The Impact of Networks of Public on Crowdsourcing in the UK Heritage Sector

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The Impact of Networks of Public on Crowdsourcing in the UK Heritage Sector

Completed Research Paper

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Abstract

This research explores the interaction between internal heritage personnel and the public over social media. Focusing on the phenomenon of crowdsourcing and what it means to those individuals involved with it, this paper aims to understand: to what extent, and in what circumstances, can crowdsourcing help heritage professionals protect, preserve and promote National heritage? To answer this question, the study employs a qualitative, interpretive approach, focusing on contemporary history ('living memory') interactions between participants of three UK Armed Forces museums and the public. Using the conceptual framework of networks of practice (Brown & Duguid 2000) as a sensitizing concept in order to gain insight into how museum personnel employ, instigate and respond to the activity of crowdsourcing, participant interviews were analyzed and coded using Grounded Theory Methodology. The findings position that crowdsourcing is not always perceived as a dedicated activity or project focused on producing a specific outcome through crowd engagement. They also challenge a contention in literature on the formation of, and knowledge exchange within, networks of practice, suggesting that rather than extending understanding of existing networks of practice, a new form of electronic network has emerged around the museum context: the network of public.

Keywords: Collaboration, crowdsourcing, heritage, network of public, grounded theory, knowledge exchange

Introduction

The idea of gaining access to the resources offered by a distributed group, or crowd, is not a new development. Gupta and Sharma (2013, p.14) note that "the practice of tapping a crowd has long been used worldwide in every sector of society". However, the emergent phenomena surrounding such globally distributed collaborations over Information Systems (IS) technologies – referred to as crowdsourcing – is still a relatively new area within academic research. The variety of crowdsourcing platforms now available, has increased opportunities for individuals to become involved in the proliferation of crowdsourcing initiatives offered by both commercial and non-profit organizations (Brabham 2013). Primarily crowdsourcing allows organizations to access the intellectual knowledge of the public, regardless of location (Oestreicher-singer & Zalmanson 2013; Yoo et al. 2006).

Despite many examinations of the phenomena of crowdsourcing, Zhao and Zhu (2014) note that whilst crowdsourcing is attracting scholarly interest, the lack of theoretical grounding within academic articles illustrates that it is still in its embryonic stages. They also observed that most studies tend to focus on areas such as conceptualization (Brabham 2008; Howe 2006; Howe 2008), application (Brabham 2010; Gatautis & Vitkauskaite 2014; Besaleva & Weaver 2013) and systems (Geiger et al. 2011; Saxton et al. 2013; Leimeister et al. 2009). Offering an extensive review of the different definitions of crowdsourcing, Estelles-Arolas and Gonzalez-Ladron-de-Guevara (2012), illustrate that it is a method for organizations to

reach out to the public, via an open call on the Internet, seeking their assistance to complete a task or project. This understanding of crowdsourcing is commonplace within extant literature. However, Howe (2008, p.280) himself acknowledges that "crowdsourcing isn't a single strategy. It's an umbrella term for a highly varied group of approaches that share one obvious attribute in common: they all depend on some contribution from the crowd".

This paper seeks to understand what crowdsourcing means to the study participants themselves and whether that fits in to existing academic understanding. Having considered the current methodologies used to examine crowdsourcing, which primarily focus on a variety of dedicated collaborations and platforms, it was felt that a new perspective should be sought. Selecting grounded theory for this study offered the ability to examine crowdsourcing as an evolving phenomena, reaching beyond bounded projects and technologies, providing an extended understanding of its meaning as perceived by the museum professionals engaged directly with it, in all of its forms.

The difference that crowdsourcing initiatives make to heritage organizations is well documented (Ridge 2013; Dunn & Hedges 2014b; Eveleigh 2014; Oomen & Aroyo 2011). Within cultural heritage, crowdsourcing is primarily undertaken in the format of collaborative and cooperative endeavours, with individuals engaged to work for the 'greater good', as opposed to competitive, reward based models that are often seen in the commercial sector (Ridge 2014). Crowdsourcing within open, online communities, such as those surrounding museums, is most successful when the crowd is empowered by the organization through socialization, forming a sense of partnership between the audience and the organization, in order for them to identify with, and contribute to, the organization itself (Jarvenpaa & Tuunainen 2013). Naturally, the expertise of the curator should not be replaced by public exchanges over social media, but the ability to share the process of inquiry and differing perspectives is extremely valuable in order for the emergence of new ideas and knowledge (Mclean 2011). Indeed, curators should be able to supplement public knowledge using their expertise at engaging with, and interpreting, such knowledge, thus relinquishing the assumption that the museum itself has the ultimate control over the interpretation of collections (Adair et al. 2011).

