC2, however, where the 'head, heart and hands' balance would be directly applicable to the content of the event / exhibition, setting a target reach would be more applicable to how an event was marketed or promoted (e.g. locally, regionally, nationally or internationally).

As discussed in the hard system evaluation, community strength was a more problematic variable. One aspect of 'the museum's community' concerned how 'levels of familiarity with people in the museum's social network' would need to mean 'familiarity to the *whole museum*': whereas for the prototype, familiarity was scored by the two collaborating staff members only.

The biggest issue emerging from considering ARC3's soft systems was (like the previous ARCs) the unreliability of the statistics, however. To an extent, this is to be expected in a prototyping exercise, however the following exchange, about the level of enjoyability of the familiarity scoring exercise upon which the system depended, indicated that this issue was more fundamental:

> *HoM – It was alright, actually. I didn't mind it. You know I said I was sort of looking to enjoy it. Well I sort of did.*
>
> *Res – So what was enjoyable about it?*

HoM – Erm… Well, er, well it was, it was… so… because we were doing it together, if we had done it separately, it would have been boring as hell. But actually we made it interesting by laughing about it, didn't… didn't we?

SMC – Uhuh.

Res – Was it kind of bouncing off what you knew about the people?

HoM: Yeah. And, so we might have said… you know, we might of, sort of said: "who is that person? And what do they say?" You know… And so we made it fun. If you see what I mean? And then we looked some of them up, when we were… So we were doing it on… with WiFi, and checking them against… against who they really were, and whether we did know them or not. And sometimes we'd go "yeah I know them!" And then you'd look at them and go "actually, no."

Res – "They're not who I thought they were…"

HoM – So that was, it was sort of, erm, it was just easy to do, really.

SMC – No, no it was fine.

HoM – It wasn't tortuous.

SMC – No, no… Once you got into a rhythm, it was fine.

HoM – Yeah, so we were sort of… understanding… so for example, once… somebody might have been a Maker. Once we knew who the Maker was, we… they… we'd go "Oh that's a Maker. We know what they are." So we got faster. We speeded up. We got into that rhythm of, of understanding and knowing what, erm, what people were and where they… how they sort of fitted together (Workshop W7).

This exchange indicates that a process of 'familiarity scoring' would need to be substantially more robust than that conducted for the ARC3 prototype: the staff admitted to occasions where they had noticed that assumptions about the identities behind Twitter accounts had been incorrect. The suggestion that 'getting into a rhythm' enabled the process to speed up also indicates a potential fluctuation in the amount of attention paid to the exercise. When combined with the overall imperfections of the 'familiarity scoring' rubric (discussed in Section 7.4.1), there are considerable

questions regarding whether such an exercise could ever be reliable enough. This is discussed more in Chapter 8.

One further learning point that emerged from ARC3 concerned the concept of 'expertise' in Social Media. Approaches to KE build upon the assumption that there is an expert available to elicit knowledge from. Even when a problem is not well understood, there is an assumption that the expert has enough past experience of dealing with similar problems that there is value in recording how they approach it (Shadbolt and Smart, 2015; Gavrilova and Andreeva, 2012). During ARC3, however, the museum staff and the researcher were learning about how Twitter worked as part of the research. The MCDA Literature provides some methodological guidance about gaps or a shortfall in expert knowledge, however. Yu and Chen (2010) hypothesise about 'expanding the habitual domain' of experts by noting how the 'competence set' of their knowledge increases as experts learn, and further suggest a model for evaluating how the increase in knowledge might improve the accuracy of their decisions. Similarly, Aissi and Roy (2010) also discuss the robustness of decisions made using MCDA techniques; proposing a model for assessing the gap between the formal representation and the real-life context of an MCDA system. Both of these approaches might provide some insight into the problem of maintaining a degree of expertise about a subject (such as Social Media) which is as yet unstable and susceptible to constant change. (See also the Discussion of Social Mediation in Chapter 9).

7.6 Conclusion of ARC3

During ARC3, the researcher helped the museum staff to score Tweets relative to each other based upon their mutual understanding of Twitter data that was captured in relation to their events. The efficacy of this process was, however, inhibited by factors such as:

- The overall difficulty inherent in applying scores to complex, nuanced concepts such as relationships with and conversations between people.
- An epistemological flaw in the Twitter API concerned with the meaning / concept attached to a key variable (RetweetCount) changing according to context.
- Flaws in the rules developed, in particular relating to the difficulty of conceiving the differences between real and virtual communities, and the impact this had upon the concept of community strength.

- Gaps in the knowledge regarding Twitter and its data in both the researcher and the museum staff.

So, as per Gavrilova and Andreeva's definition (2010), ARC3 resulted as much in knowledge *creation* as it did knowledge elicitation. However, one of the core purposes of this research (which was a feasibility study, essentially) was to uncover such issues and learn from them by prototyping. The research also uncovered literature that suggests ways in which the uncertainty of the researcher and experts could have been incorporated into the evaluation of the Tweets. The epistemological flaw with the Twitter API, however, was of greater concern, as it is part of a piece of production software that has a great many users.

Of the two output variables, reach was better modelled than community strength. This resulted in a bigger rule base, and also better results, for reach. There are two related conclusions regarding the poorer understanding of community strength:

1. The discussion of 'community strength' centred upon ideas of 'who was talking to who' in relation to the museum and the museum staff's level of familiarity with those people. This data might definitely provide a valuable indicator of *something*, (e.g. a conversational 'buzz' of some sort), but community strength did not seem to be a productive way of describing it.
2. Community in relation to culture is defined by Waterton and Smith (2010) as the community that builds around ideas and concepts. Twitter partially facilitates the gathering of some of the data that could potentially be used to evaluate this, but also has flaws in its design that prevent particular evidence of engagement (e.g. the list of Tweets in a particular conversation) being collected easily.

Reach, on the other hand, was a variable that potentially mapped more effectively onto Twitter data. Reach was, after all, a variable that was available via Twitter's own analytics tool, though it was modelled differently there than here, as the definition produced here incorporated the idea of familiarity (see below). Reach was, however, susceptible to the subjectivity of museum staff: "high reach" for Derby Museum would likely be scored differently to "high reach" for The Getty, for instance.

The finding with the most potential value, but the biggest set of related issue, to emerge from ARC3 concerned the task of 'scoring familiarity' with people that interacted with the two events. Despite this being an arduous task (905 Twitter users needed to be scored), the two members of museum staff reported that they felt this had been useful and even enjoyable, as it enabled them to take

stock of their Social Media relationships in a manner they considered meaningful and productive. Exactly how 'meaningful' this exercise may have been, however, is open to debate. The potential information that could be gleaned merely by undertaking this exercise (such as a comparing counts of users that had Tweeted about each event to assess which event had more impact with familiar or unfamiliar users) was of immediate interest and value to the museum (before such data was even run through the FLC), but it is precisely this level of potential value that indicates some thought would need to be given to the following questions before something like ARC3's prototype could ever be used, specifically, how might data about familiarity with audience members be captured in ways that:

1. Ensured all members of museum staff had input into the system?
2. Catered for the various ways people use accounts on Social Media platforms?
    a. Twitter in particular enables anonymous use, and for people to Tweet on behalf of organisations.
3. Encouraged more serious reflection upon how well known the person / organisation in question might be?
    a. In particular, a method for ascertaining the reliability / level of consensus on the scoring would need to be employed and maintained, before statistics based upon familiarity could be used safely.

The above concerns point towards the need to use a much more comprehensive system to record interactions between museum staff and visitors; interactions that occur through *all* open channels, e.g. actual visits, purchases from shops and cafes, telephone conversations, comments left on websites and so on, as well as Social Media interactions. This could potentially result in a much richer data set, contributed to by many more museum staff, and from a set such as this, it *might* be possible to approach a concept such as 'familiarity with the audience' more reliably than only looking at one set of interactions, with a small set of staff, through one channel.

8 LEARNING POINTS FROM THE ACTION RESEARCH CYCLES

This chapter generalises the learning points from the three Action Research Cycles (ARCs). It relates most closely to Objective 4 from the research Aims and Objectives (stated in Chapter 1):

> *To work with museum staff to evaluate the visitor information, potential expressions of inspiration and information about the impact of their events upon their audiences captured by the prototype systems developed to fulfil Objective 3. This information is to be evaluated primarily in terms of its relevance to the work of museum staff.*

The concept of inspiration is the foundation upon which all the learning was based, and hence will be summarised first. The chapter then considers the topic of *positive confirmation bias*, a behaviour that was not only observed on the part of the museum staff, but which (given the positive feelings about both museums and technology that motivated him to carry out this work) was also a factor in the researcher's own approach.

However, the following general themes also emerged regarding the use of Social Media, and information based upon Social Media data, in museums:

1. **Strategic use of Social Media:** this research provided a unique perspective on the relationship between museums and Social Media technology, and uncovered ways in which information based on Social Media data might potentially help develop museum strategy.
2. **Audience engagement and development**: how museums and their stakeholders (e.g. funders) might use information based on Social Media data to indicate that they may have inspired their visitors, reflect upon and learn from these indications, and plan their activities accordingly.
3. **Mediation:** the ways in which Social Media platforms affect meaning; in other words, how they mediate the processes of deriving information from Social Media data, and making meaning with that information.

The chapter brings together the *Specifying Learning* AR phases of the three ARCs, and was further supported by holding a day-long Evaluation Workshop (EW) on the 14th July 2015 with two members of Derby Museums' staff, during which information from the three ARC prototypes were reviewed alongside each other, and the processes that had been undertaken to develop the prototypes (e.g.

annotation and scoring exercises) were reflected upon. A further (post Viva) follow-up interview focusing on the topics of subjectivity, bias and reflexivity in museum evaluation work was also conducted with Derby's Head of Museums in support of this chapter. The researcher's own reflections upon the ARCs, the EW, and the museum processes that might be supported by information based upon Social Media data were given some structure by considering the *Processes of Organisational Meanings* (POM) model from the Soft Systems Methodology, introduced in Chapter 3 Section 3.3.2. These structured reflections are listed in Appendix 4.

When trying to draw more general conclusions for the wider museum sector when reading this chapter, it is useful to consider the work Derby Museums have conducted to make their visitors, and in particular the wellbeing of their visitors, the central pillar of their strategy. The reader may therefore find that the following documents provide useful context:

- Their Human Centred Design handbook (Derby Museums, 2014A).
- The Executive Summary of their successful bid for Heritage Lottery Funding (Derby Museums, 2014B).
- Their Digital Engagement Strategy (Rippleffect, 2010).
- Their Business Plan (Derby Museums, 2012).

8.1 How and why the definition of inspiration changed throughout the research

The four key iterations of the definition of inspiration that evolved throughout this research are summarised in Table 23. The primary piece of new knowledge related to the definition is the increase in emphasis upon creativity, which was not even a feature of the initial definition. Encouraging creativity among visitors and audience members, it transpired, was of particular relevance to museums.

The EW began with an initial check of this final version of the definition with the Head of Museums (HoM) and Social Media Coordinator (SMC):

> *Res – Just double check any thoughts you might have about that. Is there anything controversial, in the definition? Or does it sound like a good platform for it? Or is it missing anything?*

HoM – No it sounds right. You know we often talk about how we inspire people to do something differently, and that might be something that they do personally differently, that nobody notices but them. Or it might be something that they do that's public, differently, that other people notice.

Res – OK.

SMC – Ummm. I agree (Workshop EW).

That inspiration might be cyclical process between emotion and cognition was also noted during the Literature Review, particularly when considering Gross's emotion regulation framework (1998), but the implications of such non-linearity to museums, and the ways in which relationships between museums and their visitors might strengthen over time, did not become fully evident until ARCs 2 and 3.

Iteration	Definition	Point during research when defined
1	An experience containing a balance of rational thought and emotion.	End of Literature Review
2	An experience, or set of experiences, containing a balance of rational thought and emotion, resulting in the production and expression of fresh ideas.	End of further consultation with museum professionals
3	A cyclical, mutually supporting combination of cognitive thought, emotion and creativity, caused by an experience or series of experiences, and leading to the expression, enactment and further adaptation of fresh ideas.	Conclusion of ARC2
4	A cyclical, mutually supporting combination of emotion, cognitive thought and creativity, caused by an experience or series of experiences, and leading to the expression, enactment and further adaptation of fresh ideas.	Conclusion of Evaluation Workshop

Table 23 Evolution of the inspiration definition

The staff also described how they perceived the relationship between emotion and cognition, as stated in the definition of inspiration, and begins with the HoM reflecting about the Tweets he had seen regarding the museum's recently-relaunched Nature Gallery:

> *HoM – So OK… If we were to do this for 'nature' and the DMNature tweets, the tweets where people were engaging around that… um… we would get, I suspect, a completely different picture.*
>
> *Res – Yeah.*
>
> *HoM - Because what we're doing with nature is we're trying to emotionally… er engage with people so that they think differently. And eventually do things differently, but not necessarily get them doing things differently immediately.*
>
> *Res – Yes.*
>
> *HoM - That will be later. So it's mainly about emotions and about learning, and understanding something differently. So it would be a different picture. So it would be really interesting to compare those… the different things that we do as to where we are with the head, heart and hands? (Workshop EW)*

Note how reference is made to the 'head, heart and hands' concept that the museum already structured a lot of their thinking, planning and development work with (first introduced in Chapter 6 and discussed more below and in Chapter 9). With relationship to creativity, the staff referred to a recent conversation about trying to avoid clichés of creativity:

> *HoM – So we were discussing recently what creativity was, and how creativity is about how you take the evidence around you and you come up with something new. And that could be in any walk of life. So we were having the discussion with [the Museum's Finance Director]… um, you know, he's an accountant.*
>
> *Res – A creative accountant…*
>
> *SMC – He is!*
>
> *HoM – It's about how he looks at, erm…*

SMC – Himself….

HoM - … the top and bottom line of the organisation, and how he can change those, and improve the picture for us as a business. And he might do that by an event, or by the way he publicises something…

SMC – Shop items.

HoM – Yeah….

Res – Or taking on a new supplier?

HoM – Yeah. And that can be just as creative as painting a painting.

SMC – Yeah but when we asked him the question 'do you think you're creative'…

HoM - He was right down the bottom of the scale.

SMC - He thought he wasn't – but that's a different interpretation of creativity, and how people interpret what creativity is. We helped him reinterpret what creativity actually is.

Res – That's back to that point again, that we've had this crappy idea of what it is beaten into our heads.

HoM – And… and maybe… erm… it would be useful to show, in your creative behaviour… a… somewhere in-between? Rather than something that is about art and painting, what about something that's not ? And maybe that would… that's a useful thing to do… To think that, so that we're… 'cos we're thinking about creativity in… in lots of different ways. You know… So Rolls Royce will argue that engineering is the biggest creative industry in the UK. Erm… where your local mechanical engineer will not necessarily think they're creative at all. (Workshop EW)

While this statement shows that the staff had been consciously thinking about the relationship between their museum's activities and the creativity of potential visitors, there appear to be several assumptions made in this exchange (by both the staff and the researcher) about the idea of creativity and how 'people such as the local mechanical engineer' might interpret it. It is also worth

noting the reference to Rolls Royce, which is the biggest firm in Derby and as such is a key organisation for Derby Museums to build relationships with.

The definition of inspiration arrived at here therefore portrays the relationship between emotion, cognition and creativity in a very similar fashion to Edmonds et al's description of creative engagement, namely in terms of *attractors*, *sustainers* and *relators* (2006: p307). This is shown in Figure 20, where emotion is the attractor, cognition the sustainer, and creativity the relator.

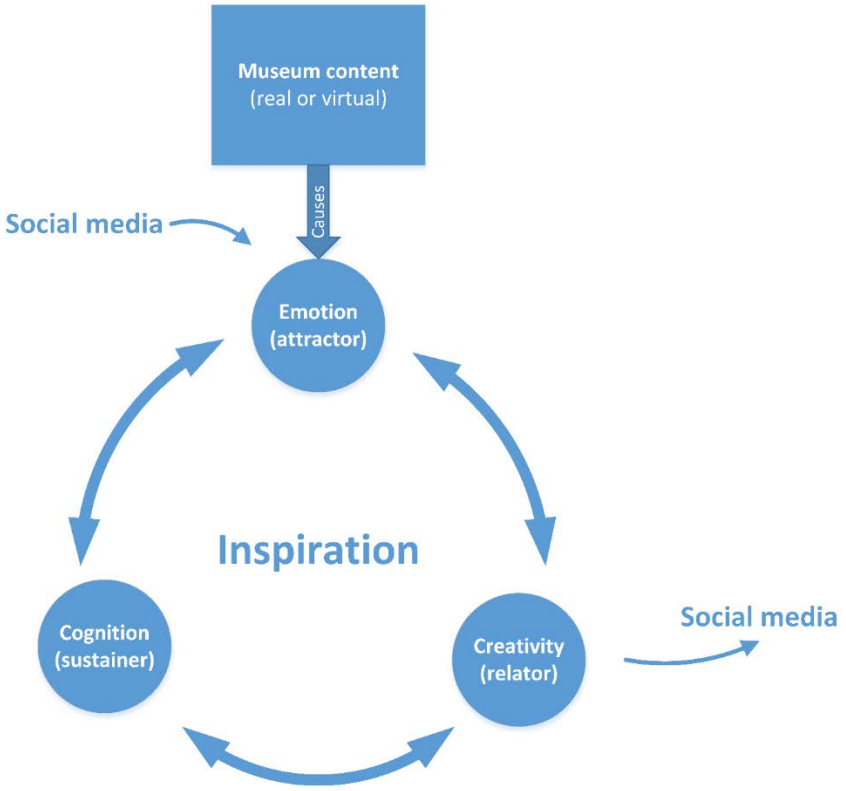

Figure 20 the inspiration definition mapped to "attractors, sustainers and relators", also highlighting relationship to Social Media content

This configuration of the definition of inspiration was supported by Derby Museum's policy of recruiting display developers from sectors like retail and graphic design, as discussed during ARC2's evaluation (Chapter 6, Section 6.5). These staff used their knowledge of how to *attract* and focus attention on objects by playing to visitors' emotions, by using dramatic lighting, for instance. The intention was then to *sustain* interest by posing questions, perhaps even by deliberately leaving information sketchy and vague, as described by Derby's Head of Museums:

It's about the importance of the object, and if we display the object really really well, people will look at it and go "that's lovely" or "that's really interesting" or "but what IS that?" So actually, we don't always need to tell them what it is, because most people have got one of these [gestures at smartphone] and they've got Google, and they'll go home and they'll look it up, or they'll go to the library and find out. We just give them a basic bit of information, but the first thing for them to do is to think "that's amazing – that's lovely – I want to know about that" (Workshop EW).

However, the *relator*, the aspect of inspiration which enables the relationship between the visitor and the museum, and its objects, to grow, is the visitor's creativity. In the model of inspiration defined here, actively synthesising the information that the museum has given them (or even better, inspired them to find out for themselves) into creative output of their own becomes the key to the bond that grows between the visitor and the museum.

8.2 Confirmation of positive bias towards museums and Social Media

Before continuing to look into the various museum activities that the Derby Museums staff thought Social Media data might contribute useful information towards, some observations regarding how both the museum staff *and* the researcher may have approached the use of data in their decision making should be made. The two exchanges below were recorded in a post-Viva follow-up interview with the HoM, which concerned the topics of subjectivity and bias in museum evaluation. With regard to subjectivity, the HoM stated:

HoM - OK. So, erm… If you've done something yourself, and then you try and evaluate whether it worked or not, you, in your head, always have all the back story of: "this worked because of this, this didn't work because of that, or that's not quite what I wanted." So sometimes that,… you would give a better, erm, … You would paint a better picture, knowing the back story, and sometimes you would paint a worse picture , knowing the back story. So sometimes it has a beneficial effect on the evaluation, and sometimes it would have a detrimental effect (Interview I7).

The reference to a subjective "back story" of "what worked and what didn't" is an indication that the HoM might have approached evaluation with a strong idea of what he expected to find, and he also seems aware of the effect that this could have ("sometimes detrimental to the quality of the evaluation, sometimes not"). The idea that having such a bias might sometimes help (or at least not hinder) an evaluation, while at other times definitely hindering it, is supported by Oswald and Grosjean (2004:82), who describe how a "positive testing strategy" (i.e. looking for results that confirm a hypothesis) can *sometimes* be a practical, efficient approach, depending upon the nature of the hypothesis in question. However, there are other times (in particular, if the data that is used to prove the hypothesis is actually evidence of a more general phenomenon occurring) where positively testing for a specific theory may result is an erroneous conclusion.

The idea that the HoM might be (very possibly unintentionally) seeking to confirm bias when evaluating his work is further suggested by the following statement from the same interview:

> *HoM - I know, where we didn't quite do something that we wanted to, or it didn't turn out quite how we envisaged it. And in those instances, we would maybe, um, mark it down slightly, if you see what I mean. We'd give it a, if we were scoring it, we'd give it a lower score. Um, or we would describe it in terms, you know, that's not quite what we wanted. Um… But your average visitor would probably say "oh yeah that looks fine ". They wouldn't think about it in the same way as us. So it's so… we have… when we're looking at it, we have a prejudice, because of our preconception of what we thought it should be like. Um…. And in most instances, you know, the exhibition produces a relatively good quality, and so people don't necessarily, they don't necessarily, you know, they might say things like, you know: 'I didn't understand what that meant, or why that was in the exhibition', and sometimes that, um, and sometimes, well normally, you can see why they've said it (Interview I7).*

Here the HoM is stating clearly that he would "mark an evaluation down" based purely on his own subjective view of how close to his own vision the exhibition had turned out. In other words, it appears that there is a conflation between the HoM's personal reflection upon the development of a particular exhibition, and the formal evaluation of that exhibition from an audience's perspective. The final statement regarding how "normally you can see why" an audience member has raised an issue with the exhibition further indicates that the HoM may have been looking to positively confirm hypotheses he already held regarding a given exhibition from the audience's reaction to it, and is

neither seeking to test alternative hypotheses, not looking for data to refute his hypothesis (i.e.: taking a negative testing approach).

This is particularly important to consider given the following two quotes (again from the HoM) regarding the potential for Social Media to make a positive contribution to the museum. The first concerns how he thought Social Media data might be used to provide the museum with insight they may not have previously had:

> *HoM – For me then, it's looking at, at… you know… We use Social Media a lot… erm… and… erm… We're getting better at using it… And we're communicating better with our audiences through Social Media. But we're still… I don't think we've still quite reached the peak of what is possible… The potential of Social Media is huge. And, we need to… erm… understand it better in order to use it better. And we need to understand how it affects our audiences and how our audiences are using it. And that, for me, is… is really important. It's also important to be able to prove that what we're doing, not on Social Media necessarily, is having an effect. And actually Social Media can be part of the tool to tell us that. Where, you know, something that I was trying to talk about last night, and you [the SMC] were going: "well you can't do that"… But actually, Social Media is maybe the only way that you can, which is: if… if… um… somebody comes and does something in your… in your venue, if he does something with you… and you inspire them to do something differently – and off they go, inspired, and they become, I don't know, they do something differently, they might, they might still be saying "I do that because of…" But you, you wouldn't know that, if they just went off and did it. And actually they might be doing it and Tweeting about it, and telling people on Social Media about it, that actually it was because of you (Workshop EW).*

This indicates a general positive outlook about Social Media: that the museum not only uses it a lot, but that they are "getting better at using it", and that they "haven't reached the peak of what's possible". It also indicates the potential to use Social Media to find specifically positive, confirmatory evidence of museum performance: audience members "going off, inspired" and changing their behaviour because of the museum. This shows a tendency to frame the museum's effect in an entirely positive way, which is echoed in this statement, from the same point in the interview, regarding the potential to "measure for" the positive outcomes that a museum may have had:

HoM – Yeah, it's about how you… erm… How you can measure for that. How you can record that, and how you can actually then produce it in something that's useful. So… We know that museums have a… can have a life-changing effect on people's lives. Museums change lives, is The Museums Association thing [i.e. a formal UKMA campaign]. But… we only know that 'cos we're guessing, really. We don't actually have any proof for it. And Social Media is… because people say things on Social Media that… they're relaxed, they say things in a… erm… In their own words, in a, you know, simple way, it's not like filling out a questionnaire or… er… because some people won't do that. It's a different… They're different people who use Social Media than who fill out a questionnaire. And actually people are being more honest or they're being more personal, on Twitter. They're being social. They're not filling out a form. So the feedback you get is more honest, and more… has a wider breadth, as well (Workshop EW).

Of course, it is unfair to single the HoM out for approaching both museum work and Social Media data from the positive angle suggested by these quotes, given the research overall concerned the nature of inspiration and the benefits of museums. The research itself would have framed the role of museums in ways that would have contributed to such positive thinking. This is covered in the Discussion (Chapter 9). It is also important, while seeing this statement as a clear indication of the HoM's positive feelings towards both museums (changing lives) and Social Media (that feedback on Twitter is 'more honest') to note that the HoM seems at least partially aware of the pitfalls: "… we're guessing, really. We don't actually have any proof…" However, it is important to keep these two issues - a tendency to use data to confirm already-formed ideas, and an overall positivity towards both museums and Social Media – in focus throughout the rest of this Chapter.

It should also be noted that, during the evaluation of the F-Measure ARC2's prototype, the positive bias of the museum staff witnessed during the annotation was acknowledged and discussed. The researcher asked whether museums were ever criticised for evaluating their work too positively and optimistically, to which the Head of Museums replied:

HoM - Yes. The evaluation that we give of what we do, and what we see in our own buildings, is different than somebody else's… But if we as museum workers were to evaluate something in somebody else's museum, that might be quite interesting… some of that happens already with things like VAQAS [Visit England's Visitor Attraction Quality Assurance Scheme – (Visit England, 2015)] – that's done by a professional evaluator with a museum person who come together. So normally

> *there is a museum person who comes along with the evaluator…. There's always two ways of doing things, too – so if we were to evaluate [another museum] and [they] were to evaluate us, we might not like what they do, and they might not like what we do, because we do it differently. But that doesn't necessarily mean either of us are right or wrong (Workshop EW).*

This suggestion is reminiscent of the 'Peer Review Pilot' criticised by Graham (2009) due to the ways in which political issues between the reviewing organisations might have influenced the evaluation (see Literature Review Section 2.4.4). However, the idea that a mixture of independent evaluators and museum staff from different organisations might annotate golden data for a separate institution as a method of increasing the objectivity of the IR system was noted.

8.3 Social Media-related museum strategies

This section discusses the strategic uses of Social Media and information based upon Social Media data in museums. These strategic ideas emerged gradually throughout the three cycles of Action Research, but were discussed at length during the Evaluation Workshop. The three strategic ideas discussed concerned:

1. Helping to align the core aims and objectives of the museum with audiences: practically, this most concerns programming the museums activities to reflect the wider interests of the audience, but also includes working more closely with partners in cultural networks, and finding and maintaining sources of funding and sponsorship.
2. Integrating information from Social Media data into museums' planning *and also* their evaluation activities, alongside audience-related information from other sources.
3. The notion that the core uses of Social Media and information based upon Social Media data sit on a continuum between two related activities: engaging museums audiences, and developing museum audiences. These activities are covered in depth in Section 8.4.

8.3.1 Contributing Social Media information towards setting museum strategies

The Evaluation Workshop with Derby Museums' staff indicated several opportunities to contribute information based upon Social Media data towards strategic thinking. The first such opportunity would be to contribute information from Social Media to the process of aligning a museum's high level mission and core messages with its current and potential audiences. One such process that Derby Museums described was the setting of the museum's programme of events. Derby Museums' staff described the programme as a two-year schedule of key exhibitions, for which they had to anticipate the topics that might inspire audiences, but which also matched their collection; as stated by the Social Media Coordinator: "… the way we engage people with the collection is helped by the programme (Workshop EW)." The staff described needing as clear a picture of as possible of how to:

1. Match current and potential audience segments with items from the programme.
2. Track the things that inspire people in those segments, to find ways of promoting the programme's events (before and during).
3. Find promotional partners related to the events – doing so would also help them tap into potential audiences, as the existing audiences of those partners could also be assessed.

This picture would need to be maintained throughout the events so that the potential impact of the events upon the audience could be investigated.

The programme would also need to be balanced with even longer-term, and more fundamental strategic objectives. As an example of how they struck such a balance, Derby Museums referred to their 'head, heart and hands' model, which they were already thinking about using to consider their activities. For example:

1. An activity based upon their Joseph Wright collection might be angled towards the "head" (cognitive), by focusing upon Enlightenment philosophy, for instance.
2. Activities such as the MuseoMix hackathon studied during ARCs 2 and 3 were angled more towards the "hands" (creativity).

The staff described how these core strategic concepts might relate to the programme: e.g. an exhibition from the programme might have a set of 'head-based', and a set of 'hands-based' activities related to it. However, the staff also realised that such events needed to be informed by the *potential* audience (during planning) and the reactions of the *actual* audience (during evaluation). They thought that Social Media might be used to connect with audience members to

help enable such activities to occur, but they also thought that information based upon Social Media data could also be used to help conceive of the activities in the first place, and check that the intended "head, heart, hands" balance had occurred (and if not, indicate reasons why not).

Finally, information based upon Social Media data could also be used to line up events from the programme with wider events, both across a museum's cultural network, and with the audiences and customer-bases of potential funding partners. The former could be achieved by studying relevant segments among the audiences of cultural partners, and using this information to propose mutually-beneficial programme items (i.e. concurrent exhibitions on a broader theme). This concept of a "single-themed, multi-destination visit" underpinned The Grand Tour initiative that Derby Museums were part of when the research took place (Experience Nottinghamshire, 2015). Such activity with external partners related to the notion of a more 'porous' organisational boundary which Social Media helps contribute to, discussed in detail in Chapter 9 in relation to the update to the SSM POM Model (Section 9.5).

8.3.2 The cycle of planning and evaluation

One recurring consideration that surfaced throughout the discussions that took place with Derby Museums' staff was the idea of using audience data, and in particular data from Social Media, in the museums own daily planning and evaluation activities. The following exchange typifies how the staff started to think about the relationship between planning and evaluation:

> *HoM – What I'd like to see is a… this is a… What I'd like to see is us try something… erm… These are two events [Maker Faire and Museomix] which were about making, what if we were doing an event about… you know, like we had a Joseph Wright conference? That's not about making, that's about thinking, understanding and learning about something. And how would that go in comparison to this? And would we see a … You know. So then when we plan our events…*
>
> *Res – [Referring to clusters around Cognitive frames] – There would be more around these thinking ones?*
>
> *HoM – Well, I'd hope so, yeah. And maybe we plan our events so we have X number of our events do this each year, X number of events do that, and X number,*

you know… And X number of events combine in here somewhere. And that [refers to the prototype] would then show that the people who were Tweeting were more engaged in this way. Maybe? So that we're, we're not just missing one of these, so – those two events, MuseoMix and Maker Faire were about hands on creativity. So they're firmly down here in percentage-wise… They do a bit of the others, but… but that's, you know, maybe there are other projects that focus on these, but do a bit of that and a bit of the others too?

Res – So it's partly that you'd use that as a planning tool, maybe?

HoM – Maybe, yeah.

SMC – That's the aim, isn't it?