Knowledge exchange, through the use of social media technologies, therefore presents an interesting paradox. Museum curators and historians are commonly considered the specialists within their field, providing verified knowledge and expertise surrounding artefacts and collections. However, with the opening up of communication methods by which the public can engage with such museum professionals, this paper illustrates that the study participants are aware that significant expertise within niche areas is more commonly found outside of the museum. How can both 'experts' share and contribute to knowledge and understanding of collections? Using the conceptual framework of networks of practice (Brown & Duguid 2000) as a sensitizing concept, this study focuses on the types of interactions that curators and the public share over social media, to understand how engaging the crowd aids knowledge assimilation and dissemination.

Literature Review

This section presents a short literature review on crowdsourcing and networks of practice theories that have informed this study.

Crowdsourcing for Heritage Organizations

Howe (2008, p.8) introduced the term "crowdsourcing" to conceptualize the Web-based out-sourcing phenomena which has become prevalent since the increase in more powerful computer technology and the emergence of tools such as social media. As Ridge (2014) states "technology has enabled crowdsourcing as we know it, but models for public participation in collection, research and observation pre-date it". To clarify further, crowdsourcing is a method for organizations to capture the "wisdom of crowds" (Surowiecki 2005, p.xiv) - individuals most commonly connected online - and harnessing their collective intelligence to solve issues or elicit responses to problems or large-scale tasks.

Ridge (2014) identifies that within cultural heritage organizations, crowdsourcing tends to revolve around projects being completed by willing participants who simply want to help and require no reward for doing so. Thus the adoption of crowdsourcing began to take place within the heritage industry, although often

still on smaller scales than traditional outsourcing projects found in commercial business. By leveraging the heritage community to produce new visions and enhance knowledge, museums are beginning to explore the range of crowdsourced tasks that they can ask of their audience in order to develop further understanding of contemporary artefacts within their collections.

Crowdsourced knowledge sharing has achieved results ranging from disaster management systems such as CrowdHelp (Besaleva & Weaver 2013) and Haiti OpenStreetMap (Richmond 2010), through to facial recognition during game playing (Tan et al. 2014) and document transcription (Moyle 2011). A form of crowdsourcing collaboration specific to heritage organizations is known as co-curation. Ridge (2014) illustrates that the use of crowdsourcing projects within the heritage sector enables the audience to engage with specific goals, "even if that goal is as broadly defined as 'gather information from the public about our collections'". It should be noted though that the term 'crowdsourcing' within the heritage domain has become more commonly associated with the augmentation of metadata, transcription and archival improvements to gain contributions from the public which will enhance collections (Eveleigh 2014). Dunn and Hedges (2014a) consider co-curation particularly interesting as the implication is that new knowledge or perspectives are gained, rather than simply adding energy or passion to an existing project. Harnessing this flow of information has allowed museums to develop exhibitions through collaborative efforts facilitating an exchange of ideas and knowledge (Moussouri 2012), although many museums still adopt a rather 'romantic' view of altruistic, transformational collaborations (Ryall 2014), with many still facing internal tensions between professionals as to who is the expert and creator of knowledge, and who the novice (Mclean 2011).

The fact that the heritage audience are already part of an elective community, sharing a common interest in the subject matter and a shared desire to achieve objectives, certainly helps with crowdsourcing opportunities. This allows the audience to engage with the organization in a very personal way, providing their own contribution to knowledge. Such a community, primarily filled with anonymous individuals, globally located but sharing a common interest or theme, can also be referred to as a network of practice.