HoM – So that actually, then, you'd use this… so you'd use that as a planning tool – I'm going to do an event that does this, and you'd use that process to prove you'd done it? (Workshop EW)

The Soft System model for ARC1 (RD1.3.1 – see Figure 3 in Chapter 5) also illustrates this relationship between planning and evaluation. However, one key finding that emerged during ARC2 and the Evaluation Workshop came to light when considering the definition of inspiration. At first glance, any definition of inspiration would appear to only be of use for evaluation, because the definition stipulates a link between inspiration and experience: thus it seems as if the experiential event would have to be underway, or in the past, for inspiration to occur. However, the museum staff defined inspiration in relation to sets of events, building over time and repeat visits. These repeat visits could thus map onto planning / evaluation cycles of events related to the longer-running themes. The way in which they might relate planning to evaluation was thus described in the extra Soft System model created after the evaluation of ARC 2 (see Figure 14 in Chapter 6).

These types of activity also sit directly between audience engagement and audience development activities, i.e. the question "who did we inspire at the event we are evaluating" leads directly to the question "who else is there in the potential audience that we might be able to inspire next time?" See Section 8.4 for more about the matrix between planning, evaluation, audience development and engagement.

The reaction to currently running events also relates to agility – especially if the links between key themes of importance to the audience, and the collection itself, have been established and understood. Derby Museums encouraged this with their Nature Gallery redesign:

> *Res – Potentially, if it was a long-running event, you could even change how the event runs. Have you ever… Have you done that? Did you change the Nature Gallery based on feedback, once it was actually open? Is that how it worked?*
>
> *SMC – We didn't change once it was open. It developed as ideas came in through the… so we had Project Lab stages. So… I dunno. I mean it's kind of happened with the mascot, actually… The mascot's off the back of one of our Project Labs, somebody said it would be nice to have a mascot, and that's come out of that. So it has, yeah… That's more about the way that that… coproduction thing that we do, as an organisation [their Human Centred Design approach (Derby Museums, 2014A)].*
>
> *Res – So the point of launch isn't the end?*
>
> *SMC – No! No…*
>
> *HoM – And actually, what's quite interesting is how we feed… And we're doing it, I think, with Nature Gallery more than we've ever done, but we're feeding what comes out of Twitter into the… changing what we actually do.*
>
> *Res – So actually putting people's Tweets up in the Gallery next to the…*
>
> *HoM – We haven't necessarily done that, but it's, erm… but… if we ask a question on Twitter, and get an answer on Twitter, it effects then what we do in the space (Workshop EW).*

Due to the overall complexity of a 'system for attracting an audience to an event', which has the potential to be influenced in unexpected ways outside of the museum's control, any change that occurs would benefit from the inclusion of information about unexpected audience reactions. In the Agile mode, such unexpected situations should be considered as more in terms of 'opportunities' than 'failures', hence examining the 'delta' of change in audience state with the unexpected in mind is as much an important part of this Information System as trying to ascertain how close to the

planned change an event has struck. Encouraging a focus upon 'the unexpected' in this way relates directly to the issue of confirmation bias discussed in Section 8.2, that is to say, it embodies an negative testing strategy in which data is sought to refute a hypothesis.

8.4 Engagement and audience development

According to the HoM and SMC from Derby Museums, the key potential uses for information based upon Social Media data sat on a continuum between audience engagement and audience development. The following exchange describes the relationship between these concepts, and also the cycles of planning and evaluation discussed in the previous section: an exchange that led to the quadrant shown in Figure 21:

> *HoM – OK. I think five ideas [for uses of information based upon Social Media data] split into two things. One of them is about… erm… growing the audience and one is about engaging the audience. Don't you?*
>
> *Res – Yeah? Well… so where does… where does… erm… Planning, based on an audience… would that come under growing?*
>
> *HoM – It's coming under growing, I guess? But also it could… it could come between the two.*
>
> *Res – So there's planning events, or exhibitions…*
>
> *HoM – So, there's museum planning… Is a…*
>
> *Res – And then there's evaluation as well, is the other…*
>
> *HoM – Which is there – at the bottom (Workshop EW).*

Certain activities sit somewhere directly between engagement and audience development, for instance "assessing familiarity with audience members" is equally applicable to both – getting to know new people is "audience development", while strengthening existing relationships counts as "increasing engagement".

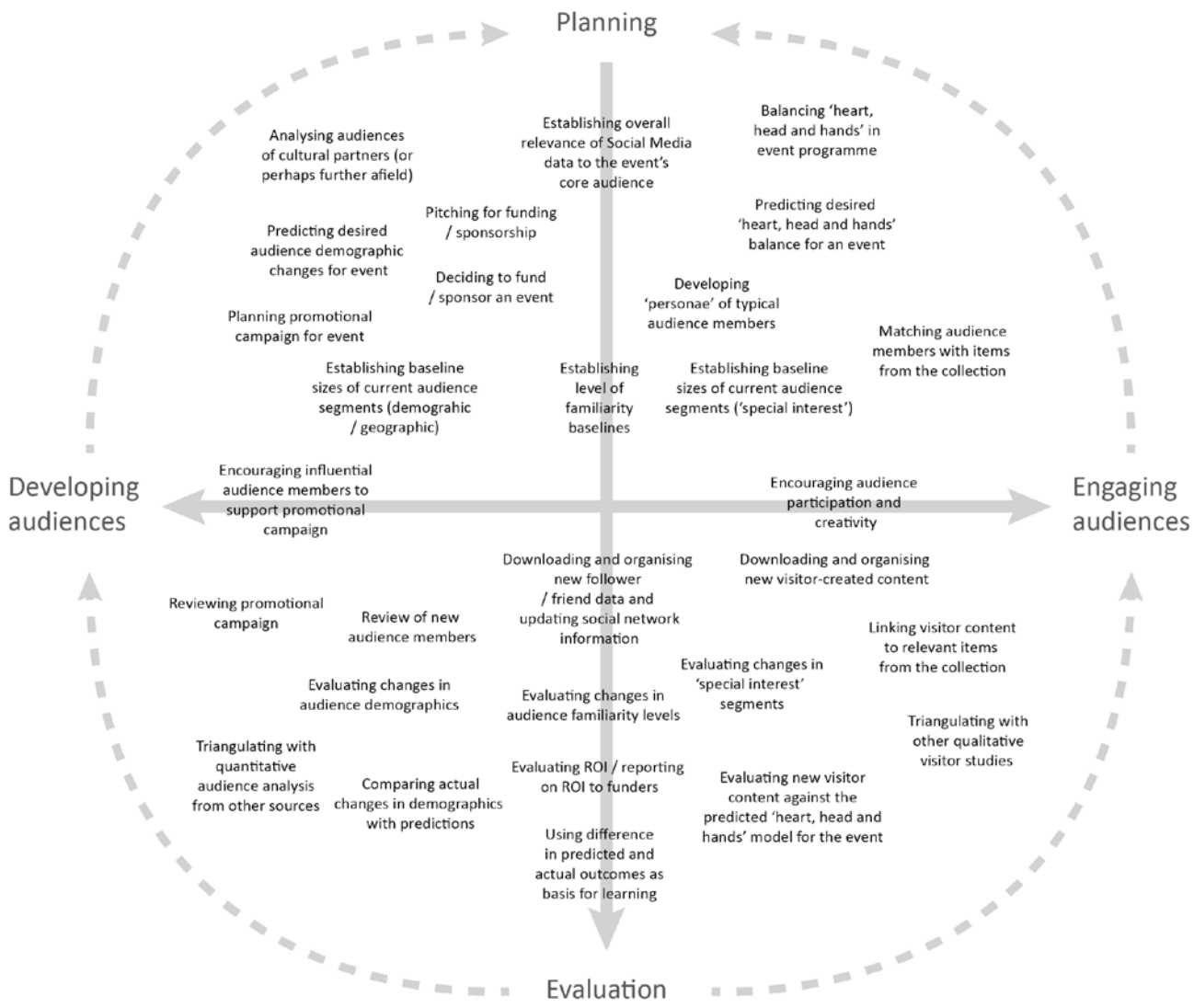

Figure 21 Quadrant diagram showing where on the continua of audience development - audience engagement and planning - evaluation various museum activities might occur

The potential importance to the museum of understanding *how* they knew people in their social network, and how well, came to the fore during the process of labelling "degree of familiarity" during ARC3. This process is, essentially, a step towards ascribing meaning to relationships with visitors, but one which *might* result in potential benefit, particularly in relation to the changes in levels of familiarity, which could provide an indicator of increases in "community strength", as described by the HoM:

> *HoM - … if we did this now, from when we did it before, there would be people where we'd go "yeah we know them more now, or we know them less", so some of these people… [have] sort of dropped off… Whereas [a specific Twitter user], he was in the museum ten days ago, we're planning a project with him, he's going to be a 'four' [I.e. a familiar user that the museum works directly with].*

In general, systems which store information about the relationships between organisations and their customers come under the catch-all term of Customer Relationship Management (CRM). However, in order to rely on a system of this sort, the problem of how to properly share the 'relationship familiarity knowledge base' with *all* members of museum staff would also need to be solved. A central CRM system might provide an opportunity to achieve this. (see Section 9.3.2 in the Discussion Chapter). More problematically, the issue of how to model 'familiarity with a visitor' in a manner that could allow data about their relationship with a museum to be used reliably and meaningfully would also have to be addressed (as the previous chapter concluded).

8.4.1 Supporting the point where curation and marketing meet

Structuring reflections upon Workshop EW around the POM Model led the researcher to consider the relationship between two important types of staff in museums: curators and marketing / promotions staff. One example of the type of process that might require collaboration between the two roles would be the accommodation (i.e. compromise) of: 'finding an appropriate level of detail for exhibition-related knowledge'. This process can be related directly to the discussion of authenticity in the Literature Review (Section 2.4). The requirements of a marketing expert might involve summarising information, often as a result of restrictions upon space imparted by the medium used to deliver the marketing message (Tweets' 140 character limit are a good example of this, as are the limited timespans of television or radio advertisements). A curator, however, might

be concerned if such restrictions encouraged the marketer, for brevity's sake, to make more concrete statements about an object than the available knowledge would allow.

In order to reduce any tensions that might occur as a result of making such an accommodation, the discourse between staff in these two roles might be guided by a formal process, such as Derby Museum's *Human Centred Design* process (Derby Museums, 2014A). The benefit of following such defined processes, and also of using Information Systems like those reviewed at the EW might be, potentially, to depersonalise the discourse: debates between staff members with conflicting views could thereby focus more upon the policy and / or related capta (i.e. filtered and hence more relevant data) and information from the Information System, and less upon the individual professional opinions of the participants, almost as if the visitor (and the information the museum knows about them) becomes the arbiter of any conflicting points of view. This is very similar to the ways in which the tensions between programmers and graphic designers can be relieved by referring to usability testing data, as described by Krug (2006).

Of course, the other key actor discussed with the Derby Museums staff with regard to content production was the visitor herself. As discussed in Section 8.1 above, the staff thought creativity key to the definition of inspiration as its importance to their museum had grown in line with the increased focus upon the potential wellbeing benefits of museums, and it helped distinguish the museum definition of 'inspiration' from the (very similar) marketing definition of 'engagement' (see the Discussion Chapter Section 9.1.3). The definition of inspiration appeared, however, slightly less relevant to audience development than to engagement; the greatest overlap with audience development is with the cognitive aspect of inspiration. As shown in ARC1, the Twitter 'biographies' of current and potential audience members could be clustered around concepts related to the themes of a planned exhibition. This could help search for potential collaborators upon museum exhibitions, as well as people to target with marketing.

8.4.2 When audiences become communities

Another key learning point, which tallied with an important set of the Literature reviewed, was the complexity inherent in the term *community*. Four distinct definitions of community emerged during the Action Taking and Evaluation phases of ARC3:

1. *Community* as defined in Derby Museum's Audience Planning documentation (Derby Museums, 2015A), which refers specifically to Black Minority Ethnic (BME) communities.
2. The core *visitor community*, described by the Head of Museums as people who:

   "…come into the museum every day and they're happy. And they like the museum. And they're all over it. They're not on Twitter, necessarily. But the museum for them is part of their lives. (Workshop EW)"

3. The *online community*, who engage with the museum virtually. This definition was (unsurprisingly) considered very important by the Social Media Coordinator.
4. The *communities of interest* that emerge around concepts, knowledge and ideas related to the museum. An example of this discussed at the EW was Derby Museum's "nature loving community" who were engaged with the Nature Gallery. This is the type of community most prone to being 'strengthened' by creative engagement with the museum.

This idea of increasing familiarity and 'strengthening community' also has a relationship with the findings of ARC2, in particular the Soft System model for RD2.3.3, (see Figure 17 in Chapter 6): the museum staff suggested that long-term changes in visitor behaviour, which indicated increases in creativity, would be a successful outcome for their museum. The issues related to the varied meanings of the term community are discussed in the Discussion, Section XXX.

The confusion about the term 'community' and this ambiguous term's relationship with Social Media, was felt most sharply during ARC3, when a variable intended to indicate 'community strength' was proposed. Unfortunately, this process failed to map successfully onto the structures of Twitter during prototyping, for two key reasons:

1. The confusion surrounding the term 'community' hampered both the elicitation of staff members' knowledge about Twitter and the development of rules about that knowledge.
2. Data relating to some of the key indicators regarding 'strengthening of community' that the museum staff were most interested in; in particular evidence of conversations about the museum spreading through the network, were very difficult to extract from Twitter due to the design of its API. See Section 8.4 below.

The categorisation process did, however, provide the museum staff with an opportunity to review and investigate their network of contacts in greater detail than they had done previously; an activity that (contrary to their initial expectations) they claimed to find rewarding and productive. There

were two flaws in this process, however, both of which were in part due to the exercise being prototypical:

1. The exercise only covered the relationships between the two staff helping with the research, so the focus was upon their networks and their knowledge exclusively. Derby Museums have a policy of encouraging Social Media use and the building of professional networks among their staff, so for the exercise to have worked completely, all staff with a Social Media presence would need to have been involved.
2. Discussions with the staff about the 'familiarity scoring' process revealed inconsistencies in the scoring process (see Chapter 7, section 7.5.2). This in turn indicated that overall process of assigning a 'score' to a situation as complex as a relationship with a visitor may not actually be possible. At the very least, such inconsistencies would need to be measured in some way, with a re-evaluation / reliability assessment process, before stats based upon changes in familiarity could be trusted.

8.4.3 Risks related to audience engagement and development

The key risk in relation to synthesising information about audience engagement from Social Media data uncovered by this research relates to the subjectivity of 'engagement', and raises issues concerning confirmation bias discussed in Section 8.2 above. However, a core risk uncovered by this research is that unavoidable bias can easily be 'buried' in layers of technology during exercises such as annotating content for training machine learning systems or preparing test reference sets to measure IR performance. This issue is considered in depth in the Discussion (Chapter 9).

Another key operational risks that emerged from discussing audience engagement and development related to scenarios in which museums might take too much interest in the private lives of their audience members. One occasion where this issue manifested itself in particular during the research related to the interest shown by Derby Museums' staff in the followers of other organisations in their cultural network (shown in Figure 6 in Chapter 5):

> *HoM – Actually, that group is one of the main… [Points at clusters of Twitter 'biographies' in the visualisation] This group's interesting, this group's interesting. This group is interesting because they are potential followers, and potential people*

to engage with. This is interesting because they're newish followers. They are being inspired to follow us.

Res – Yeah. So, having said that, there's a lot of people in this graph who aren't following you, really. They're all kind of over here. So these people in this cluster are following Derby Live and Derby Quad, but they're not following you…

HoM– So they're also potentials [I.e. potential, but not current, followers of the Derby Museums accounts].

SMC – Yeah.

HoM– But…

Res – And in a way, from what you were saying before there might be even more potential in these people, because you are cultural partners with the people they follow?

HoM – That's true. So who's this here?

Res – That is probably… That's the Silk Mill.

HoM – That's the Silk Mill, so the Silk Mill's connecting with a lot of those people, so it would be working out which ones, in there, are NOT connecting to the Silk Mill, or any of our things, but who are connected to one of our cultural partners. So they are potentials, too (Workshop EW).

Notwithstanding that the discussion above illustrates the ease at which the museum staff and the researcher fell into the trap of conflating "the text in Twitter biographies" with "the interests of real people", the discussion also led immediately to the following exchange, which illustrated the fine line between "taking an interest in one's current and potential audience" and "invading privacy", as discussed in boyd and Crawford (2013):

HoM – So those, those, those… er… and then having a look at those, we could then do that value judgement on those, and see which ones we should target, to try and get…

Res – But, would you then target them through the people you're following, though? If you actually went to…

HoM– We could…

Res – Or go to them directly?

HoM – But we could go to them directly, couldn't we..?

SMC – I think … yeah… depending on who they are. I think we just need to… I don't want to… I don't want to spam people.

HoM – No no.

SMC – Or… "why are you not following us?"

HoM – Or you could just occasionally tag them in a photo?

SMC – But you still need to think about the value of that (Workshop EW).

In the above exchange, Derby's Head of Museums and Social Media Coordinator discuss methods of approaching potential followers (i.e. ones not currently following any of Derby Museums' accounts) on Twitter, either via the cultural partner they *are* following, or directly. This illustrates how powerful a tool for 'finding useful people' an interactive graph visualisation might be. However, both staff members from Derby Museums were cautious regarding the potential to abuse that power by making 'spam' approaches to potential followers, even though a system like the prototype would have made it easy to do so. To have followed that temptation through may well have had the potential to damage the museum's reputation. One contrary argument to this, in relation to Twitter at least, is that the visitors in question have chosen to 'de-personalise' these aspects of their lives by putting the information into the public domain, but both the Derby Museums staff used the term 'stalking' (i.e. an illegal activity) when discussing such behaviour: while making such an approach would not be illegal per se, the staff clearly considered such behaviour morally dubious enough to equate it with an illegal act.

8.5 Social Mediation

The final main topic of discussion at the EW concerned the mediating effects that Twitter itself had upon the information that could be derived from Twitter data. One issue identified during ARC2 concerned how FrameNet might be practically applied to finding evidence of a complex psychological construct such as inspiration in Social Media. This question was addressed in part by considering whether an algorithm could be designed to fill slots in Frames from Tweet text automatically, and hence automate the inspiration-finding process. The Tweet below indicated how difficult this might be:

> *Brilliantly simple & effective #Engineering learning by @JWSYE at #DMMF14 @MakerFaireDERBY #STEM could take to @DerbyUK schools to inspire*

Both museum staff and the researcher agreed that this Tweet provided good evidence of inspiration. Furthermore, the researcher had managed to populate FE slots for the *Subjective_influence* Frame to which it was related. However, the syntax of this Tweet was idiosyncratic to the point that some debate occurred regarding its exact meaning, and it thus was is not completely clear, even for human annotators, how the FE slots might be filled using its text. That human beings contested the meaning of a Tweet such as this indicated that it would be *very* hard to get a computer to automate its analysis meaningfully when syntax is so idiosyncratic. This learning point potentially had severe negative implications concerned the overall suitability of Twitter for finding evidence of complex psychological constructs such as inspiration. The tendency of the clusters in the graph in-between Frames (see Figure 13 in Chapter 6) to contain false-positive Tweets was evidence of this: 140 character (or less) Tweets simply might not contain enough information to be linked to emotional, cognitive and creative Frames to enable a consistently high level of IR success. There was also a tendency, when the level of information dropped, for the analysts' biased mental models to 'fill in the gaps', often in a positive manner (as discussed in Section 8.2). The Twitter platform itself, however, seemed to encourage the masking of such ambiguity, for instance by referring to the 140 character-long descriptions of users as their 'biographies' (Twitter, 2015E), as if any human being could condense a description of their lives into 140 characters.

The 140 character constraint could also 'amplify' emotion. This was actually one of the things Derby's Social Media Coordinator *liked* about Twitter, as she appreciated the way it 'simplified' her appreciation of the audience reaction:

> *Res – There's only so much you can fit into 140 characters, as well. So what I think would be nice is to start getting blog content, or maybe longer format content from another platform? Or I don't know… I don't know… Maybe Facebook's the one, really, I mean you can… You can put longer messages in Facebook?*
>
> *SMC – You can put more content in it, but what's nice about this is, that they can summarise in those 140 characters quite nicely: "yay" or "urgh" (Workshop EW).*

Another instance of Twitter's mediation upon data manifested itself in the poor design of Twitter's API. Firstly, an issue came to light during ARC3 concerning the poor modelling around retweets, in which the meaning of the RetweetCount variable altered depending upon its context in a manner that was both bad practice epistemologically (Dubin, 1969) and bad computer coding practice (Martin, 2009). This was exacerbated by fragmented documentation on the subject. Secondly, Twitter's API design (specifically the inability to easily and consistently retrieve all replies to a Tweet, coupled with the dropping of hashtags from replies), meant that data perceived to be valuable and useful by the museum was not properly retrieved from Twitter. Both ARC2 and ARC3 were constrained by the inability to easily retrieve all conversation data from the Twitter API, because there is no API endpoint that allows a set of replies to a Tweet to be returned by using the Tweet ID. This may relate to the ways in which threads of conversation become fragmented in Twitter, a situation that was made more evident by the inclusion of a 'Show More' link to display entire threads of reply, introduced in 2015. This fragmentation of threads, linked to the speed at which Tweets can be posted, causes users to 'talk-over' each other, and brings into question how effective Twitter might be as a platform for achieving and recording engagement.

The Social Media platforms also mediate by constraining the types and volume of data that an organisation can download (as discussed in relation to the follower data downloaded for the ARC1 prototype in particular). This research focused on the use of Twitter data by small and medium-sized museums that did not generate large data volumes: downloading data at the volumes generated by major museums would have been impossible to achieve within the limits of Twitter's free API at the time; thus there is a risk that larger studies might not be able to afford access to all appropriate data.

Mediation was also evident in relation to the volume of non-textual information (mostly images) that the museum staff cited as good evidence of inspiration during the ARC2 annotation exercise.

This evidence fell completely outside the scope of the research, and is obviously beyond the capability of a Natural Language Processing system to analyse, hence the evidence gathering and analysis process was further constrained by the technology used.

Finally with regard to the topic of mediation, popular Social Media platforms also tend to attract 'spam' and other forms of low-quality data (as discovered in ARC 1). This is a constant risk to the quality of information retrieved, and hence the quality of decision making based upon that information, if not filtered effectively (see the Discussion Chapter, Section 9.4.3).

8.6 Summary of general learning

The overall conclusion of the general learning achieved during ARCs 1-3 is that *Social Media can provide a very tempting source of data from which museum staff might derive information*. The EW in particular identified some key places in the strategizing, planning and evaluation of Derby Museums' activities into which Social Media information might be incorporated beneficially. However, it also appeared, upon reflection regarding the EW, that the following issues would need to be addressed in order that *misinformation* related to Social Media data were not to occur:

1. The museum staff would need to address the issue of using event evaluation to confirm generally positive biases towards the success of their own events.
2. The term 'community' would need to be better defined / understood at the museum, in order that the goals of using Social Media to develop and engage with audience, and working with Social Media data, be better understood.
3. The subtle / hidden effects that the Social Media platforms themselves have upon the information that can be derived from data from those platforms need to be factored into any information that is derived from that data.

A considerable amount of further work would also need to be undertaken to gauge the levels of reliability of the systems that generate statistics from Social Media. During the EW, the researcher raised the topic of unreliable statistics with the museum staff, but the staff (who were not experts in statistics) seemed less concerned about this than expected:

> *Res – So anyway, the numbers on this… You can't quote these statistics, really, because the 0.46 – it's about 50% inaccurate potentially.*

HoM – Yes but if all of the things are 50% inaccurate… so? (Workshop EW)

This statement – that: "everything will be wrong by the same amount", when statistical uncertainty was flagged up, highlighted that the museum staff did not understand the implications of poor statistical reliability, to whit: "everything will be wrong by the same amount", when the actual situation is purely one of uncertainty. (In fairness to the staff, the researcher framing the situation in terms of "inaccuracy" rather than "uncertainty" or "inconsistency" would have contributed to this misunderstanding). This issue: that people may ascribe consistency to situations of uncertainty, seems to places a lot of responsibility upon those that create systems that generate statistics from Social Media data to ensure that such statistics are valid and reliable before they are released, and to publish the methods they have used to ensure validity and reliability. This key issue is revisited in the Discussion Chapter.

9 DISCUSSION

This chapter discusses the how this research builds upon the body of knowledge regarding the use of Social Media information in museums. It begins by considering the definition of inspiration that evolved throughout. This is followed by a consideration of the overall approach to the use of Social Media data, mostly in relation to how the museum staff that collaborated upon the research approached it, but also with some reflection upon the way it was approached by the researcher. The focus of the chapter then switches to the topics of audiences, "communities", and the relationship between these concepts and Social Media. Finally, the chapter concludes by considering the strategic potential of Social Media information for museums, and the potential pitfalls of using such information.

9.1 Defining inspiration for museums

This section covers how the ways in which museum staff considered the concept of inspiration came to light during the research. Firstly, the similarities between inspiration and the concept of engagement are considered, before the relationship between the creative aspects of inspiration and the concept of wellbeing is examined, which in turn leads to a discussion regarding how engagement might lead to the co-creation of museum content with visitors. The section ends by considering how the definition of inspiration might help engagement with culture to be evaluated, and the potential role of Social Media information in supporting this process.

9.1.1 Similarities between inspiration and engagement

This research provided insight about how the term engagement might best be defined in a museum context by indicating a subtle difference between the concepts of *inspiration* and *engagement*. Fundamentally, inspiration as defined by the museum staff who contributed to this research (see Chapter 8 Table 23) is very similar to definitions of engagement from the marketing literature; which also highlights the important role that experiences play. However:

- The dimensions of inspiration defined by this research are cognitive, emotional and *creative*.
- The dimensions of engagement from the marketing literature (and also some sociology) are cognitive, emotional and *behavioural* (Brodie et al, 2011).

Thus the key difference between inspiration in museums and engagement defined in the marketing literature is that the museum staff that participated in this research believed they could benefit from focusing upon a *specific type* of behaviour – namely creativity. This provides a partial answer to the question posed by Langa (2014:487) regarding the difficulty of distinguishing between *engagement* and *participation* in the museum literature: engagement in museums results in *creative output*, though this is not precisely the same as 'participation'.

The clearest overlap between this research and the literature on engagement in museums is described in Chapter 8 Section 8.1, and shown in Figure 20; namely the mapping between emotion, cognition and creativity and the attractors, sustainers and relators described by Edmonds et al (2006). This research also reflected a more general trend in the cultural sector to consider active participants in the arts to be more engaged than passive consumers (Davies et al, 2012; Carey, 2006). There also appeared to be a switch in focus in the literature during the course of the research: when work began in 2012 the focus of the literature related to museum Social Media was upon how new technology might enable new forms of public / civic engagement (e.g.: Russo, 2011; Kelly and Russo, 2010; Cameron F., 2008B; Russo et al, 2008; Cameron, D., 2004). These ideas also related to the concept of "second order" scientific communication described by Irwin (2014). Wider discussion of the role of Social Media in the 'Arab Spring' of 2011 may have influenced the literature at this point, and questions about the socio-political role of museums were included in the research for the UKMA's Museums 2020 project (The Museums Association, 2012). One of the key findings of Museums 2020 was a rejection by the UK public that museums could be used as debating chambers; they preferred the space museums provided for people to draw their own conclusions about life. This was firmly supported by one of the curators interviewed during the initial phase of validation of the inspiration definition (Chapter 4, Section 4.2.1). However, the public *were* in favour of museums being used to promote wellbeing, and to help people develop their skills (BritainThinks, 2013A). This change in focus regarding the role of museums was mirrored by the way the definition of inspiration changed throughout this research.

The definition of inspiration that emerged during this research also bears comparison with the description of reach and engagement from Visser and Richardson's Digital Engagement Framework (2013), a tool derived from practical experience in the cultural sector. Within this framework, engagement is defined in a four step process of *reach*, *interest*, *involve* and *activate*, which has

similarities with Edmonds et al's (2006) *attract*, *sustain* and *relate* model– particularly when considering that *relate* is defined as thinking deeply and synthesising one's own ideas about museum objects, in a manner similar to Visser and Richardson's *involve* and *activate* steps. The key difference between this research and the Digital Engagement Framework is that the role played by emotion is not discussed at all by Visser and Richardson, and the discussion of Metrics within the framework document has no mention of sentiment analysis, either. There are also some significant differences in Visser and Richardson's conclusions regarding the strategic use of Social Media (see Section 9.4 below).

9.1.2 Inspiration, creativity and wellbeing

The introduction of a creative aspect to the definition of inspiration had great potential relevance for museums, with relationship between creativity and wellbeing being of particular significance. Work based upon the NEF's *Five ways to wellbeing* (Aked et al, 2008) related closely to this research, in particular the third and fourth of the "five ways":

> *Take notice… Be curious. Catch sight of the beautiful. Remark on the unusual. Notice the changing seasons. Savour the moment, whether you are walking to work, eating lunch or talking to friends. Be aware of the world around you and what you are feeling. Reflecting on your experiences will help you appreciate what matters to you (2008:8).*

> *Keep learning… Try something new. Rediscover an old interest. Sign up for that course. Take on a different responsibility at work. Fix a bike. Learn to play an instrument or how to cook your favourite food. Set a challenge you will enjoy achieving. Learning new things will make you more confident as well as being fun (2008:9).*

The discussions with Derby Museums, particularly those relating to their Nature Gallery co-creation project, indicated that they had been heavily influenced by the *Five ways*. There were also strong links between Derby Museums and The Happy Museum project, which was in turn underpinned by the *Five ways* (Thompson et al, 2011). The *Five ways* are also heavily cited by an Action Research project entitled Mind, Body Spirit conducted by Leicester University (Dodd and Jones, 2014). This reported increased feelings of happiness and inspiration among participants, in part by using the UCL

Museum Wellbeing Measures Toolkit (Thomson and Chatterjee, 2013). This is illustrated in particular by a set of interventions that were carried out with three museums with the aim of increasing wellbeing in older people. These interventions all involved sessions in which participants interacted with objects, for instance:

> *…participants were invited … to look into the drawers of a small Edwardian chest filled with objects, to handle and talk about the objects inside in their own way and at their own pace. Participants commented on the physical properties of the objects - 'heavy' and 'cold' - and talked about their expectations of what they would find in the drawers. Surprise, curiosity and intrigue to find out more were shown in these moments of exploration. Different levels of confidence were shown by participants when looking at objects. Some people wanted to assign a function, label an object whether it was 'right' or not. They made up their own minds. Others were interested to learn from other people about the object's history or function. Verbal feedback from participants included 'fascinating', 'exciting', 'testing my memory', evidence of their active engagement (Dodd and Jones, 2014:46).*

This quote indicates that the activity had therapeutic benefits, and UCL's Toolkit supported that assertion. But the quote also conveys the sense of an expert / lay-person relationship between museum staff and participants, who were "invited" to handle the objects, and to talk about them "in their own way", whether it was "…'right' or not". Contrast this with Derby Museums' policy of hiring exhibition developers with expertise in fields such as graphic design or retail display, with the purpose of stimulating visitors into providing their own expertise in a co-creative relationship. For them, the interaction with participants is not so much an invitation to take part as a *request for help*. Might not feelings of encouragement and self-worth have been higher in Mind, Body, Spirit's participants if the museum experts had been asking for their help, instead of "providing therapy"? This conceptual difference is actually described explicitly by The Happy Museum Project:

> *Too often there is a one-way monologue whereas what is needed is dialogue that produces lasting change in both visitor and the museum itself. (Museums may be surprised to find that they have as much to learn from their audience as the audience does from them!). This is important to happiness because, in properly listening to their audiences, museums demonstrate that they value what people have to say; and that improves people's sense of self-worth and validates their opinions in a way that shows they matter in the world (Thompson et al, 2011: 5-6).*

9.1.3 Engagement and co-production of content

One finding of this research relates to the idea that Social Media can enable the co-production of content between a museum and its audience, as suggested by several papers discussed in the Literature Review (Section 2.4.4). The conclusion of this research is similar to Smørdal et al (2014), in that Social Media has clear potential to be a worthwhile tool for museums, if visitors are encouraged to use *their own* social channels to promote and discuss their collaborations with museums. In other words, utilising Social Media as a more subtle, underlying component of museum projects, rather than making it the core mechanism with which to deliver such projects, suits Social Media better than "collaborating on a museum project using Social Media as a platform".

The problems of initiatives that were completely based within Social Media, rather than having a 'real' museum component that visitors were encouraged to discuss via their own channels, were partially evident during ARC 1, in which the result for a museum of participating in 2014's #MuseumWeek, notwithstanding a large increase in followers, was a much smaller volume of interaction with those new followers, a high percentage of which seemed to be 'follow spam" (see Section 5.5.1). Small volumes of interaction related to purely Social Media based activity are also described by Langa (2014) and Villaespesa (2015).

Indeed, this research contradicts the initial "museum Social Media orthodoxy" described by Stein (2012), Mancini and Carreras (2010), Jensen and Kelly (2009), and summarised by Cairns, who stated that "the Social Web, … emphasises participation over dissemination (2013:107)." The findings of this research indicate that the reality was more complex: the majority of the Social Media data studied during ARCs 2 and 3 showed individuals disseminating their own activities to their own networks, *while participating in museum events*, but not necessarily interacting directly with the museum's Social Media presence. I.e.: use of Twitter or Facebook in collaborative / co-creational context by a museum can benefit from being less about: "telling us what you're doing" and more about: "telling your friends *what you are doing with us*". One way of defining this would be to refer to it as *oblique engagement* – i.e. participants are engaged with the museum, but content regarding such engagement is being directed away from it.

This concept of *oblique engagement*, or at least the potential that such engagement might be occurring and that focusing exclusively on any direct engagement between museums and visitors

would fail to find such evidence, was also noted by Langa. It is worth restating that, while Langa's study of the Twitter timelines of 50 museums found only a small amount of communication between the museums and their visitors, and lead her to conclude that: "The results of the survey indicate that Twitter does not help museums to engage with visitors (2014: 489)", this research retrieved over 6000 Tweets in relation to just two events from one museum, by using a different, hashtag-search-based information retrieval method. So Langa is correct in stating that Twitter does not help generate engagement, but it can facilitate the expression of it when it occurs due to other activities. Another benefit of this situation was that potentially interesting content was created by visitors *while they experienced a museum's events,* which addresses Davies and Heath's (2014) concern that many summative evaluation methods (e.g. exit interviews, focus groups) can lose effectiveness because they take place after the fact and away from the potential source of inspiration.

9.1.4 Inspiration, cultural engagement and Social Media data

Much of the literature related to evaluating the public understanding of and engagement with science lay outside the scope of this research. However, a clear point of convergence could be seen when the cognitive aspect of the definition of inspiration was considered. Science fair visitor studies such as Fogg-Rogers et al (2015) and Jensen and Buckley (2014) indicated a general level of audience satisfaction with more factual / rational science communication, and also that audiences were more passive consumers of information. However, a definition of inspiration that highlighted other (emotional and creative) aspects may benefit researchers studying the public's engagement with science. For instance:

1. Regarding emotion, Jensen and Buckley (2014) agree that emotion (described as 'excitement' and 'enjoyment') plays an important role in the "sense of occasion" of a science fair, and also express concern that the ways in which such fairs generate positive emotions about science might cause false impressions of the realities of a scientific career. An Information System that helped find potential expressions of emotion created at such events would enable such concerns to be better addressed.
2. The creative aspects of the definition gain relevance when considering the "second and third order engagement" with science initially proposed by Irwin (2014). These relate to dialogue between the public and scientists (second order), and assert that heterogeneous views across society (third order) are a positive social resource. The creative involvement of the

public is key to both these scenarios, and an Information System that retrieved content created by the public could hence indicate when such "higher order" engagement had occurred. A caveat should also be noted that the mediation caused by platforms such as Twitter might well impede successful evaluation of third order engagement in Social Media (see Section 9.4).

Jensen and Buckley also support another potential argument for using Social Media data in cultural evaluation. Their review of an evaluation of audience engagement at a science festival describes how visitors were asked to select the words that best described their visit from a list created by the evaluator:

> *The most commonly selected words were 'interesting' and 'informative'. However, given that these words were the researcher's and not the visitors', the validity of these data is questionable. The over-reliance on closed-response survey questions in previous studies does not allow for a detailed understanding of processes of visitor reception of science festival events (2014: P562).*

This also relates to the perspective on the use of Social Media put forward by Edwards et al (2013) who noted how data from Social Media could provide insight into types of people who avoid taking part in surveys. This research showed that both of these issues: the use of the subjects own language, and the inclusion of subjects that (allegedly) do not normally participate in visitor surveys, were considered key advantages of using Social Media data by Derby's Head of Museums from Derby Museums.

One technical aspect of this research in particular hinged upon visitor's own words: namely the indexing exercise undertaken during ARC 1, where the frequencies of key terms in 'Twitter biographies' were established, resulting in a list of the phrases those followers commonly used to describe themselves. A technical exercise such as this might be a method to establish a meaningful vocabulary to use in survey questionnaires to address the issue raised by Jensen and Buckley (2012), though demographic differences between the intended sample for the survey and Twitter users would need to be accounted for (see Section 9.2).

Another positive piece of knowledge that emerged from this research was the ease with which it was possible to map the *emotion*, *cognition* and *creativity* definition of inspiration in two directions:

1. There was a clear mapping onto the heart, head and hands model already in use at Derby Museums (Derby Museums, 2014B: p9).
2. Finding relevant frames in FrameNet for cognition, creation and emotion was straightforward, particularly given their categorisations of *cognizer*, *experiencer* and *creator* for their *sentient* Frame Elements (FrameNet, 2010).

The way Derby Museums used their 'head, heart and hands' model to frame the specific content of each of their exhibitions and achieve a balance that matched the content also related to one of the issues discussed in the literature concerning McMaster's review into the impact of culture (2008) (see Literature Review Section 2.4.5). McMaster's review defined a specific type of inspiration based upon 'risky-innovation', with the emphasis towards the 'shock' end of the emotional spectrum. This definition seemed particularly appropriate to modern art (e.g. the deliberately provocative art produced by "Young British Artists" such as Jake and Dinos Chapman or Tracy Emin). However, when the McMaster report was used as the basis for a pilot museum evaluation scheme, the results were disappointing (Graham, 2009), potentially because the specific definition of inspiration contained within McMaster was slanted too far to the emotional side of the scale for the content of the exhibitions being evaluated. Rebalancing expectations regarding the volume of potential expressions of emotion, cognition and creativity to levels appropriate to the museum activity in question would seem a more logical approach.

9.2 Approaching the use of Social Media data in museums

The conclusions above regarding the potential to use Social Media data to gain insight about the inspiration expressed by visitors to museums highlights a need to reflect upon how Social Media data was approached and understood by museum staff.

This section begins, however, by reflecting upon how Social Media data was approached in the research overall. In particular, it is important to reflect upon the distinction between "evidence that museum visitors have been inspired" and "potential expressions of inspiration that may be contained within Social Media content created by museum visitors". This distinction is at the heart of Krippendorf's assertion that text only acquires meaning in the context of its use (2004:33-34): the former statement would ascribe an unrealistic significance to Social Media data. And yet, in the case of Social Media data, referring to clusters of nodes on a graph such as that shown in Figure 6

(Chapter 6, Section 6.5.1) as being: "all the natural history lovers in Derby Museums' follower list", as opposed to "all the Twitter Biographies containing natural-history-related keywords" was an easy trap to fall into, and the researcher found it as difficult not to succumb as anyone else. However, in the absence of more concrete proof of a genuine love of nature than certain keywords in a 140 character "Twitter Biography", the latter description is all that may be genuinely claimed.

Understanding these nuances is particularly important given the propensity observed in the Derby Museums' staff to seek to confirm their positive biases when evaluating their activities. As stated in Chapter 8 Section 8.2, this positive bias also extended to the potential of Social Media, at least as far as the Derby Museums' staff were concerned; unsurprising given that Social Media use had been given a key part to play in the organisation's Digital Strategy (Rippleffect, 2010; 2015), and that the Social Media Coordinator was one of the staff taking part. Furthermore, as discussed in the Introduction Chapter (Section 1.2), the researcher also had a positive bias towards both museums and computer technology. These points are reiterated to further emphasise the importance of not ascribing too much significance to the insight that can be gained from Social Media data. When there is a risk that all one is doing is looking for confirmation that visitors are as inspired by your museum as you are, it clearly matters that one strives to avoid thinking: "here are all the inspired people" as opposed to: "here are some potential expressions of inspiration. Who might have created those? Were they genuinely inspired, I wonder?"

Reflecting upon this still further, this research could be accused (along with other museum-sector initiatives such as the Happy Museum Project, or Mind, Body, Spirit) of ingraining a positive bias towards museums to an extent that *invited* positive confirmation bias; that by focusing on "inspiration", the research framed investigation of the topic of how Social Media data was perceived by museums with an inherently positive term. As a known approach to counter the potential for confirmation bias is to seek evidence to *refute* those positive assumptions (Oswald and Grosjean, 2004), perhaps focusing on a more negative concept would have been more appropriate, though (in the case of ARCs 2 and 3 in particular), this could have made the collection and analysis of Social Media data related to museums events much harder, given that it was in the main created by those engaged in a museum activity. These points will be revisited in the discussion of the museum staff's approach to Social Media data that follows in the rest of this section.

9.2.1 Studying visitor behaviour using data from Social Media

This research supports the fundamental assertion revealed in the Computational Social Science (CSS) literature (see Section 2.3.1) that new patterns of digital communication by members of the public provide new sources of data with *the potential* to be used for research into visitor's behaviour (Edwards et al, 2013; Conte et al, 2012; Lazer et al, 2009). All three ARCs collected data from Twitter that promised insights that museum staff thought might be useful. ARCs 2 and 3 also indicated the promise of using data that was created 'on-the-spot' as an event occurred. However, the analysis of data alone was never the main point of this research: what the researcher was trying to establish was the potential for Social Media to create *worthwhile* information and knowledge for museums. To that end, the research proved that providing *accurate* information based upon Social Media data was rather more difficult.

One key area in which the literature suggested a great deal of potential for Social Media related to chronology: it was suggested by both Edwards et al (2013) and Karpf (2012) that data could be collected from Social Media, processed and analysed in near real time, in time-serialisable formats. ARC1 enabled the tracking of changes to the sizes of clusters of "Twitter biographies" related to keywords indicating potential interests in given subjects. These changes were relatable to real-world events, and indicate how Social Media data might contribute useful feedback about the potential impact of museum activities.

Another area in which data from Social Media was described in the CSS literature as having promise concerns its potential to draw in data from audiences and visitor demographics that might be harder to reach than traditional surveys (Edwards et al, 2013), though it is harder to find much in this research, that supports that statement, other than the anecdotal support of Derby's Head of Museums. Firstly, the source of the data from all three ARCs, Twitter, did not provide any demographic information regarding its users. Facebook is a much more reliable source of demographic information, as confidence in clean demographics from real users is a cornerstone of its appeal to the advertisers that provide its revenue. Twitter's much more open-ended approach to its user-base, where fake accounts and irony are commonplace (even popular) features of the platform, make accurate measures of age, gender and so forth of user samples impossible. Also with respect to demographics, one of the events, MuseoMix, from which the larger dataset was captured, was a hackathon that the attendees paid a £90 fee to attend, and both events studied in ARCs 2 and 3 undoubtedly appealed to a visitor base already well-disposed to museums and technology. Indeed, the potentially narrowness of the demographics for both events from which data was captured

tends to reinforce concerns raised by both Tufekci (2014) and Gayo-Avello et al (2011) about the self-selecting nature of samples of data taken from Twitter.

With regard to the topic of bias introduced at the start of this section, the research revealed that the processes of automated analysis had the potential to make the effects of bias less obvious to the analyst. The prototype IT systems developed for this research were tested and evaluated in part by embedding the ideas and opinions of museum staff within annotated test reference collections, though, despite the fact that most NLP algorithms rely upon human expertise in this way, the injection of bias into the process did not seem to discussed as often as it should, at least within the Computer Science literature reviewed. Where bias was mentioned at all in the CSS literature, it was most often in relation to demographic biases caused by the Social Media platforms themselves (e.g. boyd and Crawford, 2012), but bias in relation to the knowledge and expertise used to train and test algorithms is rarely covered. Snow et al (2008) was the only paper found that discussed bias in relation to text annotation, and that focused upon bias caused by *inexpert* annotators in a crowdsourced annotation. The only source reviewed that discusses *expert* bias in depth was Shadbolt and Smart (2015), and that was in the context of eliciting knowledge for expert systems, not for annotating test reference collections.

And yet, when the Tweets annotated by the researcher were re-annotated, the resulting intra-coder reliability measure was 0.52, a considerable amount less than the 'rule of thumb' measure of 0.800 that Krippendorf suggests (roughly) indicates reliability (see Section 6.5.2). This strongly indicates a problem that was also supported during observations of Derby Museums' staff's discussion of the potential meanings of Tweets: that, given their sparsity and the need to place them in the context of the surrounding social and conversational network of Twitter, Tweets are potentially ambiguous to a degree such that a higher reliability measure might be hard to achieve, particularly in relation to a complicated phenomenon such as inspiration. Higher reliability might be achieved, however, by simplifying the annotation process. If the annotator were asked: "does this Tweet mention thinking anything? Or feeling anything? Or making anything?", then a test reference collection might be annotated with enough consensus between coders to ensure that an Information Retrieval algorithm could be tested reliably, and could produce reliable statistics.

The performance of ARC2's prototype was also adversely affected by that fact that, as stated by its developers, FrameNet was not developed as a Social Media-compatible resource. Its lexicon was instead generated by annotating edited text from sources of news and literature (Baker 2014). This problem could be approached in two ways:

1. A standard lexicon of emotional, cognitive and creative phrases could be created for semantic role analysis, incorporating ideas and input from numerous cultural organisations, and validated independently.
2. If it turned out that the concept of inspiration was so institutionally and / or event dependent that a usable standard lexicon could not be developed, an alternative approach would be to "peer-review" all annotation exercises by museum staff during which Test Reference Sets were created, by involving staff from other cultural organisations. This would be something akin to a digital version of the evaluation approach taken by Visit England (2015).

The former of these potential approaches could also address the concerns of Davies and Heath (2014) that a lack of standard approaches to evaluation in the museums sector prevents comparison between events.

Another issue (that was particularly important given the tendency to confirmation bias described in the introduction to this section) related to the self-selection of those creating the Social Media data collected for ARCs 2 and 3. Content related to the Maker Faire and MuseoMix events were good examples of self-selected samples that had a positive bias towards museums. This issue was described by Tufekci, who states: "…hashtag dataset analyses need to be accompanied by a thorough discussion of the culture surrounding the specific hashtag, and analysed with careful consideration of selection and sampling biases (2014: p508)." Failing to do so increases the chances that museum staff will merely use Social Media data of this sort to confirm their own positivity.

A significant amount of the content captured in relation to the events was not actually textual in nature – much of it was photographical, with some also being audio-visual. At this point, the problem of how to automate the evaluation of inspiration / engagement starts to move from the domain of NLP to that of pattern recognition (for both speech and visual media), which is outside the scope of this research. That said, the same class of problem related to the bias of those annotating training sets for text classifiers would still apply, perhaps even more so, given that images of potential inspiration might be open to even broader interpretation than the short pieces of syntactically obscure text in Tweets.

The manner in which Twitter mediated several aspects of engagement also became evident during ARC2 and ARC3: the findings that relate to this are listed below:

1. Restrictions upon access to data via the Social Media platform's API: as this research investigated what could be achieved by museums without large amounts of funding, the

prototypes were constrained by Twitter's standard API usage restrictions. This kept the volume of data that could be retrieved relatively low, and hence constrained several research design decisions. Edwards et al (2013), Giles (2012), boyd and Crawford (2012) and Karpf (2012) all discuss the effects that varying levels of access to data can have upon the types of research it is possible to undertake. One example would be the inability of a major museum (e.g. The Tate) to easily download all of its follower information.

2. This research highlighted some of the ways in which Twitter's architecture affected the information that could be derived from data retrieved from the platform. Most obvious are the ambiguity caused by Tweet and 'biography' length, but ARC3 was also impacted by a subtle effect that was due to a counter-intuitive and poorly-documented feature of the Twitter API related to the change in meaning of the 'retweet count' variable depending upon the context of the specific datum to which it applied. Furthermore, concerning the topics of *engagement* and *conversations*: Twitter is constrained regarding the retrieval of evidence of conversations in two key ways:
    a. The API does not allow the Tweets posted in reply to a Tweet to be collected easily.
    b. When a user replies to a Tweet containing a hashtag, the hashtag is not automatically included in the reply.

The last item in the list above perhaps had most impact upon this research, as it made data perceived to be of particular value to Derby Museums (specifically: "who was being drawn into a conversation") difficult to collect automatically. These issues conspired to undermine the effectiveness of retrieving data 'by hashtag', despite it clearly being a method for capturing a valuable amount of *oblique engagement* (see Section 9.1.1 above).

Twitter in particular, with its harsh limit on Tweet length, is beholden to context to allow meaning to be applied. This was evident during ARC 2, where a Tweet that, as the museum staff and researcher unanimously agreed, contained a valuable description of the inspirational impact of the Maker Faire, was discussed for several minutes, with reference to the creator, and the various other people and organisations mentioned within it. During this discussion, various assumptions were made based upon an examination of the context of the Tweet. Without that context, its meaning would have been much harder to ascertain. The same can be said of the term 'Twitter biography', which has been used in quotes throughout this thesis due to the (absurd) idea that a 140 character-long piece of text can be considered a 'biography', a concept that contrasts starkly with Dawson and Jensen's statement that:

> *… visits to cultural institutions should be understood within a holistic and long-term framework of individual life circumstances, relationships and trajectories (2011:137).*

Regarding the issue of Social Mediation (see Chapter 8 Section 8.5), both Lovink (2013) and Van Dijck (2012) discuss the ways in which Social Media platforms mediate the data they provide, pointing to Facebook in particular. They suggest that, rather than *enabling* 'social networking' activities such as following and 'liking' (or 'favouriting'), they actually *engineer* such behaviour, as it is the behaviour upon which their business models depend. They also point to the need for the major platforms to commercialise these services as the underlying causes of many of the constraints inherent in their systems, and allude, like Karpf (2012) to the ways in which these forces can and do change these platforms over time, sometimes without warning.

The issues caused by mediation are further exacerbated because Social Media platforms change; changes to the interface design for end-users might introduce (or relax) restrictions upon the size of a post, or the nature of relationships between users and organisations, changes to the API might restrict or increase the volume of data available, and so forth. Changes of this sort could have subtle effects upon the effectiveness of Information Retrieval systems related to data from the changed platform, in ways that are not immediately evident to the consumers of information based on that data. Regular reviews of the state of the Social Media platforms being used as data sources would be required to guard against this, one way of structuring such a review would be to annotate fresh sets of data into new reference sets, and then retest the algorithms with those sets, on a regular basis.

None of the issues raised above preclude the use of Social Media data in museum visitor studies, *as long as the limitations are understood* and considered appropriately when working with information based on those data. Two approaches to this are:

1. Triangulation with other forms of research: Edwards et al state: "… it is questionable as to whether the analysis of this [Social Media] data stream can act as a surrogate for traditional social research methods (2013:247)." Instead, as this research also does, they propose that Social Media data analysis augment existing methods and act as another source of insight, not a replacement source.
2. Clear expression of the limitations of the research: Karpf insists that researchers should be transparent about the conclusions that it is safe to reach from their findings, stating: "By transparency, I specifically mean that researchers should be up-front about the limitations of

> our data sets and research designs. This has always been a good habit, but it takes on additional importance… (2012:652)"

However, the above should also be considered in the light of the underlying observation of confirmation bias and overall positivity described at the start of this section. Furthermore, some signs of a general level of inexperience with regard to statistics and evaluation on the part of the museum staff were recorded (i.e. those described in Section 8.6).

9.3 Audiences, communities and Social Media

The discussion of audiences and communities covers how Social Media information might support an audience development strategy by potentially providing information to help with audience segmentation. The issues caused by the ambiguity of the term *community* and its relationship to *audience* are also considered.

9.3.1 Audience segmentation

The discussion of audience segmentation relates to how "the whole audience" might be broken down into sub-categories (segments) to enable more efficient curation of exhibitions, development of promotional content, and so forth. One of the outputs of ARC1 was the generation of clusters based on the relationship between concepts and keywords in "Twitter biographies". Such an activity has the potential to provide information in support of the segmentation of current and potential audience by 'special interest' is discussed in the literature (Black, 2005; Dawson and Jensen, 2011). It could potentially provide information to help analyse 'psychographic' audience segments such as those proposed by The Audience Agency (2015), Arts Council England (2011B), Falk and Dierking (2013) or Morris Hargreaves MacIntyre (2013), all of which focus on more general characteristics (e.g. income, location, amount of spare time) or are goal-based (e.g. they related to information seeking behaviour or the type of experience sought by the visitor). However, in this latter instance selection of the keywords necessary to indicate 'wealth' or 'amount of spare time' would be likely to be a lot harder: indeed the potential lack of information inherent in a 140 character 'biography' (as previously discussed) would most likely make this impossible.

One potential advantage of using Social Media data to help with segmentation by special interest is the potential for scheduling data-retrieval, so that trends in changes to the size of clusters could be analysed. This would help address a particular issue related to visitor studies, namely that such analyses focus mostly upon the visit itself: this criticism is levelled specifically at Falk and Dierking, who segment museum visitors around a 'goal oriented' classification related to each specific visit they make; for instance they might have visited to "…satisfy a specific, content-related objective" or be "…primarily focused on enabling the learning and experience of others in their accompanying social group" (2013: 48). A database of time-stamped changes to cluster size could enable analysis to be conducted upon "Twitter biographies" of people who started following before, during and after a museum event, potentially a long time before or after. This also relates to the building and monitoring of long-term relationships with visitors discussed during ARC2 and inherent in Customer Relationship Management (see the following section). Both of these potential methods of analysis raise the issue of privacy and intrusion into people's personal lives discussed in in Section 9.4.2, however.

Another intriguing possibility might be to relate clusters of Social Media profiles from visitors (or even potential audience members) to themes contained in a museum's own digital Collection Management System. This idea is the result of reflecting upon the disappointing performance of the crowd-sourced knowledge base ConceptNet in ARC 1. The idea that certain Tweets from MuseoMix analysed using FrameNet for ARC2 contained direct references to collection items in their Frame Element slots also supports the idea of merging semantic networks of Social Media data with semantic networks of collection data.

Another activity that access to a cluster of Social Media profiles such as "Twitter biographies" might support is the construction of *personae* of 'typical' users from different audience segments (Redish, 2007). These personae are used to frame debate about design choices in terms of "what would *personae X* do" under a given set of circumstances.

9.3.2 What is a museum community?

One recurring problem faced by this research is the ambiguity of the word *community* in a museum context, and its relationship to the term *audience*. The researcher and Derby Museums' staff

struggled with this ambiguity throughout ARC3 and during the EW. The four potential meanings of community used by Derby Museums' staff are listed in Section 8.4.2.

Community is a concept important both to museums and to Social Media more generally, hence the ambiguity surrounding this term has the potential to cause damaging confusion. However, this research broadly concurred with the proposal that a 'communities of interest' definition was the most appropriate to the museum sector (Barret, 2011, Waterton and Smith, 2010), particularly in relation to audience segmentation around 'special interest' topics. However, the research also highlighted the difficulty in thinking about relationships built via Social Media without relating them to an 'online community'. This sheds some light upon the overlap between the terms 'community' and 'audience' – an overlap that is particularly relevant to Social Media, given its potential for interaction.

By considering these two factors together, the following ideas came to light:

1. A museum's relationship with a visitor exists along a continuum of familiarity.
2. At some point on this continuum the visitor shifts from being an 'audience member' to being a 'community member'. Exactly where this point lies is likely to be different for all museums. Indeed deciding where this point lies explicitly could become a key strategic point for museum staff to agree upon.
3. In order to relate to the definition of inspiration, the decision regarding where on the continuum the point at which an 'audience member' becomes a 'community member' could be linked to evidence that their behaviour had changed, most likely creatively, due to the museum's influence. (Note, during the ARC2 evaluation, the museum staff were keen to disavow the clichéd notion of 'creativity' as being 'artistic creativity').
4. Other pieces of information from non-Social Media sources, such as ticket sales to that individual, noted attendance at museum events and so forth could also be factored into the decision regarding "when they had joined the museum community" – engagement does not happen via Social Media alone.

One way of defining this point of particular relevance to museums could relate to the audience member's creation of content; content that is most likely to be about a special interest topic that the museum had stimulated them to create. Also, this content might not necessarily be in the form of a direct reply to or engagement with the museum or a member of its staff – it may have been disseminated via the audience member's own channels. It is also worth noting that individuals may join, fall out of, and re-join this 'community' as time passes and various different events that overlap

with different sets of interests are held; 'the community' is never fixed. That community-building is a never-ending process is discussed by Barrett (2011), and was revealed by the Derby Museums staff during the EW, when they discussed their familiarity with certain individuals decreasing, while others increased. This discussion once more highlighted the potential importance of Customer Relationship Management (CRM).

Customer Relationship Management (CRM) software is commonly used in the commercial sector, and major CRM applications include Salesforce (Salesforce, 2015) and Microsoft Dynamics CRM (Microsoft, 2015). These software systems monitor and maintain a history of interactions such as sales enquiries, purchases, or assistance requests to customer services. Many have integration with the main Social Media platforms such as Twitter built in. Derby Museums, however, do not have a CRM, as many of the services they offer are free, and hence they do not consider themselves to have 'customers' in the traditional sense.

One attempt by museum practitioners at developing a system that tracks visitor relationships that build around activities, similar to a CRM, but, crucially, not based entirely upon commercial transactions, is DMA Friends, developed by Dallas Museum of Art (Stein and Wyman, 2014). This type of 'sales-free' CRM (or *engagement management system*) might also become a key aspect of supporting the processes shown on the "audience development / engagement by planning / evaluation" matrix shown in Figure 21. The topic relates in particular to the situation described by Derby's Head of Museums during the EW. When discussing familiarity scoring and changes in familiarity levels between the museum and visitors, he said:

> *Head of Museums - … actually, it's also growing, so if we did this now, from when we did it before, there would be people where we'd go "yeah we know them more now, or we know them less", so some of these people… []'s sort of dropped off, now we've not done […] – we know who he is, vaguely, but, he's not necessarily going to go below a one, probably, because we're always going to know who he is, now. Whereas [], he was in the museum ten days ago, we're planning a project with him, he's going to be a four (Workshop EW).*

This additional of information to relationship data indicated the potential value of CRM to museums, and strongly supports Lilley and Moore's assertion that:

> *Given the daily demands on arts organisations, taking a strategic approach to audience relationships is often overwhelmed by the demands of the sales cycle. But other organisations which compete for a share of leisure time, from sports to*

> *restaurants, media companies to social networks are adopting CRM approaches which means that failing to keep pace with them - and with leaders in the arts sector as they adopt the techniques - will no longer be an option. The risk is being left behind at least as much as not leaping ahead. CRM will soon be the minimum requirement for the operational management and accountability needs of cultural bodies… (2013:13)*

However, two important issues are of note:

1. As discussed in the evaluation of ARC3 – 'scoring a relationship in terms of familiarity' is an activity that is potentially even more prone to ambiguity than annotating Tweets. Stats about "community strengthening" based on changes to these scores would be untrustworthy unless a reliability measure of some sort could be taken to ascertain a proper degree of consensus among museum staff regarding how well known a particular visitor was.
2. There is perhaps as ambiguous a relationship between the terms 'customer' and 'audience' as there is between 'community' and 'audience'. Commercial CRM systems are focused on sales and service-based relationships between organisations and the consumers of their products. A cultural organisation such as a theatre, which sells tickets to their audience, might find adoption of a system of this nature easier than it would for the great many museums, such as Derby, that are free to enter and which cannot hang evidence of a visit onto a ticket sale.

With regard to the first point – the richer set of data about relationships with visitors potentially provided by a CRM (or *engagement management system*) might actually provide a more reliable basis for considering familiarity than a Social Media platform such as Twitter or Facebook, particularly if data from those Social Media platforms could be integrated with it.

9.3.3 Risks related to working with audiences and communities

An issue that could impact audience research undertaken with Social Media profoundly is that of invasion of privacy. As discussed previously (e.g. Methods Section 3.6) – Twitter was used as a

source of data partly because it is most clear with users' that their content is, by default, placed in the public domain, and it asks users to act accordingly (i.e. as they would in public). However, there is clearly a grey area around informed consent for the use of human-related data in research that does not fit neatly with the collection of content that was not intended for use in visitor surveys, and by people who do not know it is being used for research (Tufekci, 2014; boyd and Crawford, 2012; Lazer et al, 2009). While this issue was discussed in depth by the researcher and the supervisory team, there was no formal guidance in the ethical policies of Loughborough University regarding the use of data collected from the 'public' Internet at the time consent to conduct this research was given, and as indicated by boyd and Crawford, this was not an uncommon situation in universities more generally at the time. This research, therefore, may have been running ahead of related governance at the time it was undertaken. In the absence of clear legal guidance on this topic, museums would be wise to consider these privacy issues and document what their policies are regarding use of visitor data explicitly, and share this information with visitors.

9.4 The strategic potential of Social Media data use in museums

Little other academic research into how Social Media information might be used to support strategic decisions in museums was found. The most notable contribution reviewed was that by Villaespesa, who published two conference papers (2013, 2015) produced as part of PhD research being conducted with the Tate at the same time as this research. Both these pieces of work approached the issue of strategic use of Social Media information from a Business Studies perspective, as opposed to the Information Systems perspective taken by this research (e.g. using tools such as the POM Model to structure reflection on the problems and opportunities related to Social Media use in museums - see Section 9.5).

Both Lilley and Moore and Davies and Heath state that the effective strategic incorporation of evaluative data (from Social Media or elsewhere) depends upon the increasing acknowledgement that the first customer of evaluation should be the cultural organisations themselves and their staff, and that evaluation should not be undertaken purely in a spirit of accountability to funders. Villaespesa's description of her work interleaving Social Media data with the Tate's mission and

strategy (2015) provides a good example of how to take such steps. This research provides another perspective upon the same topic, from the point of view of a smaller, less well resourced, and less famous organisation. Contrast this with Smørdal et al, who mention "… the institutional need of museums to engage in Social Media-based dialogues (2014:225)". Statements such as this put too much emphasis upon tools and not enough upon strategy: museums such as Derby have documented their institutional, strategic need to facilitate visitors' creativity and improve visitor wellbeing; to help visitors connect with their communities and the world around them. That is the strategy: Social Media is just one of several potential mechanisms to help deliver it, and evaluate its delivery.