Networks of Practice

My study employs the conceptual framework of Networks of Practice (Brown & Duguid 2000) as a sensitizing concept to understand the impact of crowdsourcing on internal heritage personnel. A network of practice is a virtual community allowing members to share knowledge through computer aided technologies. There is a great deal of extant literature focusing on virtual communities, from motivations to join (Watson & Johnson 1972; Furlong 1989; Wellman et al. 1996; Ridings & Gefen 2004; Gupta & Hee-Woong 2004), participation (Dholakia et al. 2004; Chan et al. 2004; Ardichvili et al. 2003), and self-sustaining communities (Ridings & Gefen 2004; Blanchard & Markus 2004; Andrews 2002; Whitworth & de Moor 2002). Virtual communities generally consist of members who are loosely connected through a shared interest but are unlikely to meet or know each other outside of the virtual world that they inhabit. Indeed, Gerson (2008, p.193) notes that computer technology has evolved to assist individuals in conveniently dealing with one another, and to perform cooperative tasks, such as in the case of crowdsourcing. However, van Baalen et al. (2005, p.300) also comment that "the diffusion of innovative knowledge is considered to be one of the main challenges in the emerging knowledge society. As this innovative knowledge is distributed and fragmented, Internet-based information and communication technologies can help to leverage the knowledge diffusion." Tuomi (2002) concurs stating that such distributed, loosely connected 'pockets of innovation' can be linked by using Internet technologies, and thus the diffusion of such information takes place at high speed but with moderately low cost. Networks of practice can have enormous reach, extended by the use of information technology, and yet Brown and Duguid (2000) note that the links between participants are primarily indirect, via third parties. Bell and Tight (1993) add to this that coordination and communication are therefore explicit in nature.

Members of a network of practice can also be referred to as "virtual teams" (Sarker et al. 2000, p.1) or "communities of interest" (Wenger et al. 2002, p.43). Similarly, crowdsourcing has been seen to provide highly productive, knowledge building communities, by circulating ideas to afford interactive knowledge development (Frisch 2011). Researchers have used a variety of theoretical frameworks to attempt to understand knowledge sharing behaviors, such as those that take place in a network of practice, including social exchange theory (Bock et al. 2005; Kankanhalli et al. 2005; Lin et al. 2009), social cognitive theory

(Yang & Farn 2009), social capital theory (Wasko & Faraj 2005; Chow & Chan 2008; Chiu et al. 2006), public goods theory (Wasko et al. 2009), and the theory of reasoned action (Gagné 2009; Hsu et al. 2007), although with the exception of social cognitive theory, none of the frameworks employed were motivational theories, but interestingly most of the studies concluded that knowledge sharing behaviors were influenced by motivational factors (Yoon & Rolland 2012). Wenger et al (2002) concur stating that motivational factors such as the variety of participatory levels prompt individuals to join a community.

Van Baalen et al. (2005, p.311) considers it "logical that at the emergence of a network of practice, knowledge exchange will start with knowledge with low transaction costs and low cognitive distance". In other words, more generalized, explicit knowledge is being shared between participants.   Wasko et al. (2009) also noted that sustaining a network of practice was achieved through generalized exchange between members who had developed strong community ties. However, as knowledge transfer increases through the knowledge informant and receiver engaged in different practices, and operating in varying contexts, the cost of such knowledge will increase (von Hippel 1994). There is also the danger that the available knowledge will be exhausted and subsequent requests will not be answered. Maintaining critical mass of active members is essential to sustaining a network of practice despite a "high proportion of member churn in the network" (Wasko et al. 2009, p.254) which would be expected as individuals' lives and priorities change.

The Study Context and Background

The research described in this paper was undertaken as a case study. Case study was relevant as it involved researching a phenomena, over a period of time, within a specific context (Hartley 2012). Within this study, the phenomena is tightly bound to, and influenced by, the context within which it is found and operates, not separated from it (as would be the case in laboratory research). Yin (1994) suggests case study is ideal when boundaries between phenomena and contexts are unclear. Merriam (2002, p.41) concurs, stating that a case is a phenomena that is "intrinsically bounded", where there is "a limit to the number of people who could be interviewed". The phenomena are also researched within a natural setting (Benbasat et al. 2014). Using case studies for theory building is also well suited to areas of research where existing theory is limited, or to totally new research where theory can be bounded with empirical evidence (Eisenhardt 1989).   Within the context of this study, the ability to engage museums that are accommodating in order to undertake in-depth semi-structured interviews with participants, illustrated that case study was ideal for the line of enquiry being followed.

The particular type of museums were selected as they are clearly comparative to one another, as opposed to distinctive from each other. Focusing on a small, medium and large museum (Table 1), this sample size allowed the study to reflect the varying challenges each will face in engaging with different forms of crowdsourcing over social media.