Rather than focus upon using Social Media as a source of data to help with planning and evaluating museum activities, however, the literature reviewed concentrated more upon:

1. Using Social Media to grow audiences (Visser and Richardson, 2013; Rippleffect, 2015).
2. Ways in which to disseminate and / or increase knowledge related to museum collections via Social Media: e.g. Russo (2011), Kelly and Russo (2010) and Cameron (2008A).
3. Ways in which to use Social Media to gather visitor knowledge about collections, e.g. Terras (2011), Vaughan (2010) and Kalfatovic et al (2008).

This research touched upon two main areas of strategic significance to museums. Firstly, the concept of inspiration was discussed in relation to setting a balanced programme of events by Derby Museums' staff. Secondly, reflection upon ways in which information based upon Social Media data might be used by museums indicated that it could be incorporated into a range of audience development and engagement activities in a cycle of planning and evaluation.

9.4.1 An 'inspirational' programme of exhibitions and events

One of the potential benefits of considering inspiration as a combination of thought, emotion and creativity discussed by Derby Museums' staff was the opportunity to balance a scheduled programme of events around these different aspects of visitor experience (see Section 8.3.1). Furthermore, conscious, planned consideration of how events might target specific cognitive / intellectual or creative responses also had the potential benefit of helping align a museum's activities with those of potential partners and sponsors. This relates to a challenge made to the cultural sector by Lilley and Moore in their *Counting What Counts* report:

> *There is no reason why public cultural institutions cannot turn data and measurement to their advantage. How much more powerful could a cultural institution's offer to a potential sponsor become if, for instance, it were possible to more closely understand and connect to the sponsor's desired audience and to be able to prove that to be the case? As commercial use of data from loyalty cards, and social networks increases, the cultural sector has an opportunity to strengthen its position in parallel (2013:28).*

The specific, inspiration-related 'balancing scheme' of cognition / emotion / creativity was already in use at Derby Museums in the form of their 'head, heart and hands' approach to exhibition design, which is referred to explicitly in the executive summary of their successful 2015 bid for Heritage Lottery Funding to redevelop the Silk Mill (Derby Museums, 2014B). This 'head, heart and hands' concept maps onto the fundamental structure of Bloom's Taxonomy of Educational Objectives (Bloom et al, 1956), as first discussed in the Literature Review (Section 2.5), and as such was a method of structuring the museum staff's thinking and work activities, rather than being an attempt to consider the psychology of visitors.

9.4.2 Cycles of planning and evaluation

The idea that information based upon Social Media data could fit into cycles of planning and evaluation in ways beneficial to museums was raised during the EW (see Section 8.3.2). When structuring reflections regarding the three ARCs and the EW according to the POM model (see Sections 3.3.2 and 9.5), the point at which planning and evaluation appeared to be closest together was the phase in which intentions and accommodations were made (phase 6 of the POM Model). This related to activities such as those below (as described by museums staff – see Appendix 4 for the complete list):

- Selecting the appropriate museum content and deciding how to display it in ways that might fire the emotions of the intended audience.
- Deciding how to market / promote an event, both in terms of developing promotional materials, and working out how to distribute them.
- Learning lessons about the event for direct use in planning how to engage the audiences of future events, both on event specific and overall policy levels.

As such, being able to integrate audience feedback such as that which might be gathered from Social Media data addresses a challenge made by Davies and Heath to those that evaluate museums and culture:

> *Museums need to develop an evaluation and audience research framework and formally allocate responsibilities for its implementation.* ***Mechanisms need to be in place to preserve and disseminate knowledge across successive projects.*** *It would be beneficial to identify overarching research questions that can inform individual pieces of evaluation; this would enable the creation of a data corpus and analytic framework to support the development of a collection of comparable insights, findings and recommendations. Where possible, it would be worthwhile collaborating with other institutions to build a common framework and to enable cross-institutional learning (2014:67) [Researcher's emphasis applied].*

This challenge builds upon the discussion of intrinsic, cultural value typified by Rife et al (2014), Bakhshi et al (2009) and Holden (2006, 2004), which is covered in the Literature Review (Section 2.4.5). The highlighted section emphasises Davies and Heath's recognition that the data, information and knowledge gained from evaluation must contribute to the planning of successive projects

The two activities of planning and evaluation are often described as being parts of a recurring cycle, for instance in the business science of Deming, who popularised the idea of a "plan, do, check, act" (or PDCA) cycle that became one of the pillars of Lean manufacturing (Walton, 1989), within which checking (evaluation) leads to process change (acting) which feed straight back into the next cycle of planning and doing. Continuous evaluation and its direct link to planning are also key aspects of Agile systems development (Crispin and Gregory, 2009; Cohn, 2005; Schwaber, 2004). Social Media data could provide a source of feedback into such a continuous learning and improvement system for museums, but only it would most likely only be safe to use such data qualitatively (i.e. by finding particularly supportive or problematic examples of visitor feedback). Monitoring statistical trends in the changes of sentiment in visitor content is only safe if the automated analysis tool has proven to retrieve information effectively using a dataset that has in turn been proven to have a robust inter-coder reliability measure.

9.4.3 Strategic risks to museums of working with data from Social Media platforms

The potential for increased use of Social Media data in museum strategies brings with it the following risks:

1. The various biases (often hidden) that can be applied when data is retrieved from the major platforms and analysed automatically (these have already been covered in Section 9.2.1).
2. The idea that an increasing dependency upon data from Social Media for making strategic decisions increases the overall dependency upon Social Media companies.
3. That the use of Social Media data potentially invites museums to take an interest in their audiences that could constitute an invasion of privacy.

As described at the end of Section 9.2, the principle mitigation for recognising biases caused by Social Mediation is to investigate, thoroughly, the mediating / biasing effects of every platform used to communicate with audience members. One example of this is the underlying bias of the platform's user base. This issue is exacerbated because user bases may change over time (e.g. Facebook might gradually become more popular with older people), so attention must be paid to such changes; a process made harder when the platform in question is less strict about recording user demographics (such as Twitter). Changes to a platform's functionality or user interface also have the potential to change, often subtly, the meaning of the data being uploaded by users; for example, if Twitter were to increase the maximum length of Tweets, the level of consensus between people annotating test reference collections could easily change, in turn effecting the reliability measures, and either strengthening or weakening the validity of related statistics. Also, many of the subtleties of mediation (such as the issues with Twitter's API model that caused confusion regarding the value of the Retweet variable uncovered during ARC3) were revealed by the thorough examination of the underlying data. The lesson is that one should never let an Information System incorporating Social Media data mask the underlying data for too long without reviewing and checking it.

Another mitigation would be never to drop other forms of audience analysis simply because new opportunities for using Social Media data have come into being. Should data from Social Media alone be used for planning and evaluating events, the mediation would bias such activity detrimentally – for example, only focusing on Twitter data for evaluation would skew the evaluation towards the core demographics of Twitter users (e.g. the typical age, wealth and levels of technological competence). Hence data from other sources (e.g. interviews, focus groups, attendance figures, website usage statistics) must also be captured and correlated with all other sources, including Social Media. Once data from Social Media is being collected, organised and (to some extent) analysed automatically by scheduled processes and algorithms, however, the whole

process becomes "easy" (i.e. automatic) to the point where it can happen in near real time, and relatively inexpensively (compared to, say, a labour-intensive process such as conducting, transcribing and coding interviews). Thus the temptation for any busy museum with budgetary constraints might be to over-rely on this single point of information.

The Social Media businesses themselves are also potentially unstable. Despite their size and the levels of funding behind them, in mid-2015 the major Social Media platforms were still effectively fledgling companies, were still in growth phases, and at the time of writing this thesis, it was still unclear what the future might bring for them. In mid-2015, after being publically listed since November 2013, Twitter was still not profitable, and its share price had fallen below the value set when its stock was originally offered. Dick Costolo, who had been the company CEO since going public, resigned in June 2015 (Griffin, 2015). Facebook, on the other hand, while at least making a profit, was similarly still in early growth in mid-2015. It had expanded hugely via acquisition post its Initial Public Offering, but was yet to release plans regarding how to monetise those acquisitions. The value of advertising via Social Media – the process upon which the major companies were relying, was also being questioned in some circles (Swift, 2014).

Social Media company instability could potentially manifest itself in various ways. For instance, fast expansion of these companies, related to the enthusiasm of their funders to ensure they grab large audience shares quickly, may have led to design flaws in their systems, such as the one found in the Twitter API during ARC 3. The knowledge surrounding these systems may also vary in quality: the same design flaw uncovered in ARC 3 was exacerbated by contradictory and confusing documentation produced by Twitter itself, further compounded by a reliance upon a 'developer community' of unaffiliated users with varying levels of expertise. This caused data from the platform to be misused, and it was only through in-depth analysis of the use of that data that the flaw came to light.

One way to mitigate against an over-dependency (upon Social Media platforms, or indeed any single source of value) is to diversify. For instance, data could be used from multiple Social Media platforms; alongside Twitter data, systems like the ARC prototypes could collect posts from a museum's Facebook page, from its Instagram account, and could also retrieve data from visitors' blog posts on the open internet. However, data from each source would be mediated in different ways, both in terms of how it is accessed, and in terms of how users create it in the first place. As discussed, this mediation affects the meaning that can be made from the data – hence for example: "Tweets" are not directly comparable to "Facebook posts", and Information Systems that use data from multiple sources should make this clear.

The use of an open standard data model in an Information System based on Social Media data also points towards another method for mitigating the risks of dependency upon the major Social Media platforms: the potential for setting up a Social Network of one's own, where one had a much better understanding of how data might be mediated. In mid-2015, Wikipedia listed 50 different Open Source distributed social networking applications that could enable social networks to develop across multiple server hubs, rather than relying upon a monolithic central application such as Facebook or Twitter (Wikipedia, 2015). Wider adoption of such systems would move the concept of Social Media itself towards a situation that is more like the Internet and World Wide Web, systems that were designed from the ground up to be distributed, and thus more robust. Part of this movement towards open Social Media systems is another standards organisation, Open Social, which was originally proposed by Google as part of the development of their attempt to set up a monolithic platform of their own, Google+. At the start of 2015, Google handed the work they had done to develop a standard over to the World Wide Web Consortium (Jacobs, 2014), the body responsible for maintaining the core standards of the World Wide Web. One possible result of the creation of an open standard with which Social Media applications may conform would be the encouragement of developers of Social Media platforms to create their own custom systems, knowing that the potential existed to make them interoperable with similar systems created by other developers, in the same way that web servers are interoperable with web browsers. This, ultimately, is the most fundamental way for the dependency upon the major Social Media platforms to be removed, though new risks (e.g. to the security of user data) would result.

Edwards et al (2013) also describe a scenario whereby the major Social Media platforms could cease to function at some point in the future, and Van Dijck (2012) related this to privacy issues by highlighting the line the major platforms walk between intruding upon users' personal data and reassuring users that platforms are safe, cool spaces within which to socialise. He contends that the major platforms need to keep this balance in equilibrium, as they rely on both factors for their revenue. Any imbalance between these factors could spell disaster for the platform in question.

Such privacy-related issues constitute one of the clearest strategic risks of working with Social Media information. This in turn relates to the concept of *oblique engagement* discussed earlier, i.e. that a potentially large proportion of evidence of engagement will be formed of discussion *about* the museum between visitors *within their own social networks*. Thus capturing such data risks a morally, and even legally, uncertain intrusion upon the conversations of visitors, in a manner that both staff members from Derby Museums expressed concern regarding, not least in relation to management of their organisation's reputation. These privacy concerns are also extensively discussed in the

literature regarding Computational Social Science (e.g. boyd and Crawford, 2012; Lazer et al, 2009) and in the critical theory of Social Media (e.g. Van Dijck, 2012; Lovink, 2011).

With regard to the specific context of this research, Tweets attached to hashtags related to events can be considered safer as far as invasion of privacy is concerned, as by definition to add a hashtag to a Tweet is to enter it into a public conversation; and to add a hashtag related to a public event while attending that event even more so. Unfortunately, however, the mechanisms of Twitter worked against the effective collection of data using hashtags, as described in the Section 9.2.1.

9.5 The impact of Social Media upon the Processes of Organisational Meanings

One by-product of using the POM model (Checkland and Holwell, 1998) in a strategic analysis of Social Media information use is that it provided an opportunity to illustrate how the model has been affected by the uptake of Social Media and the use of ubiquitous computing technology such as smartphones. The original model (Figure 1 in Chapter 3) was developed in the late 1990s and reflected a typical organisation of the period, within which formal Information Systems and related IT are 'to one side' in a function supporting the organisation. The version that evolved due to this research showed how the increasing use of social computer technology had moved the Information System to the centre, forming an *Information Medium*, and how dependencies upon this had formed between all the other processes in the model, including core fundamental processes such as organisation formation, discourse, and even the perception of reality. A proposal for an updated POM model is shown in Figure 22.

Working with a museum, like Derby Museums, that had Social Media as a key part of its digital strategy revealed three changes that required an update to the POM model:

1. Staff were using their own Social Media accounts for professional networking, as well as personal communications. Also, professional knowledge about museum practice was being shared via these channels. Social Media could thus be seen to be making the organisational boundaries of Derby Museums more porous, and the organisation more fluid.
2. Influences from beyond organisational boundaries had increased, for example professional networks, shared of audiences with cultural partners, and individual staff communicating

directly with audience members rather than through official channels. This had the potential to lead to an overall perception of reality for the users of the system that was outside the complete control of the museum itself.

3. This affect upon perception was exacerbated by the more ubiquitous forms of computing that had been invented since the POM model was published, i.e. smartphones and tablets. In effect, both staff and visitors were carrying access to the formal Information System around with them in a manner that allowed the Information System to directly impact (both enable and constrain) the fundamental discourse upon which the system depended, and indeed their direct perceptions of reality.

One of the results of these realisations was an update to the POM model that moved the formal Information System from its supporting role 'to one side' of the process of making meaning in organisations to a central role from which it could affect all aspects of the process. A major implication of this increased role for the Information System in a Social Media world is that working within such systems without understanding the mediating effects of Social Media platforms: (e.g. the effects that their own agendas of profit-making via activities such as advertising), could lead to misinterpretation of information based on the data from such systems. The high increase in followers attained by the initial partner museum in ARC 1, which was in part caused by a trending hashtag, was a good example of this, as it led the museum to ascribe more value to the increase than it merited.

The research conducted with Derby Museums highlights the clear potential for information based upon Social Media to become embedded in the daily activities of cultural organisations; particularly those that place audiences at the centre of what they do. However, as discussed in Section 9.4.3, embedding, and hence becoming dependent upon, such information for making important decisions comes with risk. Any Information System (or indeed any system) containing such a core dependency runs the risk of major disruption should the mechanisms of that dependency fail.

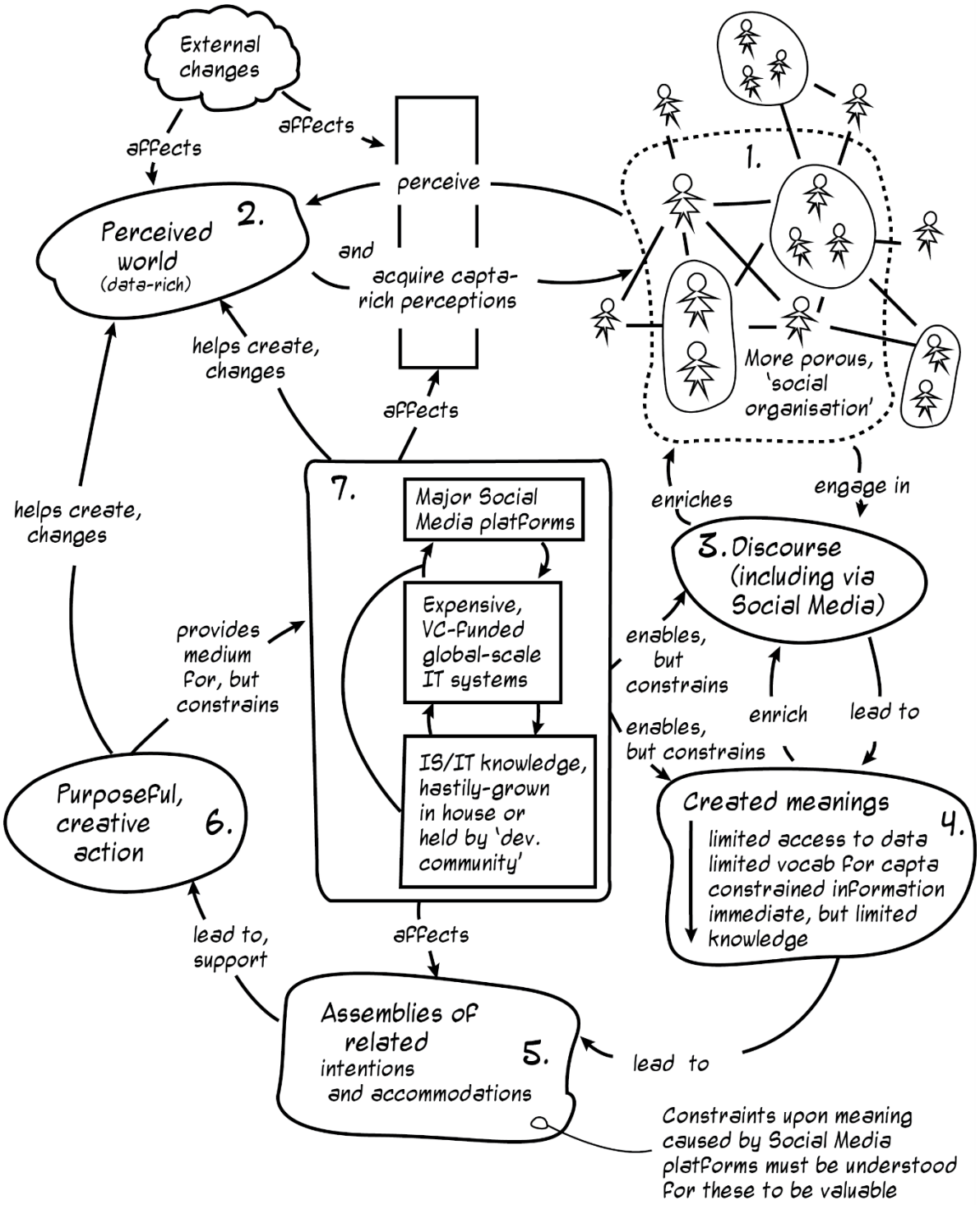

Figure 22 Update to the POM model showing increased dependency upon "Information Media" as opposed to Information Systems

9.6 Summary

The analysis of the research described in this thesis concludes that the museum staff with whom the researcher collaborated had a firm understanding of the concept of inspiration, which they could apply to their work easily. The definition as it stood at the end of the research was:

> *A cyclical, mutually supporting combination of emotion, cognitive thought and creativity, caused by an experience or series of experiences, and leading to the expression, enactment and further adaptation of fresh ideas.*

The constituent parts of the definition, namely emotion, cognitive thought and creativity, can be mapped directly onto the root categories of Blooms Taxonomy of Educational Outcomes (Bloom, 1956), and hence could be said to constitute something of a traditional approach to organising museum activities. As such, it made sense to the staff to use such a definition to organise Social Media content produced by visitors about museums for purposes of evaluating past events, but also for planning future ones. This definition also had clear parallels with the concept of 'engagement', particularly as described in the marketing literature, to the degree that the terms are almost synonymous. Considering inspiration in this way may be particularly useful given the increasing calls for cultural institutions such as museums to improve the ways in which they plan for and evaluate 'engagement' with their visitors, in order to maximise their impact in provable ways they can use to justify investment and improve public support.

The museum staff that collaborated on the ARCs that formed the body of this research also indicated that the cyclical nature of inspiration; that it builds gradually over time, when considered in tandem with Social Media, also had a role to play with regard to the building of relationships with visitors in ways that could enable 'communities of interest' to grow around topics related to museum content.

However, the research also concluded that issues such as the potential ambiguity of Social Media content, underlying biases and the mediation caused by the Social Media platforms make the retrieval of valid, robust information from Social Media data very difficult. Such difficulties are particularly important to consider given the propensity for the museum staff that collaborated upon this research to use data to try and confirm their biases about their work: any information that was not valid, in particular because it may have been based on unreliable data that human beings found

ambiguous, would have increased potential to mislead museum staff, particularly as far as statistics generated using unreliable data were concerned.

Finally, the research has indicated risks related to that the way in which information from Social Media data, organised around the concept of inspiration as defined by museum staff, could so easily be included in museums strategic planning and evaluation activities. This risk manifests itself in the potential over-dependence upon particular Social Media platforms to contribute to important decisions at a time when those platforms are not necessarily stable in terms of functionality, or business continuity. Recommendations regarding these issues are included in the Conclusion.

10 CONCLUSION

10.1 How this research met its aim and objectives

The aim of this research was to establish whether Social Media could provide museums with valuable information regarding whether their activities inspire their visitors. There were five related objectives, as described in Section 1.3 of the Introduction. This section of the conclusion examines each objective in turn and describes how the research met it.

The first two objectives were:

1. To understand how museum practitioners defined the process of inspiration in relation to visitors.
2. To ascertain how the ways in which visitors' inspiration, as understood by museum practitioners, might apply to the day-to-day work of museums.

The decisions to conduct an initial consultation exercise with practitioners and to use Action Research in collaboration with museum staff were motivated by these objectives. Such close collaboration with museum practitioners meant that the definition of inspiration evolved through four iterations, which are listed in Table 23 in Chapter 8. The key activities that enabled this evolution were:

1. The Literature Review: in particular its focus upon the nature of inspiration as a subjective experience consisting of emotion and cognition (see Chapter 2 Section 2.2.1). Also, investigating the broader social processes caused by inspiration among members of the public provided insight into the changing role of museums (Chapter 2 Section 2.4).
2. The initial consultation with museum practitioners, during which museum staff confirmed the importance of the cognitive and emotional aspects of inspiration as they defined it (Chapter 4 Section 4.2.1). Three further aspects were also added to the museum staff's definition (Section 4.2.2). These were: the importance of change in the individual being inspired, that inspiration has a creative output of some sort, and the idea that inspiration might build slowly during a set of linked experiences. It emerged that the combination of cognition, emotion and creativity was particularly important to Derby Museums, and can be related to Bloom's Taxonomy of Educational Objectives (Bloom et al, 1956).

3. The prototype development during ARC2. This was the stage of the research where the definition was most put into use, via Frames from the FrameNet lexicon that related to cognition, emotion and creativity (Chapter 6 Section 6.4.1). Using these, Social Media data in relation to two museum events were organised according to the potential expressions of inspiration they contained. Evaluating the output from the prototype to assess its usefulness to museum staff also provided another opportunity to consider inspiration in detail with museum practitioners, and the conclusion was that even more emphasis should be applied to creativity, both in terms of the creative process, and the creative output of inspiration. The cyclical nature of inspiration, which was referred to in the Literature, also came to the fore.
4. The final change to the definition came at the end of the EW with staff from Derby Museums, the output of which formed the basis of Chapter 8. This resulted in a subtle change to the definition of inspiration that reflected the *initial* role of emotion as an attracting force; as the first stage of the ongoing cycle between emotion, cognition and creativity. This was referred to in the Literature, in particular by Gross, Pinker (1998) and Connolly (2002), but discussions with Derby Museums about how they actively encouraged an initial emotional reaction in their visitors highlighted that museum thinking was coming into line with these ideas. That said, some of the opinions given by practitioners in the consultation (in particular Curator 1) regarding playing to the emotions of visitors also indicated that this approach was considered controversial in some quarters.

An understanding regarding how museum staff defined inspiration in ways that applied to their daily work is one of the key contributions this research has made, and hence will be discussed further in Section 10.2.1 below.

The third, fourth and fifth objectives of the research concerned:

3. To work with museum staff to design, adapt and evolve a prototypical computer system with which to capture relevant, valuable evidence of inspiration from Social Media.
4. To work with museum staff to evaluate the visitor information, potential expressions of inspiration and information about the potential impact of museum events upon their audiences, captured by the prototype systems developed to fulfil Objective 3. This information is to be evaluated primarily in terms of its relevance to the work of museum staff.
5. To evaluate methods by which the evidence of inspiration captured by Objective 3 above could be disseminated.

Objective 3 was met by the development of three prototypes across three separate cycles of Action Research. The decision to organise the research in this way was due to the realisation that it would be better to explore more options and consider the problem in more breadth, than to focus upon one aspect of Social Media information in depth. Taking the latter option would have reduced the number of opportunities to find strategic uses for Social Media data by museums and their staff, and also the number of opportunities to observe how the museum staff interpreted the information provided by the prototypes.

Objective 4 was satisfied because the prototypes for ARCs 2 and 3 in particular involved evaluation activities that provided opportunities not only to consider the potential of the prototypes, but also to examine two of the deeper underlying concepts being explored by the research:

1. ARC2 involved an annotation exercise with staff from Derby Museums (see Chapter 6, Section 6.4.1) that provided an opportunity to consider the topic of inspiration in depth with those staff, in continual reference to data from Twitter. The definition of inspiration was changed as a result, as described above.
2. ARC 3 involved using a spreadsheet of Twitter data as a 'performance tableau', as per the processes of Multi Criteria Decision Analysis (see Chapter 7, Section 7.4.1). This provided an opportunity to investigate the degree to which the staff understood the processes at work within Twitter, and concluded that there were subtleties to such processes that effected their understanding (and that of the researcher), in ways that could potentially cause erroneous conclusions about information based upon the data to be drawn (see Chapter 8, Section 8.4).

Two important, related finds made when meeting objectives 3 and 4 concerned the topics of the underlying unreliability of the Twitter data handled by the prototypes, and a general tendency for the museum staff to seek to confirm positive biases about their activities with the data and information from the prototypes (see Chapter 9 Section 9.2).

Objective 5 was met during the evaluation workshop for all three prototypes conducted at the end of the research phase. This provided an opportunity to review how and where information from the prototypes might be disseminated, by evaluating charts and visualisations based upon the Social Media data collected and analysed. This was supported by the follow-up work conducted during the final Evaluation Workshop, when the museum staff helped create a conceptual framework regarding how Social Media data might be used strategically, in the form of a quadrant upon which activities

are organised with audience development and engagement activities along one axis, and planning and evaluation activities along the other (see Figure 21in Chapter 8).

10.2 The contributions this research made

This research made contributions to the body of knowledge in six ways, relating to three fields of study. In the field of Museum Studies, the research established how inspiration is defined by the museum sector. The UK's Museums Association used "inspiration" in the definition of museums, but, given how the term is such a core part of this definition, there was little if any explicit discussion of its meaning in the Museums Studies literature (see Chapter 9, Section 9.1). The closest the Literature came was the discussion of the near synonymous, but slightly different term *engagement*.

The second contribution in relation to Museum Studies was one of the first analyses of the strategic use of Social Media data in museums. This contribution increases understanding of the opportunities relating to the relatively new source of data that Social Media provides, in terms of how Social Media information could be used for planning and evaluation of audience engagement and development activities (see Chapter 9, Sections 9.3. and 9.4). This contribution differs from other research in this area because the research was conducted from an Information Systems perspective: the use of the SSM and the POM model to structure the analysis resulted in findings that were more holistic than other studies of Social Media use in museums, with a perspective upon some of the risks and hidden effects of the use of Social Media information that had not been discussed previously.

The third contribution to Museum Studies concerns the relationship between Social Media data, the information that can be derived from it, and the ways in which then museum staff with whom the research was conducted approached it. This is where the most problematic and challenging set of findings was uncovered (see further discussions below).

Two related contributions to different fields were also made. In the field of Information Systems, the research enabled a proposed update to the POM model from the SSM to reflect how the ubiquity of Social Media has altered the model's Information System to an *Information Medium* (see Chapter 9, Section 9.5). And in the field of Computational Social Science, the research revealed further, under-considered areas where bias might affect automated analysis systems using IR or machine learning techniques (particularly in a cultural context), and gathered further evidence of the constraints that

the systems and processes of Social Media data production, management, capture and analysis place upon the information that can be derived from it (see Chapter 9, Sections 9.2.1 and 9.4.3).

These contributions are considered in more depth below.

10.2.1 Contributions to Museum Studies

The contribution that underpins many of the other findings of this research is the increased understanding of the way museum staff define inspiration. The final 'museum-friendly' definition of inspiration was:

> *A cyclical, mutually supporting combination of emotion, cognitive thought and creativity, caused by an experience or series of experiences, and leading to the expression, enactment and further adaptation of fresh ideas.*

The Literature Review established that this definition was similar to 'engagement' defined for the marketing domain (Brodie et al, 2011), with the crucial difference that the marketing definition is less prescriptive about the resulting behaviour caused. However, in the museum sector, it is the specific *expression, enactment and further adaptation of fresh ideas* that is the most welcome outcome. Museum practitioners would like their visitors to *create things* as a result of emotional responses to, and knowledge gained from, their museum visits, though like the marketeers, they are not prescriptive about *what* exactly is created – the cliché would suggest 'a painting' or 'an article' but 'a new business plan' would be equally acceptable according to Derby Museums' staff. They would also like this activity to continue across multiple museum visits, with the creative output building steadily, and causing longer-term, positive changes to the wellbeing of the inspired visitors in question.

The best indication the research uncovered that the definition was relevant to museums was that Derby Museums had already developed their own 'head, heart and hands' model (Derby Museums 2014B) outside of the influence of this research. This organisational scheme is most likely influenced by the root level organisation of Bloom's Taxonomy of Educational Objectives (Bloom et al, 1956), and should be considered a traditional way of thinking about how people learn that is far from being unique to museums. Discussions with museum staff indicated that defining inspiration as a combination of emotion, cognition and creativity could allow a curatorial team to work in a way in

which both the curators spoken to as part of the consultation exercise said they liked to work: by looking at the collection *first* (see Chapter 4, Section 4.2), and then applying the appropriate balance of emotion, cognition and creativity to their exhibition design activities. Indeed, the strategic framework developed with staff from Derby Museums as part of this research, discussed in Chapter 9 Section 9.4, went further by suggesting the balance of heart, head and hands could also be used to develop a target balance, to cross-reference with data captured for evaluation. One further indication that emotion, cognition and creativity were appropriate as core aspects of a definition of inspiration could be seen in how well the relevant psychological constructs defined in FrameNet mapped onto the museum staff's understanding of inspiration.

Another discovery related to the definition of inspiration concerned the way that the emphasis upon creativity within the definition increased during the period this research was undertaken. This can be related directly to two related factors:

1. The turn against using the museum as a debating chamber by the public, as discovered by the UK Museums Association's Museums 2020 survey into visitors' uses of museums (BritainThinks, 2013A).
2. The relationship between creativity and wellbeing, discussed most emphatically by Carey (2006), who describes what he considers the dangerously inappropriate way in which art was made "sacred" (with museums as "temples"); with the result that direct participation in natural, creative activity by 'ordinary' people was discouraged throughout society by labelling it amateurish.

It is a distinct possibility that increased emphasis upon the creative aspect of the definition may have been symptomatic of the move from the former of these ideas towards the latter by the museum sector, particularly as the visitors that contributed to the Museums 2020 survey also stated that they saw the improvement of wellbeing as an important part of the role of museums.

Regarding contributions with more direct, immediate impact upon the museums sector, the research uncovered the two areas where Social Media data could be useful to museums. Firstly, Social Media users' descriptions of themselves and their interests could *potentially* be used to help generate 'special interest' audience segments such as those described by Black (2005) (See Chapter 9, Section 9.3.1). However, this conclusion comes with the proviso that the descriptions used to indicate a 'special interest' were 'Twitter biographies', and were therefore over-simplifications (or complete fabrications) of what such users were *really* like. Indeed, these 'Twitter biographies' can only safely be regarded as 'pieces of text containing potential expressions of interest about a topic',

but the risk of using such text is that the temptation to consider clusters of 'Twitter biographies' as clusters of 'photographers' or 'gardeners' is very strong. Secondly, the ability to automate the process of Social Media data-gathering and time-stamp the changes in state of the 'social network' and the content visitors created about museums also allowed the development of time-serialisable information that museum staff could correlate back to events that had taken place in the museum. This gave them an insight into the impact of their events that they had never had before, but an insight that was tempered by the aforementioned temptation to read more into the data than it was safe to.

More broadly, the research helped the staff from Derby Museums consider ideas of 'community' and 'audience', and the relationship between these two phenomena, in new ways (see Chapter 9 Section 9.3.2). The key activity the museum staff undertook for ARC3 in particular was the assessment of their familiarity with those Twitter Users that had interacted with their events on Twitter, and the most useful output from that exercise was an understanding of how useful the process of tracking changes in the state of 'relationship familiarity' might be in terms of indicating a potential strengthening of, or at least changes in the nature of, the community around the museum. This relates closely to the concepts that underpin CRM systems, though how exactly 'customers' are defined in the context of museums that are free to enter is problematic (see also Further Work below). In fact, the conclusion of this research is that Twitter did not give the staff enough information about particular visitors or audience members to be able to judge their level of familiarity with the museum and its staff reliably – a 'CRM' system of some sort, that might have Social Media data linked to it in some way, would be necessary to provide the richness of data required to draw this type of conclusion about a visitor relationship, though even then, careful modelling of the concept of a 'relationship' in relation to this richer data set would be required.

The other main contribution of this research was the strategic framework regarding the uses of information based upon Social Media data in museums. Strategic use of Social Media information in museums was a new topic to which only one other comparable contribution was found, that of Villaespesa (2013, 2015). The core difference between this work and Villaespesa's is that this research uses the POM model as the framework with which to consider a more holistic appreciation of the potential strategic impact of Social Media information in museums, framed from an Information Systems perspective. This contribution is highlighted with reference to Davies and Heath (2013), who note (disapprovingly) that often the principal purpose of evaluating museum activity is to prove evidence of ROI to funders. While this is *one* of the strategic uses of information based upon Social Media data described in Chapter 9 Section 9.4, there are many more uses that focus

upon the continuous improvement of the museum itself, and the use of Social Media information in feedback that could help staff improve their daily work.

This leads to the final conclusion with regard to Museum Studies, which it is *vital* to consider in the light of those contributions described throughout this section thus far. This research concludes that Social Media data is *potentially* a rich source of information about museum audiences and visitors, and their reactions to events. However, the research also concludes that data from Twitter in particular tends towards unreliability: the low levels of consensus between the staff and researcher about what a significant number of Tweets actually *meant* indicated that statistics based upon automated analysis of such data, by the prototypes produced during this research at least, were not reliable enough to be trustworthy. This unreliability is likely to extend to any other system that generates statistics based upon Twitter data, unless those systems have a valid, plausible description of the test-set annotation process used to train and / or evaluate them, and reliability measures that indicate the level of consensus and understanding of the data achieved by the annotators (see Recommendations below). Further in relation to this conclusion, this research shows that museum staff are highly positively biased towards their work (as indeed the researcher was, too), and that these biases, in combination with the unreliability of the data, present a clear risk that Social Media data, if not handled properly, could present an opportunity for staff to confirm their positive biases at the risk of missing important other information (see Chapter 9 section 9.2). If museum staff are to integrate information about their relationships with visitors into their daily activities productively, in ways that encourage continuous learning and improvement, then they need to better understand how their biases affect these learning opportunities.

10.2.2 Contributions to other fields

Another area in which this research contributed is to the body of knowledge concerning the use of Social Media data as a potential source of information about human behaviour, in museums in particular, but this also applicable to Computational Social Science more generally. In particular, the research uncovered findings related to the negative aspects of the use of Social Media. Regarding the topic of Social Mediation (see Chapter 8 Section 8.4), the literature focused on the ways in which complex social processes are often simplified (Karpf, 2012; boyd and Crawford, 2012): e.g. the way Facebook simplifies the concept of friendship, or the idea that 'an edge in social network' could be created merely by clicking a 'follow' button in Twitter. The literature also discussed the underlying

commercial imperatives that have caused the big platforms to create these sorts of simplifying technology (Lovink, 2013; van Dijck, 2012). However, this research uncovered two further causes of Social Mediation:

1. ARC 3 uncovered the existence of legacy data structures in the Twitter API, and the poor documentation of such structures (see Chapter 7, Section 7.6).
2. The evaluation workshop of all three prototypes also discussed changes to the user interface of Twitter, changes that caused a new form of user behaviour, that had no official documentation in the API, but which were instead being discussed by the 'developer community', from a variety of differing viewpoints and with various mental models on show.

These forces, related to the design, maintenance, documentation and change control of Social Media platforms, similarly had the potential to change the meaning of information derived from Social Media data, but were not discussed by the literature reviewed.

Another factor that could cause Social Media information to be misinterpreted was the impact of bias. Bias *is* discussed in the literature related to Computational Social Science; e.g. Tufekci (2014) and boyd and Crawford (2012) both discuss the biases inherent in the demographics that use particular Social Media platforms. However, one factor that could cause bias that was not considered in the literature reviewed was that placed into the system by experts annotating test reference sets (see Chapter 6 Section 6.6). The biases uncovered during ARC2's annotation work - namely that the annotation was being conducted by people who had themselves been inspired by the same event to which the content they were annotating related – raised similar issues to the literature related to cultural evaluation – Graham's discussion of the Arts Council's Peer Review Pilot (2009) being a good example (see Literature Review Section 2.4.5). This is discussed in more detail in Section 10.3 below. As previously discussed at the end of the previous section, these biases were exacerbated by the observed unreliability of data from Twitter in particular.

The potential impact of Social Mediation was also illustrated by another contribution this research made outside of museum studies, namely the proposed update to the POM model from Checkland and Holwell's *Information, Systems and Information Systems* (1998). This research shows how the formal Information System, that used to sit to one side and support a few key aspects of the meaning making process, had (thanks to Social Media, and the ubiquitous apps that allow access to it) become central to the whole meaning-making process, and even more fundamental parts of meaning making such as the discourse undertaken by individuals and groups in organisations, or the perception of reality itself, could be directly affected by it. The updated POM model (see Figure XXX

in Chapter 9 Section 9.5) therefore redefines the Information System as an *Information Medium* that is more central to the model.

10.3 Recommendations

The following recommendations can be mapped onto the contributions related to the definition of inspiration for museums, the increased understanding of information based upon Social Media data, and the strategic use of such information in museums.

The following recommendation for museum staff and related researchers can be made in relation to the definition of inspiration:

> *R1: Visitors' creative responses to museum events often contain potential expressions of inspiration that can contribute to an assessment of event impact. If one of the key outcomes of a museum event is a creative response by visitors, then planning how to evaluate that event should include some consideration of the type of creative output, the media such output is likely to be produced with, how such output could be captured and, where possible, what exemplary content might look like.*

The ideas behind this recommendation are discussed in Section 9.1.2 of the Discussion in relation to Leicester University's *Mind, Body, Spirit* project (Dodd and Jones, 2014). Encouraging event participants to produce some form of creative output might result in additional sets of evidence that could be used to investigate the impact of the museum content specifically, in combination with any noted increase in wellbeing – which could otherwise be the more general result of the event in question occurring, and the levels of interest being taken in its participants by the researchers.

This is not to say that it is reasonable to anticipate exactly what sort of creative output visitors are likely to produce: as mentioned in The Happy Museum project's key paper: "Museums may be surprised to find that they have as much to learn from their audience as the audience does from them (Thompson et al, 2011: p5)." However, dealing with such unexpected outcomes becomes easier once the mind-set related to evaluation changes from one of accountability to one of continuous learning and improvement. When staff consider themselves the first customers of their evaluation, tests that 'fail' because they return unexpected outcomes are actually considered more

valuable, as it is via these unexpected outcomes that greater learning opportunities arise. This leads to the second recommendation:

> *R2: Museum staff should be aware of their unavoidable tendency to approach their work positively, and take steps to account for it by reflecting critically upon how it alters their perceptions of visitor feedback.*

Several of the key museum staff that this research was conducted with were aware of the issue (for example, Chapter 8 Section 8.2 discusses how Derby's Head of Museums recognised the effects of the 'back story' that he often took into evaluations), but more formal training and learning about this topic in organisations, like Derby Museums, that emphasise the importance of working closely with visitors and responding to their feedback is required if opportunities to learn genuine lessons from such feedback are not to be missed. In particular, the importance of incorporating negative testing strategies, and alternate hypotheses, in evaluation work should be emphasised.

In relation to the contributions this research makes towards a deeper understanding of the use of Social Media information in museums, the following recommendations are made:

> *R3: Museums need to better understand both the importance of statistical reliability and the effects of Social Mediation in order to work with Social Media information more effectively.*

As a basic example, the number of 'Likes' a museum's Facebook page gets does not equate exactly with the number of Followers they have on Twitter, as the processes of 'Liking' and 'Following' have many differences. Indeed, following Karpf (2012), it is safe to say that 500 Facebook 'Likes' received in 2015 do not equate with 500 'Likes' received in 2009, as the underlying demographics of Facebook users will have changed. Hence, according to Karpf, the good practice of noting which sources data came from, and the impact upon the information which the source imparts, is even more important in a Social Media world of information dashboards and fast access to statistics. This research has also revealed the importance of only trusting statistics based upon automated systems where there is a high degree of consensus among human beings about what the underlying data actually meant. This leads to the fourth recommendation:

> *R4: Museums should refrain from trusting statistics based upon systems that retrieve information from Social Media text (such as Sentiment Analysis tools), unless the providers of those tools are explicit about the ways in which training /*

testing data sets have been annotated, and the levels of inter-coder reliability achieved by the annotators.

This recommendation applies to statistics in particular. It is safe to use systems that merely enable search, sorting and filtration of text for qualitative analysis, but systems that suggest, for example, "a 10% increase in expressions of happiness" are only trustworthy if there is convincing proof that the people who annotated the data with which the tool was tested agreed consistently that such expressions were observable. This leads to recommendation 5:

R5: If the opportunities to automate (or at least semi-automate) analysis of data from Social Media are going to be realised safely, museums (and the wider cultural sector) should collaborate upon standard methods and approaches to underpin such automation.

This recommendation suggests that those in the cultural sector ought to work together to try and produce reliably-annotated testing sets for retrieving information about cultural phenomena such as the constituent 'head, heart and hands' components of the museum-friendly definition of inspiration (see Further Work, below). Following Graham's discussion of the peer review pilot, such standardisation might be based upon the collaborative creation (and maintenance) of a standard, agreed "lexicon of inspiration" (for Information Retrieval systems based upon entity-linking), or a standard testing set of culturally-relevant data (for systems based upon machine learning). It could also be based upon an agreed, standard procedure for incorporating peer review into the annotation process, and measuring inter-coder reliability, should it be discovered that 'inspiration in the cultural sector' is too heterogeneous a subject for a manageable lexicon to cover.

R6: Museums should implement Information Systems that allow them to better understand, and account for, the natures of the relationships they have with their visitors, and how these relationships change over time.

The basis of each museums' set of Social Media presences is a set of relationships between the museum and its community and audience members. ARC3 indicated the core value to the museum of understanding these relationships in more detail, hence the sixth recommendation builds upon Lilley and Moore's recommendations (2013) about improving relationship management in the cultural sector. However, with regard to the ARC3 prototype, 'levels of familiarity' were scored in a very unreliable way. A key research question for further investigation of CRM for museums concerns the use of such software in 'customer-free' contexts (see the section on Further Work below).

Finally, with regard to the strategic use of information from Social Media data in museums, this research resulted in two recommendations.

> *R7: Museums (indeed all organisations) should be wary of an over-dependence upon any one particular Social Media platform.*

This recommendation contradicts the advice given by Visser and Richardson (2013), who recommend minimising the number of Social Media channels used. Their recommendation is made because they are aware of the effort involved in the proper maintenance of a Social Media channel, and the advice is offered in the justifiable spirit of trying to minimise the use of stretched resources in underfunded museums. However, basing all the effort of staff upon one dependency also represents a risk that their efforts may one day be wasted, should that platform fail. A compromise between these two approaches would be to explicitly decide upon indicators regarding whether a specific Social Media platform might be experiencing difficulties. Such indicators could be negative press reports, lowering share prices or profit warnings, or indeed the behaviour of community and audience members that use those platforms. Following this latter approach might at least give a museum some warning that they might need to adjust their Social Media-related procedures, or start experimenting with other platforms.

The second strategic recommendation, alluded to above, is to follow the advice discussed in Davies and Heath (2013).

> *R8: Museums should move away from an accountability model of evaluation to one in which the first customer of the evaluation is the museum and its staff.*

There has been a growing understanding in the IT development sector for some time that evaluation of work is most valuable when it is an honest (and blame-free) process of improving one's working practices (Schwaber, 2004; Crispin and Gregory, 2009). Museums should follow suit: and this means accepting, and indeed welcoming, those times when the information gained from evaluating ones performance tells you something unexpected, and seeing it as an opportunity to learn. Making this shift would allow museums to unlock the rich variety of opportunities to incorporate Social Media information, and information from other sources too, into their audience development and engagement activities.

10.4 The limitations of this research

The first and most obvious limitation of this research is the researcher's own positivity towards museums, and also (to a lesser extent) technology and Social Media. The fundamental way this manifested itself was in the focus upon the topic of 'inspiration', which, while it might have some negative connotations in certain contexts (e.g. inspiring people towards negative actions such as violence or anti-social behaviour), is generally a positive construct. That the actual word 'inspiration' is used in the UK Museum's Association's definition of what a museum is (The Museums Association, 2014) can be considered an indication of how positively the museum might think about itself. However, it is also worthy of note that, in the case of the data collected for ARCs 2 and 3 in particular, thinking about the role of museums positively actually resulted in finding a lot of potentially relevant information. In other words, it seemed from those two ARCs that Social Media data might lend itself to the types of *Positive Testing Strategy* described by Oswald and Grosjean (2004). This in itself is not completely problematic, as long as the forces of positivity at work are noted, recognised and accounted for.

This research was further limited by the small number of museums and their staff collaborated with. This effected the ability to make general conclusions about the findings, and was further exacerbated because Derby Museums, with their particular approach to co-creation of content and human-centred design, were a key collaborator. However, a factor that mitigates against this limitation was that Derby Museums were open about their approach and made the key documents that describe it publically available (Derby Museums, 2014A; 2014B; Rippleffect, 2015, 2010). These documents should be used to gain a sense of the broader context within which the strategic use of Social Media information sat. However, these limitations upon generalisation could be further overcome if a broader survey of the uses of Social Media information in museums was conducted with which to cross reference the findings of this research (see the Further Work section below).

Another limitation of this research was that only data from Twitter was used, partly for the ethical reasons described in Chapter 3 Section 3.6. This limited the capacity of the research in ways that actually formed some of the findings of the research itself; related to the mediation of the Twitter platform - in particular, the effects that Twitter's 140 character limit had upon the syntax of Tweets, and the degree of meaning that can be ascribed to 'Twitter biographies'. Tufekci (2014) provides a useful discussion of this topic, which this research serves to support.

Another limitation concerned the risks to the research caused by its collaborative nature. This risk manifested itself when the original collaborators for ARC1 left their museum while the research was underway. While this situation was rescued to a degree (because evaluation of the information output by ARC1's prototype was undertaken by the Derby Museums staff using freshly-collected data), this unfortunately meant that the Information Retrieval performance of the prototype was not evaluated in the same depth as for the prototype created for ARC2. With hindsight, it is possible to say that the type of collaborative AR undertaken by the researcher was always going to be vulnerable to potential disruption of this nature, given that museums were expected to work on the project for free. However, the benefits in terms of producing meaningful research incorporating input from real-life museum practitioners, as opposed to only studying the mechanical aspects of the system, meant that there were no regrets on the part of the researcher regarding adopting a field-based, AR method. However, one learning point might be that future attempts to conduct research in this way might include a budget for compensating collaborating organisations, or indeed involve the collaborators from the project's inception.

One further consideration regarding the limitations inherent in a study of Social Media is that some of the findings of this research are likely to date rather quickly. To illustrate this point, during the writing up phase of this research, Twitter's then CEO Dick Costolo was forced to resign, and press rumours indicated that his replacement, the returning Jack Dorsey, was considering staff cuts to 'increase efficiency' (Ray, 2015). More broadly, the entire Social Media landscape changed significantly while the research was taking place due to the revelations made by the whistleblowing US National Security Agency employee Edward Snowden, revelations that culminated in a court action in the European court of justice. At the time of writing this conclusion, the legal position about the use of European citizens' data by Facebook and other major US technology companies was subject to major change (Naughton, 2015). This thesis is written in the hope that there are certain fundamental conclusions to this research, such as those relating to the need to understand the forces at work within Social Media, which will stand the test of time regardless of the exact changes that occur to specific platforms and technologies.

The final limitation of this research concerns the nature of the prototypes created for the three Action Research Cycles. These prototypes were each designed with a breadth of topic exploration in mind, as per the AR / DS methods discussed in Chapter 3 Section 3.4. Furthermore, the computing techniques used in the prototypes were chosen to ensure the maximum amount of exploration of the topic *with museum staff*; e.g. involving techniques such as:

1. The annotation of test data sets (see Chapter 6 Section 6.4.1), which ensured that the topic of inspiration was discussed heavily with museum staff while referring in detail to samples of Social Media data that related to museum events.
2. The MCDA performance tableau analysis (see Chapter 7, Section 7.4.1), which enabled detailed exploration of the museum staff members' understanding of Twitter, and helped explore the topic of what activities information from Twitter might be able to support.

The point of the prototyping work, therefore, was to cause changes to the Information Systems within the museum, and examine those changes. It was *not* to create flawless working systems; indeed, by definition a prototype should never be even close to flawless. The low F Measure recorded in ARC2 (see Chapter 6 Section 6.5.1) stands as testament to this – a considerable amount of further work (discussed in Section 10.5 below) would be required before any of the prototypes could be considered usable. However, the strategic framework produced in Chapter 8 at least provides some clear indications of where to start such work.

10.5 Further work

Perhaps the most pragmatic piece of further work that would build upon this research would be a survey of the ways in which museums use information based upon Social Media data. Given that tools such as Google Analytics are starting to make the links between website usage and Social Media channels more explicit, and the built-in analytics tools in Facebook and Twitter have become more sophisticated, such a survey is more than likely underway. The output might be something as useful as the second Culture 24 *Let's Get Real* report (Malde et al, 2013), which explained how museums were using their web analytics, and would provide much-needed breadth to research such as this, and that of Villaespesa (2015, 2013).

Further direct support for this research could be gathered quickly by undertaking an IR performance evaluation (i.e. generating an F-Measure) and a data reliability evaluation related to the information about potential expressions of interests in topics contained in 'Twitter biographies'. This exercise would better establish the potential for Twitter follower data to contribute to audience segmentation work in museums.

Similarly, another piece of work that would build upon this research immediately would be to conduct another entity-linking exercise between a set of museum-related Tweets and FrameNet

Frames related to emotion, cognition and creativity. This research could attempt to improve the F Measure reported here in two ways: firstly, by using a more Social Media-friendly vocabulary, i.e. by using an updated set of Lexical Units taken from Twitter itself. Secondly, the annotation scheme for a test reference set for the automated system should not be based upon the complex psychological construct of 'inspiration', but instead upon the simpler, constituent parts of the model; i.e. by asking the annotators:

1. What has the Tweeter felt?
2. What the Tweeter thought?
3. What has the Tweeter made?

The result of this work might be an Information Retrieval system that is more effective at finding evidence of inspiration than the one produced during ARC2, and one in which there is a more reliable inter-coder consensus regarding the meaning of the content.

However, such a Computer Science project as that described above would still require more input from Information Science, and Museology, and the Social Sciences, in order to ascertain whether or not such a system could genuinely provide robust evidence of value to the cultural sector. This work relates directly to the recommendation made in Section 10.3 above regarding a standard process of automation for retrieval of digital evidence for cultural evaluation. The value of an Information Retrieval system for such evidence would depend upon answers to research questions such as:

1. Can a standard lexicon of inspiration be built? If so, is it just applicable to museums, or to culture more broadly?
2. Similarly, can a standard training set for the retrieval of evidence of inspiration be developed?
3. Can such a training set be annotated with a high-enough level of inter-coder reliability to enable statistics related to the data to be worked with confidently?
4. Which of the two approaches above would be the most effective? This would need to consider the processes and effort required to maintain the standard lexicon / training set as both culture and Social Media changed.
5. How can bias be accounted for? (In particular positive confirmation bias on the part of museum staff). Could the processes of peer review (e.g. Visit England, 2015) be incorporated into the selection of Lexical Units, and / or annotation processes, for example?
6. How does the mechanism of defining a standard set of tools for automating Information Retrieval compare with defining a standard *process for developing those tools*, should it

become clear that the heterogeneous nature of inspiring cultural activity makes standard tools unfeasible to develop?

Finally, given the importance of 'Customer' Relationship Management discovered during ARC 3, and highlighted by Lilley and Moore (2013), research could also be undertaken to consider what 'customer' relationship management in a sales-free museum environment actually entails. Two possible directions for such work to take might be:

1. To implement the *DMA Friends* system, a platform that 'gamifies' a museum's relationship with its visitors and hence builds a relationship around engaging activities, rather than commercial transactions (Stein and Wyman, 2014).
2. To connect a graph of museum visitor data from Social Media, segmented by 'special interest' as per ARC 1, to a graph of museum collection data, such as that produced by Tyne and Wear Archives and Museums to help visitors browse their collection by following semantic edges between nodes made up of collection items (Tyne and Wear Archives and Museums, 2015). This would be much like the attempt made during ARC 1 to cluster Twitter followers around data from ConceptNet, but using museum information exclusively, rather than a more general knowledge base.

10.6 Closing comment

The final comment to be made at the conclusion of this thesis concerns the topic of debating in museums, and the switch in focus noted in the literature away from the potential role of museums as democratic facilitators to places that can improve individual wellbeing. This switch was underpinned by the UK Museums Association's public consultation as part of their Museums 2020 project, in which the members of the public with whom they consulted came out strongly against the use of museums to examine controversial debating topics, and strongly in favour of museums being used as places to relax, relieve stress, and build upon one's personal skills and knowledge. This report had been taken on board by many of the museum practitioners consulted in the initial consultation, and as Chapter 4 Section 4.2.1 shows, one practitioner was strongly in favour of it, describing how: "… a lot of bigheads in the museum world got upset" at the conclusions the report drew about debating in museums.

This thesis ends with a proposition. It is a proposition based upon the understanding that the Museums 2020 survey (which relied heavily on qualitative data obtained using focus groups) represents one snapshot in time; an indication of how the museum-visiting public in the UK felt about museums in 2012 – 2013, when the survey was conducted. The proposition concerns the idea that public support for the ways in which museums might *serve the individual*, as opposed to how museums might *serve society*, is a snapshot of public opinion very much of its time, from an individualistic society obsessed with fame, gossip, and the conspicuous behaviour of celebrities.

The proposition goes further, however. Turning attention back to Social Media, and back to Twitter in particular: is it not the case that Twitter, too, is a Social Media platform very much from the same time and place as the Museums 2020 survey? Twitter is heavily used and endorsed by the same celebrities that society has chosen to focus upon. It is also a platform that makes it easy for all users to broadcast (or in most cases, narrowcast) their opinions, ideas and news about their activities, in the manner of 'oblique engagement' described in the Discussion Chapter (Section 9.2.4). The idea that Twitter provides an opportunity for the public to engage directly with museums is undermined by the evidence: for instance the figure reported by Villaespesa (2015), in which a set of 28 Tweets from the Tate gathered 836,339 impressions (i.e. they were downloaded nearly 850,000 times), but received only 79 replies (a response rate of 0.0094%). Notwithstanding that 79 Tweets represents a potentially useful qualitative data sample, this begs the question: do people, in the main, use Twitter to engage? Or do they use it more to publicise themselves, and their activities? In other words, is Twitter the perfect 'Social' Media platform for a culture that places the individual above the social?

If this is the case, then perhaps things might change in future. Perhaps a new Social Media platform might be conceived that is structured more around the type of debate envisioned by Habermas's Theory of Rational Communication? (See Section 2.2.2 of the Literature Review). Knowing the speed at which the Social Media world works, perhaps the basis of such a platform already exists. Perhaps this platform might provide a means by which positive, democratic debate could take place, by being a place that allows creative, spirited, reflective, *passionate*, but *rational* debate, based upon valid, factual claims?

Perhaps the passionate, intellectual, knowledgeable, creative people who work in and visit museums might actually collaborate together to build such a platform?

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12 APPENDIX 1: ARC1 PROTOTYPE – HIGH-LEVEL DOCUMENTATION

As discussed in Chapter 5, ARC1 suffered from one of the key issues facing AR, namely that the work deviated too far from the underlying research questions in to areas related to museum's Twitter audiences, rather than retaining a focus on the core concept of inspiration. This resulted in a prototype that did more than is described in the main body of the thesis, incorporating three sub-systems:

1. A system for retrieving follower data from Twitter across an 'ego-centric' social network – (Scott, 2013) of cultural organisations: i.e. a network which focused on the cultural organisations in particular, and highlighted the relationships of those organisations specifically, rather than looking at all the relationships of every actor in the network
2. A system for analysing key terms and phrases within the 'Twitter Biographies' of the followers of the cultural organisations in the network, in order to generate potential 'special interest' audience segments (Black, 2005).
3. A system for visualising the information about the followers in the network and special interest audience segments.

This appendix covers each sub-system in turn and looks at three aspects: the requirements for the sub-system, the architecture of the sub-system (at a very low level of detail) and the logic for the sub-system.

12.1 Retrieving follower data from Twitter

The fundamental purpose of the follower data retrieval sub-system was to track the followers of a set of related cultural organisations (e.g. the cultural partners of Derby Museums), connect to Twitter on a daily schedule, and download follower information about each organisation.

12.1.1 Follower data retrieval requirements

The data retrieval part of the ARC1 prototype had the following functional requirements:

1. To retrieve follower information about each cultural organisation in the 'ego-centric' social network from Twitter.
2. To enable analysis of the overlaps between sets of followers, i.e. which followers of organisation A were also following B, to judge the potential benefits of being in a cultural network.
3. To update the relationship status of each organisation's followers on a daily basis, so that changes and trends could be tracked.

The sub-system also had to follow the following non-functional requirement:

1. To work within the free usage limits of Twitter's API usage requirements.
    a. This was because the system was designed to investigate how a small / medium sized regional museum such as Museum1, with limited resources, might use information based on Social Media data.

12.1.2 Follower data retrieval architecture

The follower data retrieval sub-system had the architecture shown in Figure 23. The components of the sub-system shown are described below:

1. The Twitter API Adaptor component connected to Twitter's API and retrieved two sets of information – the Ids of each organisation's followers, and full user information for those new followers who weren't already part of the network (see the section on logic below). The Twitter API Adaptor originally used the TweetInvi .Net client library (Imart, 2015), but was altered to use the Linq2Twitter library (Mayo, 2015) between the data collection for Museum1 and Derby Museums (see Chapter 5).
2. The Logic component contained the rules needed to track changes to the networks state such as new followers, unfollowers and so forth (described in the logic section below).
3. The Persistence component stored the new and updated follower information collected each day in a Neo4J graph database (Neo4J, 2013; Robinson et al, 2013), using Readify's .Net

client for Neo4J (Oddie and Derbynew, 2015). It also read the previous day's state into the system at the start of each scheduled data collection run (see the section on application logic below).

4. The console application enabled the system to be started from the Windows Command Line, which in turn enabled the system to be scheduled to run daily using the Windows Scheduler.

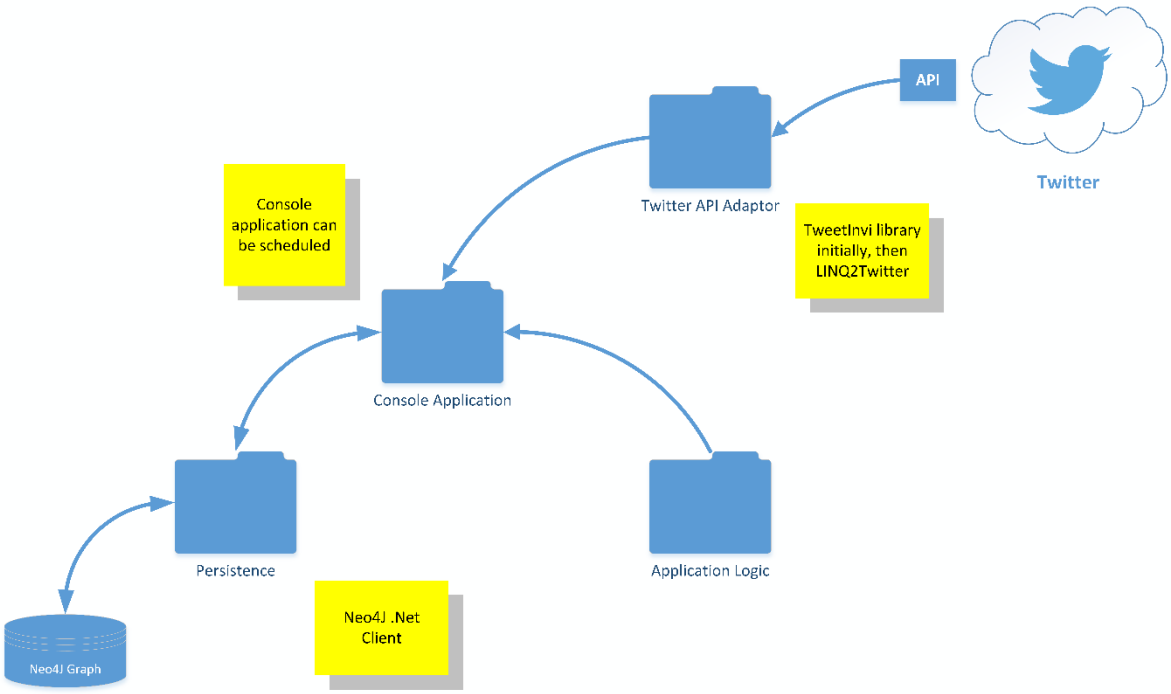

Figure 23 High-level architecture of the ARC1 prototype

12.1.3 Follower data retrieval logic

The basis of the logic for the follower data retrieval subsystem is the different categories of 'follower', shown in Table 24. These categories were placed in a C# enumerator and used to generate various lists of follower information for each organisation, based upon the previous day's network state (read into the system from the Graph Database at the start of the process), and the present day's follower information (retrieved from Twitter via the API).

Follower category	Description
Unchanged Followers	People that were following a given organisation on the previous day, and who were still following them on the present day.
Unchanged Unfollowers	People who had followed the given organisation at some point, but who were no longer following them on the previous day, and who were still no longer following them.
New Unfollowers	People who were following the given organisation on the previous day, but who had stopped following them by the present day.
New Followers From Another Organisation	People who had started following the given organisation on the present day, whose information was already in the graph because they followed one or more of the other organisations on the previous day.
New Followers From Unattached	People who had started following the given organisation on the present day, whose information was already in the graph because they used to follow one or more of the other organisations on the previous day, but who were no longer following any of them (hence being 'unattached').
Brand New Followers	People who had started following the given organisation on the present day, and whose information was not in the graph as this was the first organisation from the network they had started to follow.
Re-followers	People who had unfollowed the given organisation on some prior occasion, but who had started following them again on the present day.

Table 24 Logic of the Twitter relationship status update algorithm

Updating the state of the graph day-by-day was thus a process of using .Net's built-in list intersection and exception functions to compare various lists of followers. For example, the new unfollowers were derived from the exception between the previous day's followers for a given organisation, and the list of the present day's followers (i.e. those people who were in the previous day's list, but not in the present day's list, had unfollowed at some point between the previous and present day).

12.2 Generating potential 'special interest' audience segments

The next subsystem produced for the ARC1 prototype was used to generate potential audience segments 'by special interest' using the follower data stored in the graph database by the follower data retrieval subsystem. As part of investigating the technology relating to this subsystem, an experiment was conducted using the ConceptNet knowledge base (Speer et al, 2014; Havasi et al, 2007) to see if clusters of users around topics could be generated automatically (see Section 12.3 below for more information about this experiment). This section first considers the requirements for the subsystem, then discusses the architecture and the logical flow together in one section.

12.2.1 Requirements for generating 'special interest' clusters around concepts

The 'special interest' cluster generation subsystem had the following requirements:

1. To analyse the corpus of 'Twitter Biographies' of followers in the graph to find commonly-occurring concepts denoting "special interests" potentially expressed by the followers in question.
2. To order these areas of interest by the volume of users that potentially expressed them as an interest (i.e. to find the 'biggest' topics of potential interest).
3. To agglomerate potential topics of interest into bigger topics by generalisation (e.g. 'painting' and 'photography' could be agglomerated under the parent topic 'art and design'), to enable a more general picture of broader topic clusters.
4. To create clusters of Twitter Users around the topics in the graph database.
5. To analyse changes to the size of the clusters over time.

12.2.2 Logic and architecture of the audience segmentation subsystem

The 'special interest' cluster generation subsystem required a set of Natural Language Processing (NLP) techniques to be used (listed below, and shown in Figure 24). All of these techniques were enabled using the Apache Lucene indexer (Hatcher et al, 2010).

1. **NGram generation:** in order to find key referring *phrases* of interest, instead of single terms, the system needed to index NGrams (i.e. phrases of N words in length, such as the bigram 'Loughborough University') (Jurafsky and Martin, 2009).
    a. As Twitter was the source of data, hence all the 'documents' being indexed were Tweet length (140 characters), quad grams were the maximum length of NGram indexed (i.e. four words in length).
    b. A filter was also put in place to remove commonly occurring 'stop words' (e.g. 'if', 'of' etc). However, this filter was adapted to allow stop words in the middle of NGrams, thus phrases such as 'University of Derby' were indexed.
2. **Term Indexing:** once the correct indexing filter was in place, a system was produced to read followers' 'Twitter biographies' from the Graph Database and index the text (in the form of NGrams) into a central index.
3. **Term Frequency Analysis:** Lucene was then used to count the frequency at which the NGrams occurred across the entire corpus. There was no point in counting NGram frequency "per document" as the documents in question were 140 character Twitter "Biographies", so they rarely contained the same terms more than once. Terms and their frequencies were output as a Comma-Separated file and imported into Excel for further analysis.

The result of this processing was a list of all the terms used in the biographies of all the followers in the database. This list was then ordered by descending order of occurrence. For the purposes of the prototype, the decision was taken to extract some concepts initially "by hand" from the most-commonly occurring NGrams, though also with reference to the human-readable online version of WordNet (Princeton University, 2010), which was used to find hyponyms (more specific concepts related to the terms) and hypernyms (more general concepts).

Once conceptually-similar NGrams were linked to overarching concepts (such as creativity or nature), concept nodes could be generated in the graph database, and Twitter follower nodes in the graph could be linked to those concepts using creation statements in Neo4J's proprietary Cypher query language (Robinson et al, 2013). This created clusters of followers around concepts, and hence became the basis for the visualisation subsystem described in Section 12.4 below.

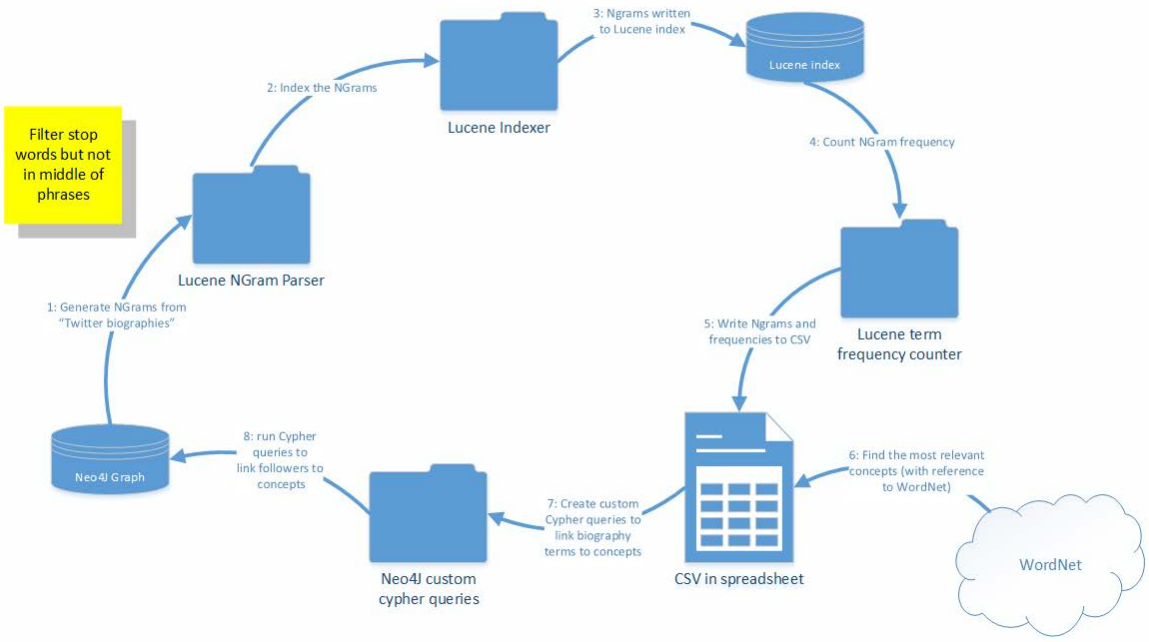

Figure 24 architecture of a system for automatically clustering 'Twitter biographies' around concepts from ConceptNet5

12.3 Auto-generation of potential audience clusters using ConceptNet and WordNet

The development of the 'special interest' cluster generation subsystem has three stages which had the potential to be automated. With reference to Figure 31 in the previous section, these stages were:

1. Finding the most relevant concepts (with reference to WordNet).
2. Creating custom queries using Neo4J's built-in query language (Cypher) to link biography terms to those concepts found in stage 6.
3. Using more Cypher queries to link the concepts to the Twitter followers than mentioned the related terms in their "Twitter biographies".

An experiment was therefore conducted to try and automate the generation of concept clusters by using the online knowledge base ConceptNet (Speer et al, 2014; Havasi et al, 2013), which consists

of data imported from a range of other online sources such as WordNet and DBPedia (DBPedia, 2015). ConceptNet then uses a straightforward relationship scheme to relate information from each source, with relationship types such as "HasA" or "UsedFor". The experiment consisted of trying to automate the process of generalising from specific terms in the Twitter biographies (the NGrams indexed in the process described above) using the ConceptNet "IsA" relationship type, e.g.:

- Derby IsA city

Extra NLP techniques were required for ConceptNet, because the concepts in the knowledgebase had been morphed using WordNet's Morphy algorithm (Princeton University, 2015). This meant that the following extra processes had to be enacted:

1. Part of Speech (PoS) tagging: to establish the senses of words used in followers' 'Twitter biographies'. E.g. the word "Tweet" can be a noun ("did you read my Tweet?") or a verb ("I'll Tweet you later"). This was conducted using the Ark Tweet POS tagger from Carnegie Mellon University (Owoputi et al, 2013)
2. Morphing: i.e. reducing a word to its common root. E.g. the nouns painting and painter have the root paint. Nouns, verbs and adjectives are morphed according to different rules, hence needing to establish the Part of Speech first. An implementation of the Morphy Algorithm in Java (Viveros-Jiminez, 2012) was employed for this step. A version of the biography with 'morphed' text was then saved back to the graph for each follower node, and NGrams were generated, terms indexed, and term frequencies counted for these morphed descriptions as per the audience segmentation process described in Section 12.2 above.
3. For the next stage of the process, each term that occurred more than six times in the database was looked-up in a local copy of ConceptNet that had been downloaded and stored in a MySQL database. Those terms that were found in ConceptNet were noted in a separate text file.
4. The terms from the Twitter biographies that did exist in ConceptNet were then used for a second lookup process, this time looking for those concepts that had an 'IsA' relationship (i.e. that could be generalised about) to another term. That more general term, along with the IsA relationship, was then stored in the graph database.

The consequence of running through this process was that concept clusters formed. However, the experiment was unsuccessful because the amount of irrelevant data contained in ConceptNet was overwhelming. This was principally because ConceptNet contained a large volume of data from DBPedia, which is in turn derived from Wikipedia. Thus false positives related to commonly-

occurring terms used as album, song, book or film titles often occurred. Thus the experiment was technologically successful (for a prototype), but failed to provide much usable information. However, there were some signs that better results might occur if a more relevant source of knowledge were to be used, the most likely source being a museum's own collection, which, if used with WordNet rather than the whole of ConceptNet, might allow links between visitors' Social Media data and objects to be made at a level of generalisation 'above' both sets of data.

12.4 The visualisation subsystem

The final part of the ARC1 prototype was the visualisation subsystem. At a high level, this part of the system created charts, graphs and other graphical forms of information to highlight the potential uses of the information that could be derived from the data collected by the follower data retrieval subsystem, and analysed with the audience segment generation system. This section follows the same pattern as the sections that describe those subsystems, by considering the requirements in more detail, then covering the architecture and logic at a high level.

12.4.1 Visualisation subsystem requirements

The requirements for this subsystem involved investigating the following types of information that could potentially be derived from the data about the cultural organisations' followers and 'special interest' segment data stored in the graph database:

1. General information about increases in followers over time, with a specific focus on the overlaps between followers of different organisations.
    a. In the case of Derby Museums, they had a number of different Twitter accounts, hence they needed to know which Twitter users in the graph followed more than one account, and whether following one led to following another.
2. More specialised information about the subsets of followers clustered by 'special interest' (or at least by *potential* special interest – please refer to the Discussion and Conclusion for considerations about whether keywords in a Tweet-length 'Twitter biography' genuinely constitute firm evidence of an 'interest' in a topic).

The result of these requirements was to create the following types of visual information, examples of which are included in Chapter 5:

1. Graphs showing trends in follower changes (see Figure 8).
    a. This includes graphs showing 'where followers came from' – i.e. which other organisation in the cultural network Twitter users may have been following first, before they started following the organisation of interest (Figure 9).
2. A matrix of follower overlap sizes at a given point in time (see Table 9).
3. Bar charts showing the sizes of segments at given points in time (Figure 10).
4. Graph visualisations produced using the Gephi visualisation tool (Gephi, 2015), showing:
    a. Clusters of followers related to special interest sub-segments related to Art and Design (Figure 11).
    b. Clusters of followers with a higher-level special interest in 'nature', further clustered around the cultural institutions they followed, and time-stamped to indicate which users were had joined the network more recently (Figure 12).

12.4.2 Visualisation architecture

The architectural approach to delivering the requirements varied according to the type of visualisation being produced:

1. Graphs, charts and the matrix of follower overlaps were produced (for this prototype) by generating figures using amalgamation functions built into Neo4J's Cypher query language, and then placed into Excel spreadsheets by hand. Certain additional processing (such as deriving the percentage figures used in the matrix) was accomplished using Excel functions. Charts and graphs were also produced using the built-in visualisation functions in Excel.
2. The process of generating the network graph visualisations in Gephi were more complex, as they required the development of a small system to convert data from Neo4J to a Gephi-friendly import language called GEXF (GEXF Working Group, 2009). The logical process for this small system is discussed in more detail in the following section.
    a. Note: there are a set of functions (or at least a *placeholder* for a set of functions) within the version of Gephi used for this project intended to enable direct import of data from Neo4J, but because Gephi is an open-source tool, that aspect of the

software was not fully-functional at the time of development of the prototype, and certainly not as well documented as the GEFX language at the time.

Figure 25 illustrates the relationship between the Excel-based and Gephi-based parts of the visualisation subsystem.

It would be perfectly possible to automate all the Excel-based information creation processes using other related Microsoft tools such as SQL Server Analysis Services (SSAS) and SQL Server Reporting Services (SSRS). For instance, a system could be scheduled to automatically generate the amalgamated figures from Neo4J and import them into an Excel-friendly data warehouse in SSAS, and to display the graphs and charts in a browser-based dashboard using SharePoint using the same Excel visualisation tools. Open-source options for warehousing data from Neo4J also exist and are discussed in more detail in Robinson et al (2013).

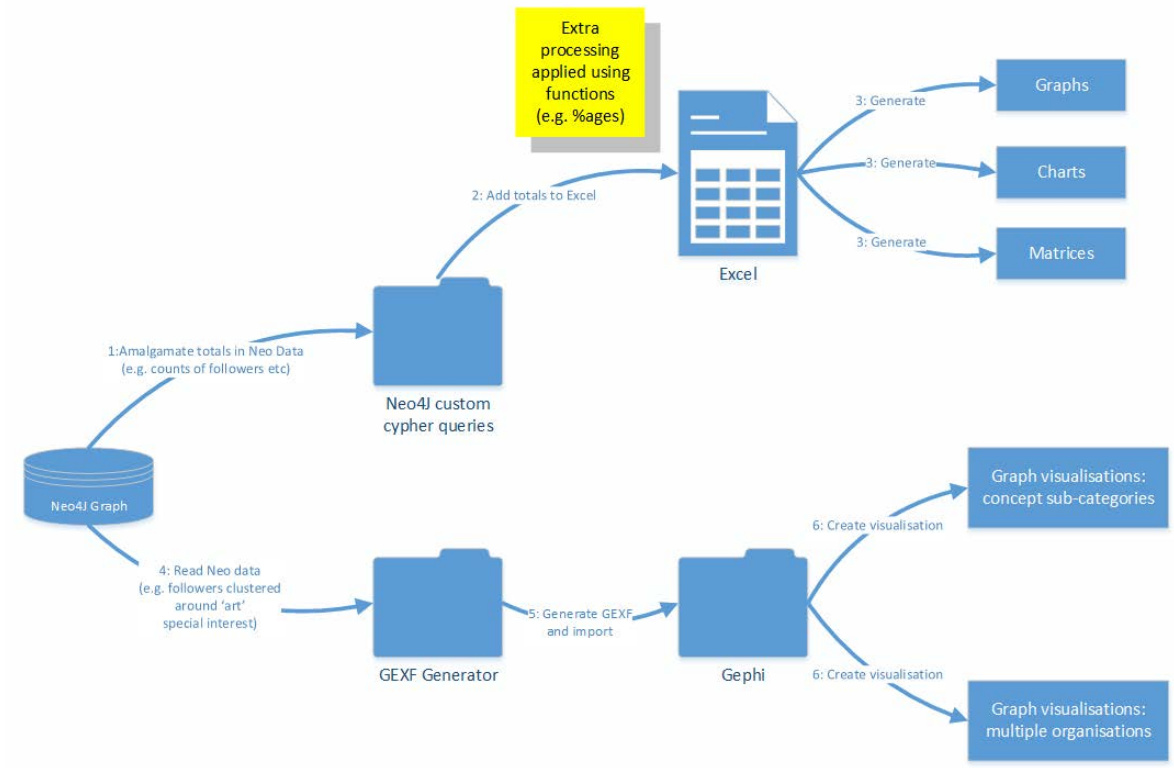

Figure 25 Logic of the ARC1 prototype visualisation subsystem

12.4.3 Logic of the GEXF generation tool

GEXF is an XML-based standard used to import graph data into, and export graph data from, the Gephi visualisation tool, among other applications. At the core of the GEXF file format are the concepts of nodes and edges that are in turn central to graph theory. Generating data in the GEXF format thus became a process of taking node and edge data from Neo4J and generating XML in the GEXF format. A small C# application was developed to do this (though the basic functionality to import directly from Neo4J to Gephi was also included in Gephi itself at the time this work was undertaken, in a state of early release).

The packages of the prototype GEXF generator included:

1. A graph generator package that contained the logic of generating the node and edge elements in the GEXF.
2. A data access package that read the required data from Neo4J.
3. A console application that:
    a. Took user input regarding the type of visualisation to produce.
    b. Called the data access package to get the relevant data from Neo4J.
    c. Passed the Neo4J data to the graph generator to generate the GEXF.
    d. Fed back the result to the user.

The types of visualisation produced enabled two main types of cluster to be visualised:

1. Twitter followers clustered around the organisations they followed.
2. Twitter followers clustered around their (potential) special interests. This clustering included two levels:
    a. The top-level concepts – for the prototype these were 'art and design' and 'nature'.
    b. A sub-category level: art and design was sub-divided into categories such as 'film and photography' and 'performance, musical'. Nature was divided into 'botanists' or 'environmentalists'.

With regard to the categorisations above, for the sake of the prototype, these were decided by the researcher, though guided by the indexing and term frequency analysis performed during the audience segmentation. Moving on from a prototype, category selection would become a much more inclusive process, taking into account the meaning being made with such categories by various museum staff and stakeholders, though it would still need to be guided by the data, too, in order for

effort not to be wasted creating categories with no data to support them. Processes such as card-sorting (Spencer, 2009) would provide a mechanism for deciding upon such information collaboratively.

The GEXF generation was a simple process of taking lists of related nodes and writing out XML node elements for each node, and edge elements for each relationship. Nodes were labelled with each follower's Twitter handle (i.e. their screen name, such as the researcher's: @EpiphanyLboro). However, GEXF also allows for extra attributes to be attached to each node, and it was these attributes that were used to add time-stamps, description text (i.e. the "Twitter biography" data, so each node could be checked in the interactive Gephi graph), and whether the node was a 'normal' follower or one of the 'primary' cultural organisations in the ego-centric network.

13 APPENDIX 2: ARC2 PROTOTYPE – HIGH LEVEL DOCUMENTATION

The prototype developed for the second Action Research cycle (ARC2) was intended to investigate how a model of inspiration based upon emotion, cognition and creativity might be used to retrieve information of value to museums from Tweets. It was based upon the User Stories listed in Chapter 6, Section 6.3.1. All of ARC2's user stories could be considered "epic" user stories as they refer to the concept of inspiration, hence no information system could therefore be produced in support of these stories without defining (or modelling) inspiration in some way (i.e. as was undertaken during the Literature Review and initial consultation exercise). As discussed in Chapter 6, rather than attempt to build the NLP and lexical resources necessary to undertake such an investigation from scratch, the FrameNet lexical database was used. This was because FrameNet organises its lexicon in relation to a collection of psychological constructs with included several related to emotion, cognition and creativity.

This appendix therefore covers:

1. A synopsis of the information sourced from FrameNet that was used, in terms of Frames, Frame Elements and Lexical Units (see Chapter 6, Section 6.3.4 for a discussion about those types of entity).
    a. Note: as the main intention behind the prototype was to investigate whether the model made sense to museum workers, FrameNet itself was used rather roughly – i.e. 'just enough for the prototype'. Thus there are additional aspects and finer details to FrameNet that are not covered here. Focusing more upon those finer elements would be part of the work necessary to attempt to improve the Information Retrieval performance of the prototype.
2. How data from both FrameNet and Twitter were imported into a graph database to enable Tweets to be linked and clustered around the Frames.
3. How the linking and clustering around Frames was undertaken.
4. How data were exported:
    a. For analysis and evaluation in spreadsheets.
    b. To create visual information in Gephi (as per ARC1, see Appendix 1 Section 11.4).

13.1 Information from FrameNet

FrameNet has a variety of entities (Rupenhofer et al, 2010) but just three of them were used (as described in Chapter 6, Section 6.3.4:

1. Frames.
2. Frame Elements.
3. Lexical Units.

Table 25 shows information about the relationships between these entities for the Frames chosen for this research. It is further sub-divided by the emotional, cognitive and creative categories that map onto the working definition of inspiration (and thus assigned to them by the researcher, not FrameNet's own developers). Lexical Units highlighted in bold text actually occurred in the Tweets collected for the two events studied.

Frame Name	**Category**	**Frame Elements used**	**Lexical Units**
Becoming_aware	Cognitive	Cognizer, Phenomenon	chance across, chance on, chance upon, **come across**, come upon, descry, detect, discern, **discover**, **discovery**, encounter, espy, fall on, fall upon, **find**, **find myself**, **find out**, happen on, happen upon, **learn**, **locate**, **note**, **notice**, **observe**, perceive, pick up, **recognize**, register, **spot**, spy out, **tell**, **told**
Cogitation	Cognitive	Cognizer, Topic	brood, consider, **consideration**, **contemplate**, contemplation, deliberate, deliberation, dwell, give thought, meditate, meditation, mull over, muse, **ponder**, **reflect**, reflection, ruminate, **think**, **thought**, **wonder**
Coming_to_believe	Cognitive	Cognizer, Content, Evidence, Topic	ascertain, **conclude**, conclusion, deduce, deduction, determine, figure out, **find**, **gather**, **guess**, infer, inference, **learn**, puzzle out, realization, **realize**, speculate, strike, struck, surmise, **work out**

Frame Name (cont)	Category	Frame Elements used	Lexical Units
Coming_up_with	Cognitive	Cognizer, Idea	coin, **come up**, conceive, concoct, concoction, contrivance, contrive, **cook up**, **design**, devise, **find**, **formulate**, hatch, improvise, invent, **invention**, think up
Creating	Creative	Cause, Created_entity	**assemble**, **create**, **form**, formation, generate, issuance, **issue**, **make**, **produce**, **production**, yield
Emotion_directed	Emotional	Circumstances, Experiencer, Stimulus, Topic	abashed, affronted, agitated, agitation, agonized, agony, alarmed, **all about**, amused, amusement, anger, angry, anguish, anguished, annoyance, annoyed, **anxious**, appalled, ashamed, astonished, astonishment, astounded, baffled, bafflement, befuddled, bewildered, bewilderment, bitterness, **blue**, **bored**, boredom, chagrin, chagrined, concern, concerned, contented, covetous, crestfallen, **cross**, crushed, dejected, dejection, delight, **delighted**, demolished, depressed, desolate, despair, despondency, despondent, devastated, disappointed, disappointment, discomfited, discomfiture, disconcerted, disconcertion, disconsolate, discouraged, discouragement, disgruntled, disgruntlement, disheartened, dismay, dismayed, disorientation, disoriented, displeased, displeasure, disquiet, disquieted, distress, distressed, downcast, downhearted, ecstatic, elated, elation, embarrassed, embarrassment, embittered, enraged, exasperated, exasperation, **excited**, **excitement**, exhilarated, exhilaration, fascinated, fed up, fed-up, **fine**, flabbergasted, flummoxed, flustered, frightened, furious, fury, glee, gleeful, glum, glumness, gratification, gratified, grief, grief-stricken, grim, **happy**, harried…

Frame Name (cont)	Category	Frame Elements used	Lexical Units
Emotion_directed (cont)	Emotional	Circumstances, Experiencer, Stimulus, Topic	…heartbreak, heartbroken, horrified, horror, humiliated, incensed, inconsolable, indignant, infuriated, **interest**, irate, irked, irritated, jubilant, livid, low-spirited, lugubrious, **mad**, miffed, miserable, misery, mortification, mortified, mournful, mourning, mystification, mystified, nervous, nettled, nonplussed, **offended**, **OK**, outrage, overjoyed, overwrought, peeved, perplexed, perplexity, perturbed, petrified, **pleased**, puzzlement, rattled, relaxed, resentful, revolted, revulsion, riled, ruffled, **sad**, saddened, sadness, shocked, sickened, sore, sorrow, sorrowful, startled, stressed, stunned, stupefaction, stupefied, sympathetic, sympathize, sympathy, terror-stricken, **thrilled**, tormented, traumatised, unsettled, unsympathetic, upset, vexation, vexed, woebegone, **worried**, wretched
Experiencer_obj	Emotional	Experiencer, Stimulus	abash, aggravate, aggrieve, agonize, alarm, **amaze**, **annoy**, antagonize, appeal, arouse, astonish, astound, baffle, beguile, bewilder, bewitch, boggle, bore, **calm**, captivate, charm, **cheer**, **comfort**, conciliate, **confuse**, console, crush, dazzle, demolish, depress, destroy, devastate, disappoint, discomfit, disconcert, discourage, dishearten, displease, disturb, embarrass, embitter, enchant, **encourage**, **engage**, enrage, **entertain**, enthrall, exasperate, **excite**, exhilarate, **fascinate**, faze, flabbergast, **floor**, flummox, fluster, frighten, frustrate, fulfill, gall, gladden, grate, gratify, harass, hearten, humiliate, **impress**, incense, infuriate, intimidate, **intrigue**, irk, irritate, kill, let down, madden, mollify, mortify, mystify, nettle…

Frame Name (cont)	Category	Frame Elements used	Lexical Units
Experiencer_obj (cont)	Emotional	Experiencer, Stimulus	nonplus, offend, pacify, perplex, perturb, petrify, placate, **please**, **puzzle**, rankle, rattle, **reassure**, repel, revolt, rile, sadden, satisfy, **scare**, shake, shame, **shock**, shocker, sicken, sober, solace, soothe, spook, stagger, startle, stimulate, sting, **stir**, stun, stupefy, **surprise**, **terrify**, thrill, tickle, torment, traumatize, **trouble**, unnerve, unsettle, vex, **worry**, wound, **wow**
Intentionally_create	Creative	Components, Created_entity, Creator	**create**, **creation**, **develop**, **development**, establish, establishment, **found**, generate, **make**, **produce**, **production**, **set up**, synthesis, synthesize
Subjective_influence	Cognitive	Action, Behaviour, Cognizer, Entity, Product, Situation	**drive**, **effect**, galvanize, impact, **influence**, influential, **inspiration**, **inspire**, motivate, **push**

Table 25 FrameNet data selected based on the inspiration definition

The analysis methods used upon the Tweets containing the Lexical Units highlighted in the table above are discussed in more detail in Section 11.7 below.

13.2 Importing Tweet and Frame data into a graph

Tweet data was imported using the process shown in Figure 33 and described below:

1. The starting point was a Neo4J database containing an ego-centric social network of Twitter follower data created by the system developed for ARC1.
2. A Tweet capturing system was used to download Tweet data from the Twitter Search API, using hashtags and account names (e.g. @DerbyMuseums) as the search terms.

3. The Tweet data was then written out line by line to text files using pipe separators (i.e. the | symbol). These text files then served as input to the next phase of the process.
4. A Tweet Importer system was then used to read the Tweet data from the text files.
5. Tweet data was then written to the database and linked to any existing users captured by the ARC1 system. There are two types of user relationships with Tweets: a 'creator – created' relationship and a 'mentioned – mentions' relationship.
6. As Tweet content can sometimes contain unexpected data (i.e. characters from non-Roman alphabets, and not least the pipe symbols used to separate the data fields in the text files), import errors needed to be handled and output (in a text file once more). For the prototype, such errors were noted (to get a sense of the scale of the issue, which was small) and then otherwise ignored.
7. If, during the import process, the creator of the Tweet being imported at any given point did not exist in the database, the Tweet Importer wrote the missing user's Id, and the Id of the Tweet to another text file.
8. The same process as described in 7 above also happened for users mentioned in Tweets.
9. Missing Tweet creator data was then read by a third system, the User Importer.
10. Missing mentioned user data also formed a source of data input for the User Importer.
11. The User Importer then used the user ids for missing users to retrieve the missing user information from Twitter via its user-related API endpoint.
12. The missing user data was written to the graph and linked to the Tweets to which it related.

All of the interactions with Twitter used the Linq2Twitter library for .Net (Mayo, 2015).

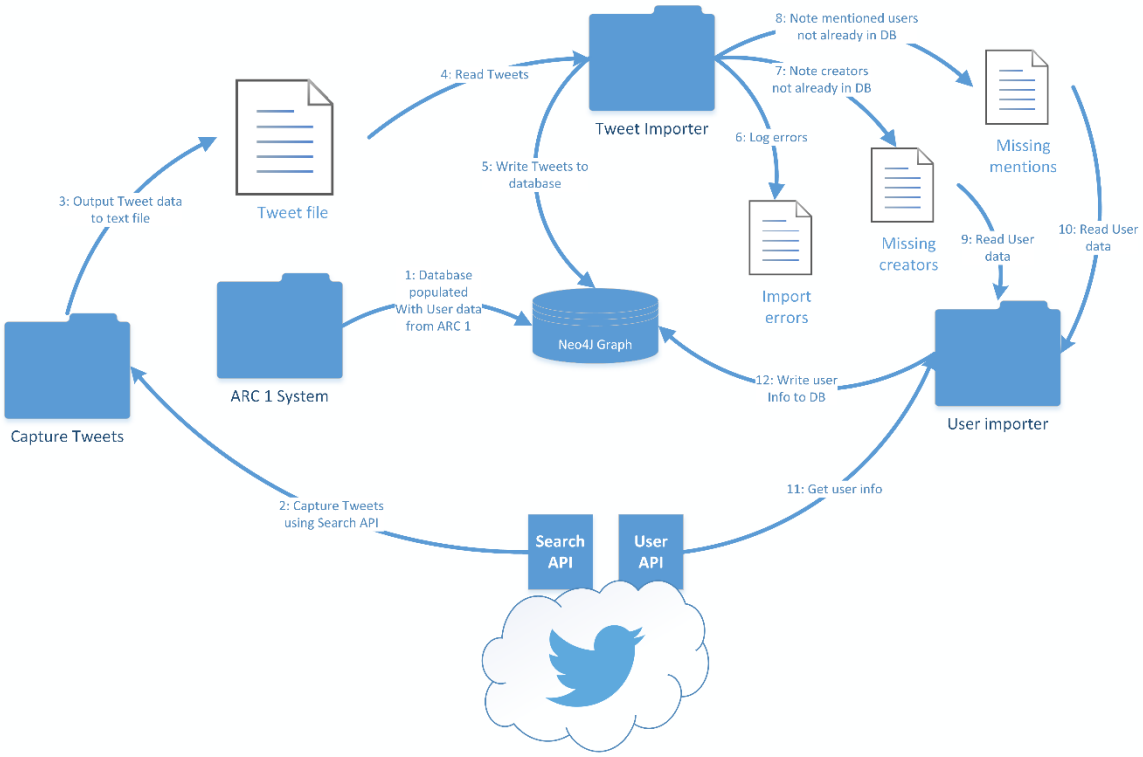

Figure 26 High-level architecture of the ARC2 prototype Tweet data capture and import subsystem

Frame information was imported into Neo4J using the XML output by FrameNet: the entire set of FrameNet data can be downloaded from the project as a library of XML files. Only Frames and Lexical Units were imported into Neo4J, as this was all that was required to cluster Tweets around Frames.

Linking Tweets to Lexical Units was undertaken by creating more text input files. These files contained regular expressions that simulated the text morphing process whereby a collection of words is grouped around the root of the term. For example, consider the regular expression:

- scar(e|es|ed|ing|y|ier|iest)

This generates a series of words from the root "scare", namely: scare, scares, scared, scaring, scary, scarier and scariest (Jurafsky and Martin, 2009). The intention of linking Tweets to Lexical Units in this way was to try and increase the recall of the Information Retrieval system (Baeza-Yates and Ribeiro-Neto, 1999). A less prototypical system would more likely solve the problem by including a Morphing step in the Natural Language Processing pipeline (as per that described in Appendix 1 Section 12.2). This could enable the Part of Speech of the term to be considered when morphing the

term down to its root. One of the areas to investigate further to attempt to improve precision and recall of this system would be to improve this process, though given the issues of syntax and semantics related to the 140 character limit Twitter constraint, this would most likely be a non-trivial task that might never be as accurate as it would for more formally written text, and would be very Twitter-specific, hence thought would have to be given as to the long-term, overall value of undertaking it.

The text input files containing these regular expressions were then read into a very simple system that relied upon Neo4J's sophisticated built in regular expression parser to generate links between Tweets and Lexical Units.

13.3 Exporting and analysing the data

Once Tweet data had been imported into the database and linked to the various emotional, cognitive and creative Frames via their Lexical Units, data about the linked Tweets could then be exported for further analysis. There were two purposes for exporting the data:

1. To ascertain the effectiveness of using FrameNet to retrieve potential expressions of inspiration from the Tweets. There were two further aspects to this:
    a. How useful a resource was the FrameNet lexicon for achieving this?
    b. How well did the definition of inspiration based upon emotion, cognition and creativity match with the expectations of the museum?
2. To find out whether the links in the data between Tweets and Frames could be used to visualise some of the inspiration that had occurred during events in ways that were meaningful and useful to museum staff.

The first purpose was investigated by exporting data from the database into Excel and further analysing it. To address question 1a in the list above, the researcher analysed the entire datasets from both events, while 1b was addressed by analysing a subset of the data with two museum staff (i.e a 'golden data set'). The second purpose was investigated by importing the data into Gephi (Gephi, 2015).

13.3.1 Exporting to a spreadsheet for analysis

Tweets were exported into Excel by using the built-in CSV export function in Neo4J's browser-based query tool, which is part of the Neo4J system. The Cypher query listed below was used to extract the data. This Cypher output the name (i.e. the term) of the Lexical Unit, the Twitter ScreenName of the Tweet's creator, and three fields relating to the text of the Tweet; the raw text, the Parts of Speech of the Tweet text - established using the ArkTweet tool from Carnegie Mellon (Owoputi et al, 2013), and a mixed field of the text and tags. Once in a spreadsheet, the information about the Tweet and its relationship to the Frame and Lexical Unit could be analysed in more detail.

```
MATCH
  (fr:Frame {Name:'subjective_influence'})<-[:SUB_CLASS_OF]-
(lu:LexicalUnit)
  <-[:TEXT_CONTAINS]-(t:Tweet)
  <-[:CREATED]-(tu:TwitterUser)
WHERE
  t.IsRetweet = false
RETURN
  lu.Name,
  tu.ScreenName, etc…
```

One spreadsheet per frame was created in an Excel workbook, containing all the Tweets that were related to the Frame. The researcher then annotated each Tweet with a simple yes or no decision regarding whether the Tweet showed evidence that inspiration had occurred (a discussion of the efficacy of this is included in Chapter 6, and in the further work section in the Conclusion Chapter). In order to consider the Tweets' relationships to the various Frames in more detail, a column was created for each Frame Element (e.g. the becoming_aware Frame contains extra columns for the *Cognizer* and the *Phenomenon*), used to indicate which element of the Tweet's text might correspond to those elements. For example, the Tweet below was related to becoming_aware:

Really good to see families learning about technology @MakerFaireDERBY #dmmf14 http://t.co/B2sFu3lJCY

In this Tweet, the cognizer(s) are 'families', the Lexical Unit via which the Tweet is linked to the becoming_aware frame is 'learn' (i.e. the root of 'learning') and the phenomenon about which they are learning is 'technology'. It soon became evident that Tweets very often referred to the creator, or the reader as the sentient Frame Element, for example in the Tweet below, in which the sentient is the creator, the relationship to becoming_aware is, as previously, via the 'learn' Lexical Unit, and the phenomenon is the model railway at the Silk Mill:

Learning about the model railway :D @derbysilkmill @museomixuk #mmuk14

Also, it was often the case that the subjects of Tweets (e.g. the 'phenomenon' in the case of becoming_aware) were *shown* in media related to Tweets, as per the following Tweet linked to the intentionally_create Frame via the "make" Lexical Unit – in which the Created_entity Frame Element is shown in the image attached to the Tweet (available at the URL within the Tweet text):

Many thanks to @billymccoy who made this #dinosaur :) now for the @Raspberry_Pi & LED's #MMUK14 http://t.co/nxu95FXknx

The key finding that resulted from annotating the Tweets in this way was just how dependent upon the context of the surrounding Twitter platform Tweets are, and the extent to which this context needs to be understood in order to ascertain the meaning of a high proportion of Tweets.

The golden data set used to establish the effectiveness of the information system was also created using Cypher queries. However, in this instance, Tweets that were not linked to any Lexical Units at all (i.e. 'negative results') were included so that precision measures could be ascertained. Four hundred Tweets were added to the Golden Data set, with the same proportion of positive and negative results as in the total set. From this, the F Measure of 0.46 discussed in Chapter 6 was ascertained. Also, the (low) level of consensus about what constituted 'good evidence of inspiration' could be ascertained, as the two museum staff and the researcher annotated the Tweets separately. The implications of this low consensus are discussed in Chapter 6, the Discussion and Conclusion chapters.

13.3.2 Exporting for use in a Gephi visualisation

The analysis described above deals with each Tweet's relationship to a Frame in isolation, but the research also needed to explore the opportunity for finding potential expressions of inspiration contained in Tweets that linked to more than one Frame. The way this was approached was to create a network visualisation (using data related to the Maker Faire) showing Tweets linked to frames. As with the network visualisations generated for ARC1 (described in Appendix 1), the Gephi visualisation tool was used, and data was imported into Gephi using a small .Net application to generate files in the GEXF specification (GEXF Working Group, 2009). This process was conceptually identical to that described in Appendix 1 Section 12.4, and resulted in the visualisation shown in Chapter 6 Figure 13. However, the overall effectiveness of the visualisation, as evaluated by Derby Museums' staff, was low, the fundamental reason being the low F Measure: i.e. the Tweets displayed in the visualisation that were linked to various frames were only considered relevant on roughly half of the occasions they were examined from within the interactive visualisation in Gephi. Hence, based on the results of the evaluation, the F Measure would need to be improved in order for such visualisation to be considered meaningful.

14 APPENDIX 3: ARC3 PROTOTYPE – HIGH LEVEL DOCUMENTATION

This appendix outlines the prototype developed in support of ARC3's research. It begins with an overview of the architecture, which is based very heavily upon a Fuzzy Expert System which processes rules using a Fuzzy Logic Controller, which is the subject of section two. The third section covers how the system was tested, both automatically in a Test Driven process (which also allowed the iterative development of the rule-base) and by using a Test Reference set, in the form of a Multi Criteria Decision Support 'performance tableau' (Lootsma, 1997) scored by staff from Derby Museums. Evaluation of the system's performance and the responses of museum staff to the information it provided are discussed in depth in Chapter 7.

14.1 The overall architecture

The architecture of the entire system for the ARC3 prototype is based upon three main subsystems:

1. A Tweet pre-processor, which generates the input / antecedent variables for the the Fuzzy Logic system to process, and stores them with the Tweet data.
2. A Fuzzy Logic expert system which processes the Tweet data and reaches a conclusion about the potential value of that Tweet, in terms of the evidence it provides of "reach" (i.e. how widely it was broadcast to the network) and "community strength" (i.e. whether it provided evidence of a strengthening connections between the museum and other actors on the network).
3. The Fuzzy Logic Test Harness, which enabled iterative development of the Fuzzy Logic rule base (using a development reference set) and assessment of the overall performance of the system (using a test reference set).

These three sub systems are shown in Figure 27. The logical flow of the overall architecture is as follows:

1. The system started with a Neo4J database containing the same datasets of Tweets captured and imported during ARC2 (see Chapter 6 and Appendix 2).

2. The data was pre-processed by marking each Tweet with scores based upon the User Familiarity exercise conducted by the museum staff (see Chapter 7 Section 7.4.1), adding a location score from 1-5 based on a small set of rules devised by the researcher: 1 meant "VeryLocal" (i.e. Derby and Derbyshire), 2 was Local (the East Midlands Region), 3 was Average (the UK), 4 was Far Away (Europe) and 5 was "VeryFarAway" (i.e. the rest of the world). A score of zero meant "unknown", because location was an optional free text field in Twitter, meaning it was often blank, and sometimes filled with junk data (usually jokes). Averages of follower counts for people mentioned in Tweets were also calculated at this stage, as the museum staff initially considered this to be potentially important, however this variable turned out not to be used when the scoring of Tweet values took place.
3. Development and Test Reference sets scored by the museum staff (collaboratively in this instance) were then used to generate two sets of 400 automatic tests in the Fuzzy Logic Test Harness. This utilised the Microsoft .Net templating engine (T4) to read the expected scores from the scored sets and generate Unit Test code (for the .Net testing tool MS Test) to match the values the staff expected with the values the Fuzzy Logic controller had created.
4. Information about the rules in the Fuzzy Logic Controller was written into the Neo4J database. This allowed a connection to be made between each Tweet processed and the rules that fired during the processing, to help with diagnosing unexpected results as the rules were developed (see Section 14.3 below).
5. The Fuzzy Logic system then read the pre-processed Tweet data from Neo4J.
6. Each Tweet was processed by reading its relevant variables (see Chapter 7 Table 16) and processing them with the rules stored in the Fuzzy Logic Controller.
7. The results of the processing for each Tweet were stored back in Neo. This involved storing both the output / consequent variable values, and the links to the rules that fired to generate those values.
8. The Test Harness then read the results from Neo4J.
9. The results were compared with the expectations generated from the development or test reference sets, in order to judge the efficacy of the rules.
10. In the case of the development set, errors caused by mismatched expectations were used to iteratively adjust the rules until all tests passed. In the case of the test reference set, the results indicated how effective the rules were against a human-scored dataset. The results of this stage indicated how effective the rule base was overall, and in turn indicated how effective the knowledge capture exercise had been (see Chapter 7 Section 7.5.1).

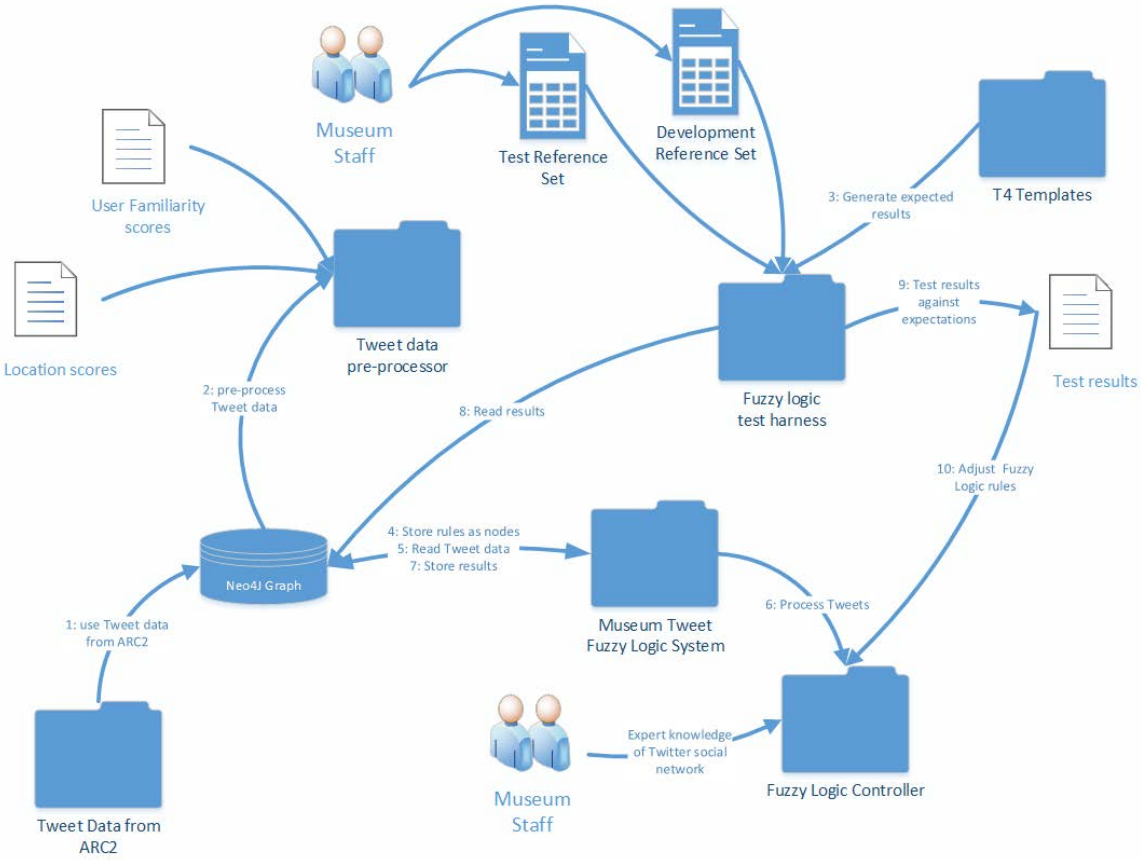

Figure 27 High-level architecture of the ARC3 prototype

14.2 The Fuzzy Logic System

The Fuzzy Logic system used in the ARC3 prototype consisted of two main processes:

1. Creating, reading and updating data about Tweets and rules from the Neo4J database.
2. Processing the Tweet data using a Fuzzy Logic controller based upon the JFuzzyLogic application. Both of these aspects of the system are discussed in detail below.

At a high level, Fuzzy Logic Controllers (FLCs) generally consist of the following components:

1. A rule base or knowledge base within which the experts' knowledge about the problem domain is stored, preferably in a human-readable format.

2. A “fuzzification” system, which takes ‘crisp’ input / antecedent variable values (i.e. single integer or floating point / decimal values) and maps them onto pre-defined fuzzy sets.
3. An inference system, which brings the logic from the rules and data from the fuzzy sets together and reasons with them.
4. A “defuzzification” system, which takes the fuzzy output from the inference system and uses one of several approaches to generate crisp values for the rules’ output / consequent variables (Cingolani and Alcalá –Fdez, 2012).

This process is discussed in more detail in Section 14.2.1. The system chosen to perform these tasks was JFuzzyLogic (Cingolani, 2015).

14.2.1 JFuzzyLogic

JFuzzyLogic is a freely-available FLC written in Java that conforms to the general controller component architecture described above. It also supports the International Electrotechnical Commission’s standard language for Fuzzy Logic Control (IEC 61131-7), resulting in knowledge bases and fuzzy set information that is human readable and which can easily be edited using a standard text editor. Standards-compliance also makes knowledge bases produced for JFuzzyLogic compatible with other FLCs that conform to the standard. Because JFuzzyLogic is based upon Java, there is a Java API which allows fuzzy variables and knowledge bases to be loaded programmatically, inferred with, and defuzzified in Java code, making an interface between a JFuzzyLogic rule base and variable data stored in Neo4J easier to create.

14.2.2 IEC1131-7 Fuzzy Control Language Structure

The IEC1131-7 Fuzzy Control Language (FCL) specification is described in a formal document aimed at control systems manufacturers. As such, it is kept behind a paywall, though, because it describes the functionality of their software, the creators of the JFuzzyLogic system have made a pre-publication version of the specification available (International Electrotechnical Commission, 1997). Figure 28 shows the structure of the FCL specification.

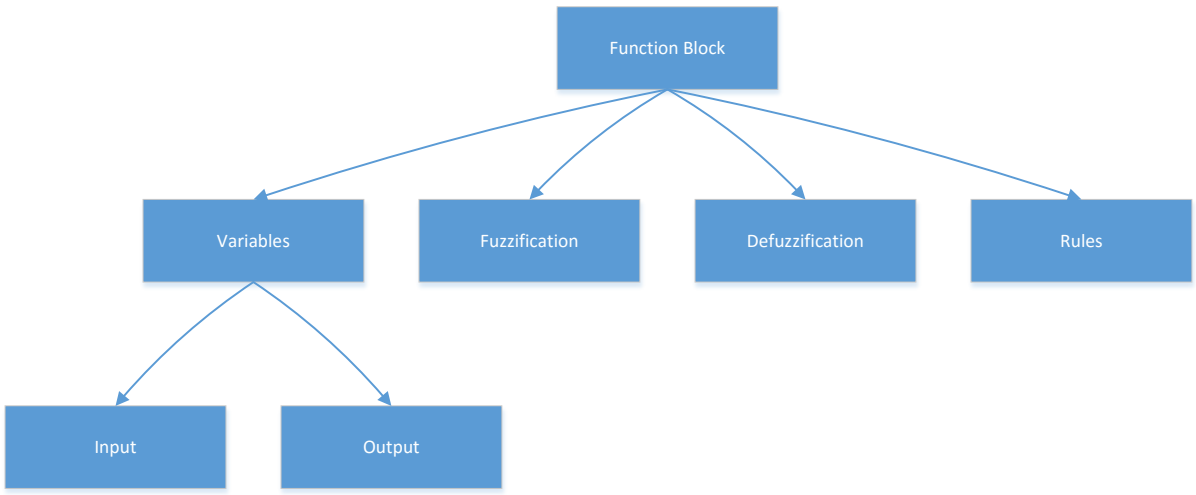

Figure 28 Structure of a Fuzzy Control Logic Function Block

The basic parent of the FCL is the *Function Block* – a wrapper around the entirety of each set of fuzzy logic variables and rules created using the language (Cingolani and Alcalá –Fdez, 2012). Each Function Block then has four main sections:

1. A section where variables are declared. This is subdivided into two:
    a. Input (i.e. antecedent) variable declarations.
    b. Output (i.e. consequent) variable declarations.
2. A fuzzification section where the fuzzy sets for the input variables are defined.
3. A defuzzification section which sets both the fuzzy sets for output variables and the method for defuzzifying to a crisp result.
4. A rules section, which contains the logical rules for processing input into output variables.

The variable declaration section is the most straightforward part of the Function Block, in which variables are given names and data types (they can be declared either as integers or real numbers). The code below shows the declaration of variables related to the reach of a Tweet.

```
VAR_INPUT
  IsReply : REAL;
  TweeterFollowerCount : REAL;
```

```
  IsRetweet : REAL;
  RetweetCount : REAL;
  TweeterHasLocation : REAL;
  TweeterLocation : REAL;
  TweeterFamiliarity : REAL;
END_VAR

VAR_OUTPUT
  Reach : REAL;
END_VAR
```

The Fuzzification section sets up the Fuzzy Sets for each of the variables. Each variable is given a set of membership functions that correspond to the logical rules. The FCL code below shows the fuzzy set for the RetweetCount variable, while Fig 36 shows how this fuzzy set of membership functions is displayed as a graph.

```
FUZZIFY RetweetCount
  TERM Low := (0,1) (3,1) (4,0) ;
  TERM Medium := (3, 0) (4,1) (10,1) (11,0) ;
  TERM High := (10,0) (11,1) (19,1) ;
END_FUZZIFY
```

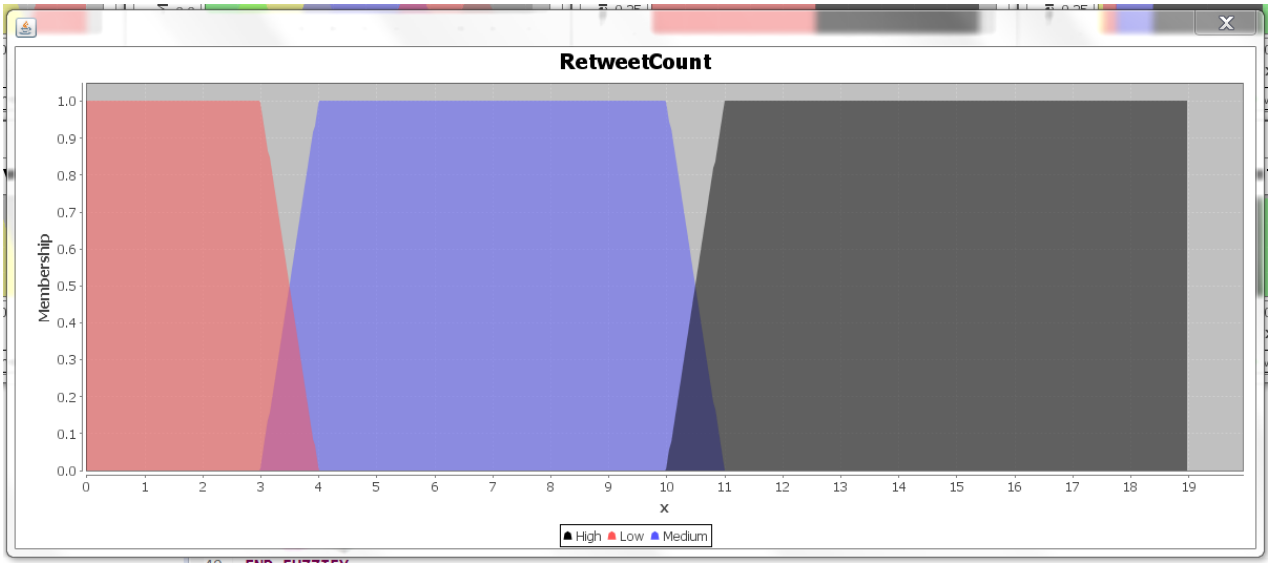

Figure 29 JFuzzyLogic graph of the RetweetCount membership functions

In this example, the variable RetweetCount has the following three membership functions:

1. Low – between 0 and 4 retweets.
2. Medium – between 3 and 11 retweets.
3. High – between 10 and 19 retweets.

Note: these membership function values are specific to both Derby Museums and the Maker Faire and MuseoMix events, as established by reviewing the collected Twitter data with the museum staff. A larger museum and / or longer running events might expect corresponding sets of membership functions to be configured quite differently, to support much higher numbers of retweets, for example. Also, for the ARC3 prototype, the membership functions are encoded as simple trapezoid shapes, but the FCL specification allows for other shapes of function and the JFuzzyLogic system extends the specification even further. Thus there is considerable scope for developing and optimising Fuzzy Logic Controllers with JFuzzyLogic.

The defuzzification section of the Function Block contains two pieces of information: the fuzzy set for the output variable to be defuzzified, and the defuzzification method. There are five possible defuzzification methods (described in detail in the language specification): the defuzzification code below refers to the Centre of Gravity (COG) method, which takes a figure from the middle of the output's "shape", defined by the combination of the membership functions for the rules that fired in that specific instance (which in turn depends upon the values of the input / antecedent variables for

that instance). The default value is the value assigned to the output variable in the event that none of the rules from the rulebase that are relevant to the output variable fire.

```
DEFUZZIFY Reach
  TERM VeryNarrow := (0,1) (10,1) (20,0) ;
  TERM Narrow := (10,0) (20,1) (30,1) (40,0) ;
  TERM Medium := (30,0) (40,1) (60,1) (70,0) ;
  TERM Broad := (60,0) (70,1) (80,1) (90,0) ;
  TERM VeryBroad := (80,0) (90,1) (100,1) ;

  METHOD : COG;
  DEFAULT := 0;
END_DEFUZZIFY
```

Rules take the format below, which shows a rule which defines that the reach of a Tweet is low based upon the number of followers the Tweeter had, whether location information was known and so forth. The human readability of the rules is the primary advantage of using a system based upon the IEC1131-7 standard, as it makes the logic of the system more understandable and is thus self-documenting to a large degree.

```
RULE 6 : IF IsReply IS False AND TweeterFollowerCount IS VeryLow AND
IsRetweet IS True AND TweeterHasLocation IS False AND
TweeterFamiliarity IS TotallyUnknown THEN Reach IS Low;
```

14.3 Testing the system

14.3.1 Building a test harness

The design of the test harness supported the following processes:

1. Importing test data that resulted from the knowledge elicitation phase into a T4 template. This took the form of:
    a. An identifier for each Tweet, to use to retrieve the output / consequent variable result from the database once the FLC had run.
    b. An expected output / consequent variable "outcome" for each Tweet (as provided by the museum experts).
        i. These "outcomes" were described in Fuzzy terms such as "Low" or "Very High" – part of the job of the test harness was to check that the 'defuzzified' output / consequent variable values were in acceptable ranges of these outcomes.
2. Using the template to build a piece of test code for each Tweet's expected outcome.
3. Runing the tests – each test then:
    a. Read the actual value of the output / consequent variable that resulted from the FLC processing Tweet data from the database.
    b. Checked that the actual output value was with the expected range for VeryLow, Low, Medium, High and VeryHigh results, as defined by the museum staff for the Tweet in question. If the output value was within an acceptable range of the expected value, the test passed.

If an unexpected result occurred while evaluating the results in this way using the development reference set, the links generated by the Fuzzy Logic System in the Neo4J graph between each Tweet and the rules from the rule-base that fired during its processing could be used to diagnose why the test had failed due to rules firing unexpectedly. Figure 30 shows the links between Tweets and rules in the Neo4J database.

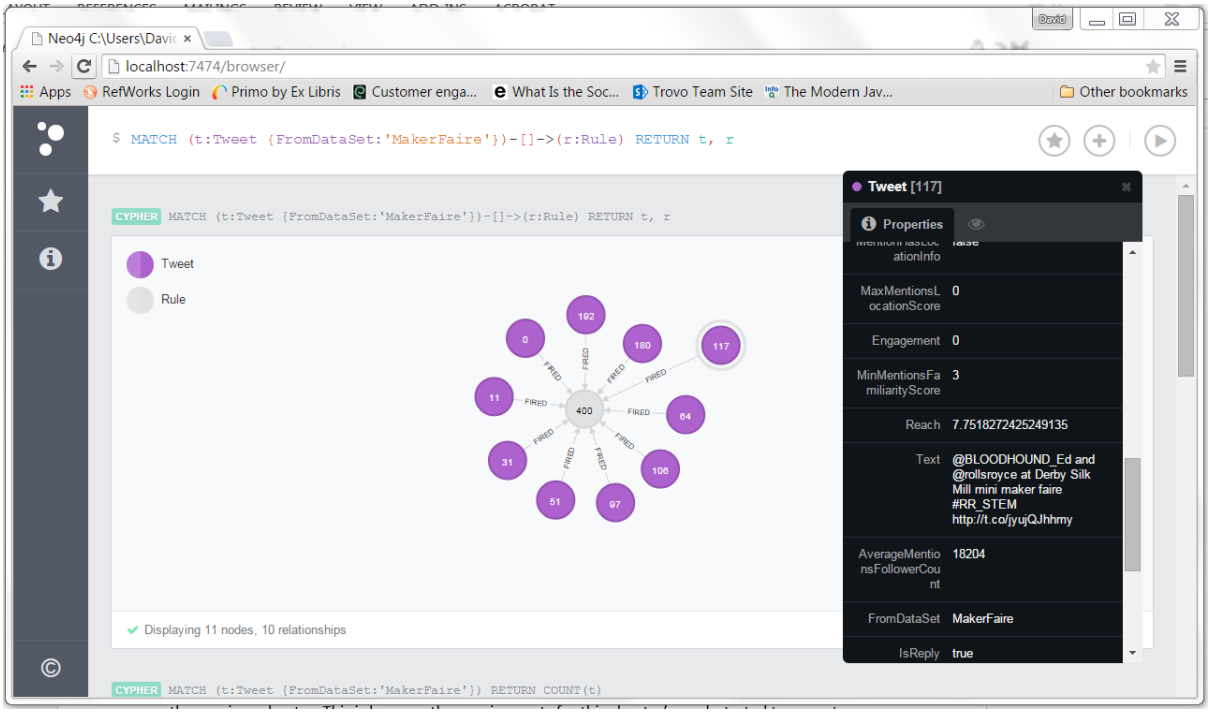

Figure 30 Output from Neo4J showing which Tweets caused a rule from the FLC rulebase to fire

Several logical inconsistencies in the development data were found; i.e. contradictions when a given Tweet was scored with a certain output, only for Tweets with antecedent variable values in the same ranges to be scored differently later on. 18 such inconsistencies emerged for reach and two for community-strength. In the case of reach, this was in part due to a lack of clarity regarding the "RetweetCount" variable, the meaning of which changed depending upon the context of the Tweet (this is also covered in more depth in Chapter 7). The effects and implications of such logical inconsistencies were also evident when running the rules against the Testing set of data, which was annotated by the museum staff away from the researcher with the express purpose of trying to establish the levels of such inconsistencies, to contribute towards the degree of confidence in which the team's understanding of Twitter data could be held.

15 APPENDIX 4: STRUCTURING REFLECTIONS USING THE POM MODEL

The tables that form the body of this Appendix are organised into seven sections that related to the stages of the POM model, and contain the following information:

1. Whether the process described pertains more to planning or evaluation.
2. What the process is.
3. Which of the two core uses for Social Media information the process most relates to, i.e. engagement (Eng), or audience development (Dev), or both equally (Both).
4. Which stages of the research the learning about the process occurred: these are the initial consultation exercise (see Chapter 4), ARCs 1-3 (see Chapters 5, 6 and 7), or the Evaluation Workshop held with Derby Museums' staff.

The intention of this exercise was to provide structure to the researcher's reflections upon the interactions with museums staff listed above. These reflections related to the fourth and fifth research objectives in particular:

4. To work with museum staff to evaluate the visitor information, potential expressions of inspiration and information about the potential impact of museum events upon their audiences, captured by the prototype systems developed to fulfil Objective 3. This information is to be evaluated primarily in terms of its relevance to the work of museum staff.
5. To evaluate methods by which the evidence of inspiration captured by Objective 3 above could be disseminated.
6.

15.1 Learning points from the research structured around the POM model

The ways in which the POM model helped structure information from the Validation of Inspiration exercise, the three ARCs, and the final evaluation workshop are summarised in the tables throughout the rest of this appendix.

15.1.1 The people involved

Tables 26 and 27 show the processes related to stage 1 of the POM model, that is those related to people (both individuals and groups) in and around museums. All the processes listed might be affected by Social Media directly, or indirectly by information based upon Social Media data. The first table focuses upon individuals, and the second upon groups of people.

15.1.1.1 Individuals involved

Planning or evaluation?	**Processes related to the individuals affected by Social Media in museums**	**Eng? Dev? Both?**	**Stage of research where learning occurred**
Individuals involved in planning	*Museum curators* are often assigned with providing knowledge of the collection in relation to upcoming events / exhibitions. Though in a co-creation mode, this task is often downplayed as audience members are encouraged to contribute their knowledge. Curators *could* potentially be tasked with matching objects to planned or existing audience segments with related interests.	Both	Consultation (Cons) Evaluation Workshop (EW)
	Marketing and promotions staff are responsible for promoting upcoming events / exhibitions, and the museum more generally. They are also more responsible for attracting new audiences to the museum.	Both	Cons ARC1 EW
	Managers set the programme of upcoming events / exhibitions, unblock planning problems and ensure plans are in line with the museum's strategy.	Both	EW
	Current and potential audience members may be looking for events to attend, information that supports their personal interests, and opportunities to get involved in co-creation activities, and express themselves.	Eng.	ARC1, ARC2, ARC3
Individuals involved in evaluation	*Curators* will want to know how engaged people were by collection objects, what kind of creative reaction there was to them, how people interpreted the objects and whether visitors' knowledge of the objects increased. They may wish to see individual detailed examples of engagement, or understand the broader reach of their efforts (i.e. how the audience developed because of them).	Both	ARC2, ARC3, EW
	Marketing staff will want to know what visitors' overall impressions of an event were and how that affected the museum's audience as a whole – i.e. the impact on new and existing audiences.	Both	Cons ARC2, ARC3, EW
	Managers / trustees will want to know the impact of the event, gain an overall indication of the event / exhibition's success, and feed any lessons learned into reviews of museum policies and processes. They also need to know the overall state of the museums audiences at any given time.	Both	Cons ARC2, ARC3, EW

Table 26 Museum Social Media processes related to individuals

15.1.1.2 Groups involved

Planning or evaluation?	Processes related to groups affected by Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
The groups involved in planning	*Governors / trustees* ensure that events are in line with the museum's core themes and overarching narratives. They also need to ensure that the museum is attracting the audiences it has set out to in line with the overall strategy of the museum.	Both.	ARC2 ARC3 EW
	Event / exhibition development teams form to plan, create and promote events and exhibitions. They do this in part by researching the current and potential audience for that event, from the museum's current 'community' or from wider potential audiences.	Both.	EW
	Funding bodies / sponsoring organisations assess how closely the planned event targets audience segments that they are also trying to reach (e.g. the sponsoring organisations customer base), to ensure the best ROI for their funding commitment.	Dev.	Cons ARC1 EW
The groups involved in evaluation	*The project team* will wish to learn lessons about the event, perhaps to change it while it is running, but also to develop their skills and expertise for future events.	Eng.	ARC2 EW
	Management groups (trustees / steering etc) will need to assess the success of the event in order to make any policy / process changes to improve future events.	Eng.	Cons EW
	Funders and sponsors may need to know if their funding / sponsorship decision was good value and affected the intended audience. It is sometimes the case that such information is only required in order to make decisions about future funding.	Both	Cons EW

Table 27 Museum Social Media processes related to groups

15.1.2 The perceived world

Table 28 structures the learning points related to the perceptions of museum staff about engaging with and developing audiences, in terms of both planning and evaluation. As previously, the stages of the research during which the learning occurred are also shown.

Planning or evaluation?	**Processes related to the ways Social Media affects perceptions of the world in museums**	**Eng? Dev? Both?**	**Stage of research where learning occurred**
Planning-related perceptions of the world	Staff at a museum plan, design and develop events (such as exhibitions) with the intention of attracting new audiences and / or consolidating existing audiences. There may be an overarching process of audience development planning, which could be formalised in a strategy.	Dev.	Cons ARC1 ARC3 EW
	Museum events and activities will often (usually) relate to some of the objects from the museum's collections (or borrowed from other museums), and / or to the knowledge related to those objects.	Eng.	Cons ARC2 EW
	Museum events and activities should provide an opportunity to tell engaging stories about the objects / museum knowledge, and allow potential visitors to be inspired (i.e. feel an emotional response, consider what the meaning of that response might be, and then interpret, and hopefully communicate, that meaning in some way).	Eng.	Cons ARC2 EW
	Museum events and activities will most often be in line with the museum's overall goals and strategic direction. They should support and extend the profile of the museum. This may be ensured by planning a balanced programme of events. The event may also be part of a wider programme created by the museum's cultural network, such as a regional or national cultural festival.	Eng.	Cons ARC3 EW
	Museum events and activities might be worth funding / sponsoring if there is a chance they will impact upon an audience that that funder / sponsor has a remit to support or is keen to attract to their brand.	Dev.	Cons ARC1 EW

Planning or evaluation?	Processes related to the ways Social Media affects perceptions of the world in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Evaluation-related perceptions	When an event is underway, staff may wish to evaluate whether that event is attracting the planned / intended audiences. Staff may also wish to know more about visitors to the event that are not from the targeted audiences segments, and to find out more about any unintended consequences of the event to the make-up of the audience. Once the event has finished, staff will need to summarise the change to the audience caused by the event. This will help them learn their own lessons about the event.	Dev.	ARC1 ARC3 EW
	Some visitors will have been inspired by / engaged with a recent (or running) event to varying degrees. At its strongest, the engagement will have resulted in the visitors creating some sort of content about the event as a whole, or some of the specific objects within it.	Eng.	ARC2 EW
	The museum staff will need to understand the nature of that engagement and learn lessons from it, either to change the event itself if it is still running, or to take that learning forward into future events.	Eng.	ARC2 ARC3 EW
	Assessment of the ROI of funders / sponsors will also need to be made.	Dev.	Cons EW

Table 28 Museum Social Media processes related to the perceived world

The learning points above are discussed in the sections on strategy (Section 8.2) and engagement (Section 8.3) in Chapter 8. The concept of audience members communicating their perceptions of the world via Social Media also relates to the subject of mediation (Chapter 8 Section 8.4).

15.1.3 The discourse

Planning or evaluation?	Processes related to discourse in museums that are affected by Social Media	Eng? Dev? Both?	Stage of research where learning occurred
Discourse of planning	The discourse of engagement planning concerns debating and discussing the upcoming event in terms of matching the content of the event (e.g. objects in an exhibition) and the capacity of the potential audience to be engaged / inspired by it (i.e. the dispositions and interests of audience members).	Both	Cons ARC1 ARC2 EW
	The inclusion of creative input of audience members in the discourse might also be actively sought. This may be intended to improve the sense of wellbeing of the audience members, but should be undertaken in a spirit of intending to learn from the audience (Thompson et al, 2011).	Eng.	ARC2 ARC3 EW
	The discourse will also be guided by a separate, but interconnected, strategic programming discourse, conducted by managerial staff.	Both	EW
	A discourse may also take place with funding / sponsorship organisations to try and attract their investment. This could be achieved by showing them how the event developers' intended audience overlaps with a sponsors own audiences / customer bases.	Dev.	ARC1 EW
Discourse of evaluation	The discourse of evaluation concerns learning lessons about current and recent events, and taking that learning forward. One way of doing so might be by exploiting popularity with a new audience that was not anticipated during development. This may also involve adjusting how the event is promoted.	Both	ARC2 ARC3 EW
	Learning based upon evaluating audience composition and engagement might be fed directly into the planning and organisation of specific subsequent events, or it might be generalised to the level of overall museum policy, to help guide all subsequent events. This may be informed by a growing set of relationships with visitors, as an audience becomes a community.	Eng.	ARC3 EW
	Evaluation discourse also includes reporting to stakeholders (especially funders and sponsors) about the impact and general success of the event.	Eng.	Cons ARC2 ARC3 EW

Table 29 Museum Social Media processes related to discourse

15.1.4 Creating meaning

The POM model includes four levels of meaning making, each of which builds upon the others. Those are: data, capta (i.e. data filtered initially by relevance), information and knowledge. The four tables 30, 31, 32 and 33 divide learning points about Social-Media and engagement-related meaning making into these four categories, further sub-dividing them into planning and evaluation-related topics.

15.1.4.1 Data related Social Media in museums

Planning or evaluation?	**Processes related to Social Media data in museums**	**Eng? Dev? Both?**	**Stage of research where learning occurred**
Data-related processes used in planning	Collecting user account / 'biographical' information of 'friends' and 'followers'.	Dev.	ARC1 EW
	Collecting "posts" related to previous events (note – "posts" is an insufficient catch-all term for a wide variety of content types)	Eng.	ARC2 ARC3 EW
	Collecting records of conversations / interactions	Eng.	ARC3 EW
	Collecting audio / visual media (e.g. photographs or video clips)	Eng.	ARC2 EW
	Conducting new surveys of wider target audiences (e.g. focus groups with invited participants from target segments). A focus group could potentially lead into co-creation with the audience members in question.	Both	ARC1 ARC3 EW
	Collecting data from other sources with which to triangulate information based upon Social Media, such as: data from Customer Relationship Management systems, data from documentation related to previous events, data from interviews and focus groups (i.e. non-digital), data about the museum collection itself (which might be both digital and analogue).	Both	Cons EW

Planning or evaluation?	Processes related to Social Media data in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Data-related processes used in evaluation	Collecting fresh user data from Social Media, e.g. 'biographies' and profiles of new followers that joined the network during the run-up to the event, during and after.	Both	ARC1 EW
	Collecting fresh Social Media posts from the time when the event was running.	Eng.	ARC2 EW
	Collecting Social Media content the visitors were specifically asked to create in relation to the event, as part of the event itself.	Eng.	ARC2 EW
	Collecting data from other sources for triangulation, such as interview and survey data, data from media coverage about the event, and data from Customer Relationship Management systems.	Both.	Cons EW

Table 30 Museum Social Media processes related to data

15.1.4.2 Capta related to Social Media

Planning or evaluation?	Capta-related processes related to Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
Planning-related capta	Clustering Social Media data from 'biographies' around 'special interest' concepts.	Dev.	ARC1
	Clustering Social Media data from posts and biographies related to previous events. These would be linked to those events using a specific custom term (e.g. a hashtag), or they would contain terms relevant to the event (potentially taken from the museum's own Collection Management System), or to the process of engagement (perhaps derived from a lexicon such as FrameNet).	Eng.	ARC2 ARC3
	Filtering capta from other data sources identified for triangulating Social Media in the same way.	Both	EW

Planning or evaluation?	Capta-related processes related to Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Evaluation-related capta	Clustering and filtering Social Media capta that specifically pertain to the event in question (e.g. are related to it using a custom Twitter hashtag or event-related keywords).	Eng.	ARC2 ARC3 EW
	Filtering newly-created Social Media data to focus on the target audience segments. Also, filtering such data that falls outside the target audience segments, but which is potentially still related to the event.	Dev.	ARC1 EW
	Filtered capta using keywords related to the 'heart, head and hands' model of inspiration (i.e. containing relevant terminology from a lexicon like FrameNet).	Eng.	ARC2 EW
	Filtering capta using keywords specific to the topic of the event, potentially taken from museum object descriptions or higher levels of the collection taxonomy (i.e. object classification terms).	Eng.	ARC1 EW
	Also filtering capta from other sources for triangulation, such as CRM records whose state changed during the event's time period, and / or in direct relation to the event, relevant media stories, coded interview data etc.	Both	EW

Table 31 Museum Social Media processes related to capta

15.1.4.3 Information related to Social Media

Planning or evaluation?	Information-related processes related to Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
Planning-related information	Setting baselines for existing audience segments and existing levels of engagement with the museum and its collection.	Both	ARC1 EW
	Finding potential audiences that are currently engaged with cultural partners.	Dev.	ARC1 EW
	Setting baselines for existing levels of familiarity between museum staff and members of the audience segment to which the planned event pertains.	Eng.	ARC3 EW
	Developing personae of typical target audience members. These personae are intended to focus the development team upon particular aspects of the personality of a 'typical' audience member.	Eng.	ARC1 EW

Planning or evaluation?	Information-related processes related to Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Evaluation-related information	Putting together a picture of the 'delta' (i.e. new / changed) capta, from the point the baseline was established in the planning stage (see above) onwards. This could consist of charts of the volume of new visitor content (from Social Media or elsewhere) linked to 'heart, head and hands' or levels of increased familiarity with audience members, or changes to the sizes of special interest clusters, for example.	Both	ARC1 ARC2 ARC3 EW
	Finding out to what extent the event is reaching / reached the target audience, and also which new visitors from outside the target audience have been reached (perhaps unintentionally).	Dev.	ARC1 ARC3 EW
	Evaluating how close to the intended shape an event's actual 'shape' might be, according to 'head, heart and hands' dimensions.	Eng.	ARC2 EW

Table 32 Museum Social Media processes related to information

15.1.4.4 Knowledge related to Social Media

Planning or evaluation?	Knowledge-forming processes related to Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
Planning-related knowledge	Generating a picture of the predicted, intended 'heart, head and hands' balance of the event being planned. This would result in the development team and management having a target 'event shape' to aim for. This could be used to help design the event itself, to develop and target promotional material for it, and to attract funding and sponsorship. It would also be ready for use in evaluation (see below).	Eng.	ARC2 ARC3 EW
	Knowing the composition of specific audience segments related to an event, and understanding how the development team / museum management wish that composition to change because of the event. Also, being prepared for unexpected changes in audience during the course of an event.	Dev	ARC1 ARC3 EW

Planning or evaluation?	Knowledge-forming processes related to Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Planning-related knowledge (cont)	Understanding how to co-promote the event with the help of cultural partners in the museum's network, perhaps by bringing the event in line with their plans.	Dev.	ARC1 EW
	Preparing to evaluate the event by using the baseline of current levels of engagement for the specific audience segments to which an event relates. Setting a baseline in this way will enable all changes that build upon the baseline to be correlated back to the events being planned.	Eng.	EW
Evaluation-related knowledge	Establishing how close to the intended, planned 'shape' of 'heart, head and hands' the event was, and focusing upon any differences and the potential reasons behind them. The reasons would be likely to emerge from a qualitative analysis of content such as the Social Media posts that did not 'fit' within the intended 'shape' of the event (i.e. the 'unexpected results'), and potentially with some post-event discussion (e.g. discussions via Social Media, or potentially even interviews) with the visitors who had produced that content.	Eng.	ARC1 ARC2 EW
	Understanding how and why an event changed the composition of an audience. Using this understanding of to consolidate and develop the museum's audience in the development of future events.	Dev.	ARC1 ARC3 EW

Table 33 Museum Social Media processes related to knowledge formation

15.1.5 Assembling intentions and accommodations

Tables 34 and 35 structure learning points about processes related to intentions (i.e. the decisions people make about the meaning they have made) and accommodations (i.e. the compromises that have to be made to ensure that, where possible and desirable, the intentions of others are satisfied).

15.1.5.1 Processes of intent

Planning or evaluation?	Processes of intent (i.e. key decisions made) related to Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
Planning intentions	Deciding what the 'shape' of the event should be in terms of 'heart, head and hands'.	Eng.	ARC2 EW
	Deciding which audience 'special interests' segments to target and planning an appropriate marketing campaign.	Dev.	ARC1 EW
	Selecting the appropriate museum content and deciding how to display it in ways that fire the emotions of the intended audience.	Both.	Cons EW
	Deciding how to market / promote an event, both in terms of developing promotional materials, and where to put them.	Both	ARC1 ARC3 EW
	Deciding which events to programme in the first instance.	Both	ARC1 ARC3 EW
	Deciding upon relevant knowledge that supports the event, potentially by including contributions from visitors.	Eng.	Cons ARC2 EW
	Deciding which sources of funding to pursue, by considering which potential funders have audiences that overlap with the intended audience for the event.	Dev.	ARC1 ARC3 EW

Planning or evaluation?	Processes of intent (i.e. key decisions made) related to Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Evaluation-related intensions	Deciding how to improve the visitors' experience of currently running events by changing the event based upon knowledge about the audience's engagement.	Eng.	ARC2 ARC3 EW
	Learning lessons about the event for direct use in planning how to engage the audiences of future events, both on event specific and overall policy levels.	Both	ARC2 ARC3 EW
	Adjusting the composition and / or promotion of a running event in order to attract more visitors from the intended audience (if audience levels are disappointing) or from an unexpected audience (if there is an unexpected interest in the event from an unpredicted source).	Dev.	ARC1 ARC3 EW
	Using engagement knowledge from event evaluation to help programme future events. Using the sequence of events to underpin longer-term relationships with visitors to facilitate changes in their behaviour.	Eng.	ARC2 ARC3 EW
	Helping funders assess the ROI on their funding activities.	Both	Cons EW
	Seeking future funding and sponsorship.	Both	Cons EW

Table 34 Museum Social Media processes related to assembly of intentions

15.1.5.2 Processes of accommodation

Planning or evaluation?	Accommodations (i.e. key compromises) related to Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
Planning related accommodations	Matching items from the collection with interested audiences.	Dev.	ARC1 EW
	Finding an appropriate level of detail for the exhibition-related knowledge.	Eng.	Cons ARC1 EW
	Achieving the correct balance between curatorial knowledge and marketing information.	Both	ARC1 ARC2 ARC3 EW

Planning or evaluation?	Accommodations (i.e. key compromises) related to Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Planning related accommodations (cont)	Involving members of the audience in event planning and content creation.	Eng.	ARC2 EW
	Incorporating knowledge from the audience / community into exhibitions.	Eng.	ARC2 ARC3 EW
	Pitching to / persuading funders to back the event.	Both	ARC1 ARC3 EW
Evaluation-related accommodations	Achieving an acceptable balance of 'heart, head and hands' for a running event, to ensure it both engages and informs the audience.	Eng.	ARC2 EW
	Basing compromises about the composition / balance of subsequent events upon knowledge of the museum's audience, rather than on the personal opinions of curators, marketing staff and managers.	Both	ARC1 ARC2 ARC3 EW
	Achieving an acceptable head, heart and hands balance for the evaluation of future events.	Eng.	ARC2 EW
	Adjusting the balance of the programme for the future.	Both	ARC1 ARC3 EW
	Persuading funders / sponsors to fund for future events, by providing convincing evidence of engagement.	Eng.	Cons ARC2 ARC3 EW

Table 35 Museum Social Media processes related to assembly of accommodations

15.1.6 Taking purposeful action

Table 36 lists the purposeful actions discussed during the research that could be influenced by engagement-related information based upon Social Media data.

Planning or evaluation?	Purposeful actions taken in museums that could be influenced by information based upon Social Media data	Eng? Dev? Both?	Stage of research where learning occurred
Planning actions	Putting objects in an exhibition.	Eng.	Cons EW
	Creating supporting information / knowledge for an exhibition.	Eng.	Cons ARC2 EW
	Designing the exhibition space.	Eng.	Cons EW
	Co-creating the event / exhibition with audience members. Finding the appropriate collaboration partners from appropriate audience segments.	Both	ARC1 ARC2 ARC3 EW
	Encouraging a creative response to the event by visitors.	Eng.	ARC2 EW
	Marketing / promoting the event / exhibition, potentially in partnership with cultural network partners.	Both	ARC1 ARC2 EW
	Setting the event / exhibition programme to attract the intended audiences, and to match up with plans of cultural partner organisations.	Both	Cons EW
	Attracting funding / sponsorship of events / exhibitions from organisations whose audiences / goals complement those of the event.	Both	Cons EW
Evaluation actions	Adjusting the content of a running event (e.g. an exhibition) to appeal more to the intended audience, or capitalise upon unexpected popularity among unintended audiences.	Both	ARC2 EW
	Encouraging audience collaboration with a running event.	Eng.	ARC2 ARC3 EW
	Planning future events based on thorough learning from the previous events, both in terms of individuals' engagement and impact on the audience as a whole.	Both	ARC3 EW
	Reporting to funders / sponsors, particularly when seeking future funding.	Both	Cons EW
	Strengthening the museum 'community of interest' around the topics covered by the event (e.g. by following up interest shown by visitors). Using this community to encourage and enable longer-term change in visitors' behaviour, related to their wellbeing and personal growth.	Eng.	ARC2 ARC3 EW

Table 36 Museum Social Media processes related to purposeful action taking

15.1.7 Information Systems

The POM model highlights three aspects of the formal Information System intended to support the processes of organisational meaning that form the core of the model. They are: the formal Information System itself, the technology that supports that system (i.e. the IT infrastructure) and the knowledge about that technology. Three tables (37, 38 and 39) have been created to structure learning points about those three aspects. As before, these are sub-divided by planning and evaluation, and the occasions in the research where these learning points arose are noted.

Most of the learning points in this section were clarified by the Evaluation Workshop where all three prototypes were reviewed. It was at this stage in the research that the potential for an Information System beyond the prototypes developed for the research to be of use to museums began to emerge.

15.1.7.1 Aspects of a formal Information System

Planning or evaluation?	**Formal Information System processes that could relate to engagement and Social Media in museums**	**Eng? Dev? Both?**	**Stage of research where learning occurred**
Aspects of the Information System that support planning	Reviewing the current 'baseline' state of the audience with trend charts, bar-charts of the special interest cluster sizes, or graphs of the audience network, potentially including the audiences of other cultural partners.	Dev.	ARC1 EW
	Matching members of the current audience to potentially relevant objects from collections, by graphing the semantic network of collection data (or at least using concepts from the collection data) with a graph of special interest audience segments.	Eng.	ARC1 ARC2 ARC3 EW
	Referring to 'personae' of typical audience members, partially developed using Social Media data about real audience and community members, when designing event / exhibition and related promotional materials.	Eng.	ARC1 EW
	Comparing audience development and engagement data with data from other sources, in order to validate its informational value.	Both	ARC1 ARC2 ARC3 EW

Planning or evaluation?	Formal Information System processes that could relate to engagement and Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Aspects of the Information System that support planning (cont)	Selecting specific, known audience members with the potential to be engaged by the event from an interactive (Gephi) graph of special interest clusters and encouraging their participation. Working with these audience members to promote the event via their own Social Media channels.	Eng.	ARC1 EW
	Using all the information above to discover potential opportunities to involve audience members in co-creation.	Eng.	ARC1 EW
Aspects of the Information System that support evaluation	Using bar charts and trend graphs related to the use of key concepts within Social Media content (posts, and 'biography' / account information) to correlate increases in terminology used in Social Media content with museum events, in order to establish relationships between those events and the creation of new Social Media content.	Eng.	ARC1 EW
	Analysing the changes in 'special interest' audience segments, with a particular focus upon unexpected changes, with a view to finding new opportunities to broaden the audience.	Dev.	ARC1 ARC3 EW
	Clustering newly-created content to establish the impact upon 'heart, head, hands' of the event, and changes to the audience composition during the event. Interactive network graphs of audience composition and the semantics of freshly-created Social Media content (clustered around psychological constructs or concepts from the collection) would be used.	Eng.	ARC2 EW
	Graphing trends in familiarity changes between the museum staff and members of the audience to see how an event (or programme of events) may have strengthened (or loosened) relationships with audience members.	Eng.	ARC3 EW
	Triangulating engagement-related data from Social Media with that from other sources, e.g. survey data or other IT systems (see below).	Both	ARC2 EW
	Tracking the direct interactions visitors have made during the event, e.g. by collecting hashtag data or posts to Facebook pages etc.	Eng.	ARC3 EW

Table 37 Museum Social Media processes related to the formal Information System

15.1.7.2 Information Technology in support of the formal Information System

Planning or evaluation?	Information Technology processes supporting Information Systems related to engagement and Social Media in museums	Eng? Dev? Both?	Stage of research where learning occurred
Social-media related IT processes for use in planning	Linking terms from the museum's Collection Management System keyword / classification taxonomy to Social Media data in a graph, in order to generate audience segments / clusters in the graph database by linking them to user profile data such as Social Media 'biographies'.	Dev.	ARC1 EW
	Linking terms from a lexicon of psychological constructs such as FrameNet to Social Media data, to generate clusters of content relating to the experiences of audience and community members.	Eng.	ARC2 EW
	Generating visualisations of the database of current audience members (taken from Social Media and other sources such as CRM systems) to establish engagement-state baselines.	Dev.	ARC1 ARC3 EW
	Indexing Social Media content (e.g. posts, conversations) and then searching for terms related to the event being planned.	Both	ARC1 EW
	Setting up digital co-creation platforms (such as blogs on platforms such as Tumblr, dedicated Facebook pages, or Twitter hashtags), ready to be used in the run-up to, during and after the event being planned.	Eng.	EW
	Using data from other digital sources to triangulate with Social Media data, e.g.: design and development information about previous events stored digitally, CRM / contacts data etc.	Both	EW

Planning or evaluation?	Information Technology processes supporting Information Systems related to engagement and Social Media in museums (cont)	Eng? Dev? Both?	Stage of research where learning occurred
Social Media related IT processes for use in evaluation	Updating the graph of the cultural social network at regular, scheduled intervals, using a digital data collection system linked to Social Media APIs. The regular scheduling enables a time series of changes to the graph before, during and after the event to be created.	Both	ARC1 ARC2 ARC3 EW
	Automatically linking collected Social Media data to 'heart, head and hands' concepts based upon a lexicon of relevant keywords such as FrameNet.	Eng.	ARC2 EW
	Potentially tying Social Media activity to digital tracking of the real space, either by allowing login to museum WiFi with Social Media account details, or logging into a museum app that uses Near Field Communication technology such as IBeacons, hence enabling actual, real visits to be tied to Social Media activity and relationships.	Eng.	EW
	Triangulating data from Social Media with data from other digital sources, most obviously website usage data from systems such as Google Analytics.	Dev.	Cons EW
	Extracting reports and charting the changes in state of relationships with visitors from a CRM system, to potentially indicate increased 'community strength'.	Eng.	ARC3 EW
	Reporting upon / charting direct visitor interactions with the museum's Social Media accounts.	Eng.	ARC2 EW

Table 38 Museum Social Media processes related to IT in support of the formal Information System

15.1.7.3 IT knowledge that supports the formal Information System

The same IT knowledge underpins the entire system, both for planning and evaluation. Hence Table 40 does not need the planning / evaluation sub-categories.

IT knowledge required in support of Social-Media related information systems	**Eng? Dev? Both?**	**Stage of research where learning occurred**
Understanding Social Media APIs.	Both	ARC1 ARC2 ARC3
Understanding how to input data into and query data from graph databases.	Both	ARC1
Understanding how to create content on, and encourage collaboration on, Social Media and web-based content management platforms.	Eng.	ARC2 ARC2 EW
Knowing how to organise, index and cluster content around keywords and concepts.	Both	ARC1 ARC2
Knowing how to maintain a lexicon of relevant concepts, both in the Social Media analysis system and in the Collection Management System, and maintain consistency across the two (potentially with some form of upper-level ontology).	Both	ARC1 ARC2
Knowing how to maintain a CRM system that is potentially based upon interactions with a non-paying audience.	Both	ARC3 EW
Knowing how to interpret information from a website usage analysis tool such as Google Analytics.	Dev.	ARC1 ARC3 EW
Understanding of data-warehousing and reporting systems, to aggregate data used for establishing trends, sizes of clusters around special interest segments etc.	Both	ARC1 ARC2 ARC3 EW
Knowledge of how to export data into visualisation systems, and design those visualisations to be intuitive, easy to use and not misleading.	Both	ARC1 ARC2

Table 39 Museum Social Media processes related to the IT knowledge required to build and maintain the formal Information System

16 APPENDIX 5: SUMMARY OF INTERVIEWS AND WORKSHOPS

The following interviews and workshops were conducted as part of this research:

Id	Date	Type	Participants	See chapter
I1	30th October 2013	Interview	Learning and Engagement Officer 1 House Manager	4
I2	11th November 2013	Interview	Learning and Engagement Officer 2 Public Relations Volunteer	4
I3	21st November 2013	Interview	Director (retired) Marketing Manager	4
I4	10th December 2013	Interview	Curator 1	4
I5	11th December 2013	Interview	Digital Manager Visitor Studies Curator Policy Research Officer	4
I6	11th December 2013	Interview	Curator 2	4
W1	29th August 2014	Workshop	Head of Museums Social Media Coordinator	5
W2	24th September 2014	Workshop	Head of Museums Social Media Coordinator	5
W3	15th October 2014	Workshop	Head of Museums	6 and 7
W4	21st October 2014	Workshop	Head of Museums Social Media Coordinator	6 and 7
W5	30th October 2014	Workshop	Head of Museums Social Media Coordinator	6 and 7
W6	20th November 2014	Workshop	Head of Museums Social Media Coordinator Museum Partner	7
W7	3rd December 2014	Workshop	Head of Museums Social Media Coordinator	7
W8	12th December 2014	Workshop	Head of Museums Social Media Coordinator	7

Id	Date		Participants	
W9	30th December 2014	Workshop	Head of Museums Social Media Coordinator	6
W10	16th January 2015	Workshop	Head of Museums Social Media Coordinator	6
EW	7th July 2015	Workshop	Head of Museums Social Media Coordinator	6, 7 and 8
I7	3rd June 2016	Interview	Head of Museums	8 and 9

Notes:

Interviews 1-6, conducted between 30th October and 11th December 2013, were undertaken as part of the consultation exercise described in Chapter 4. Interviews 7-16 between the researcher and the Head of Museums and Social Media Coordinator, which took place between 29th August 2014 and 16th January 2015, were the main pieces of collaboration for ARCs 1, 2 and 3, and are described in Chapters 5, 6 and 7. Interview 17, which took place on 7th July 2015, was the Prototype Evaluation Workshop described in Chapter 8. The final interview conducted on the 3rd June 2016 was an opportunity to discuss the outcome of the project Viva with one of the core participants.

Some interviews not listed above also took place as part of ARC1, but as discussed in Chapter 5, these have not been used in the research due to staffing changes at the museum where they were conducted.

17 APPENDIX 6: CONFERENCE PRESENTATIONS RELATED TO THIS RESEARCH

The researcher presented aspects of this work at two conferences during the research period, in the form of the two papers listed below, with their abstracts.

17.1 Paper 1

The first paper was presented at EKSIG 2013: Knowing Inside Out, the International Conference of the Design Research Society Special Interest Group. The paper presented was entitled: *Controversy and debate within Social Media: can museums improve 21st Century Democracy*, and was co-authored by Dr. Ann O'Brien and Professor Tom Jackson.

The paper is available in the conference proceedings, available from: http://experientialknowledge.org.uk/proceedings_2013_files/EKSIG%202013%20Conference%20Proceedings.pdf

17.2 Paper 2

The second paper was presented at Museums and the Web 2014. The paper presented was entitled: *The Epiphany Project: Discovering the Intrinsic Value of Museums by Analysing Social Media*, and was co-authored by Dr. Ann O'Brien and Professor Tom Jackson.

The paper was selected for the printed conference proceedings. A digital version of the paper is available from: http://mw2014.museumsandtheweb.com/paper/the-epiphany-project-discovering-the-intrinsic-value-of-museums-by-analysing-social-media/