Museum Size and Study Population		
Organization	Size	Permanent Personnel
Museum 1	Large	489
Museum 2	Medium	202
Museum 3	Small	120

Table 1 - Museum Sample

From within the museums a number of participants were contacted to ascertain their interest in the study. The individuals were chosen for their experience of dealing with social media activities either directly as part of their position, or indirectly by providing or receiving information from social media streams that their organizations were involved with. Interviews with thirty-one participants were undertaken. Twenty-six were unique participants, with five being re-interviewed due to changes to their position or organizational structure. Interviews were voice recorded and subsequently transcribed.   Recording allowed for a more natural flow of conversation and to avoid having to stop and restart discussions whilst

notes were taken. Participants and their organizations were anonymized to maintain a level of confidentiality.

Each participant provided details of one or more participants appropriate to the study. The nature of this contact development provided a snowball (Patton 1990) effect which meant that subsequent participants were more open to being contacted and engaging in the study. The roles of the unique participants at the point of initial interview are illustrated in Table 2.

Unique Museum Participants			
Participant Occupation	Rationale for inclusion	Specific selection strategy	Interviews
Digital media personnel (manager, coordinator or similar)	Influential in managing social media projects and engagements. Encouraging use of social media tools by other personnel	Involved with digital media / social media as their primary role	Museum 1 = 5 Museum 2 = 1 Museum 3 = 1
Curator / Assistant Curator / Researcher / Historian	Engaging with museum audience / public through social media technologies and initiatives (directly or indirectly) alongside traditional role	Variety of ages, time in role and differing experience of social media engagement	Museum 1 = 8 Museum 2 = 5 Museum 3 = 2
Organizational Manager / Director	Managing personnel and organizational objectives. Involved in social media initiatives with additional specialist or non-specialist personnel	Involved directly with social media engagement, either personally or through managed staff	Museum 1 = 2 Museum 2 =1 Museum 3 = 1

Table 2 - Research Sample - Unique Participants

Each participant was asked a range of questions. Whilst using semi-structured interviews allowed for a variance in questioning dependent upon the direction the conversation was taking, there were a number of questions that were noted down to ensure that all areas relative to the study were captured. It must be remembered that all participants had already stated that they were involved in social media engagements. Such engagements may have been specific events, general interactions or dedicated projects. Examples of questions posed are as follows:

- What kind of social media engagement do you have with the public?
- What kind of specific social media activities have you been involved with, eg. #AskACurator day?
- What does the term 'crowdsourcing' mean to you?
- How do you validate information that you receive from the public relating to artefacts or collections?
- What, if any, changes have you noticed to your daily workload since you began engaging with the public over social media?

The questions were used primarily as a prompt to ensure that all aspects of social media interactions, and understanding of crowdsourcing definitions, were explored.

In order to analyze participant responses, the study adopted grounded theory methodology (Glaser & Strauss 1967) to examine the impact of the variety of crowdsourcing approaches on the participants.

Theoretical Foundation

The seminal book on grounded theory method (Glaser & Strauss 1967) was published in 1967 and was seen as a revolutionary way to analyses qualitative data. Glaser was from a quantitative research tradition and Strauss from a qualitative one, yet despite the conflicting philosophical perspectives, it is widely

recognized that the theoretical underpinning of "symbolic interactionism [*is*] the most important source of inspiration for grounded theory" (Alvesson & Skoldberg 2009; Strauss & Corbin 1990). There followed a book by Glaser (1978) on Theoretical Sensitivity which elaborated on how theory emerges from the data. As Glaser and Strauss (1967, p.23) explained:

> *"In discovering theory, one generates conceptual categories or their properties from evidence; then the evidence from which the category emerged is used to illustrate the concept. The evidence may not necessarily be accurate beyond a doubt (nor is it even in studies concerned only with accuracy), but the concept is undoubtedly a relevant theoretical abstraction about what is going on in the area studied."*

Often perceived as a term relating to 'coding' of data (Urquhart 2013), grounded theory method can be viewed as a purely analytical tool whereas in reality, the concepts and associations informed by such codes can be extended to build theory "suited to its supposed uses" (Glaser & Strauss 1967, p.3), which was the original aim. Through coding, "our analytic categories and the relationships we draw between them provide a conceptual handle on the studied experience" (Charmaz 2006, p.3). The theory itself is grounded in data through systematic collection and analysis, producing a more inductive theory of a substantive area of research (Glaser 1992). Grounded theory generates theory "based on data, rather than [*to*] verify 'grand theory'" (Urquhart 2013, p.5) and as such is based on the ground up interpretation of data from the researchers own perspective. Theory generated through a grounded theory approach "is typically a substantive mid-range theory" and is often based on a "behavioural phenomenon" (Morse 2001, p.3). Indeed, "the 'rule of 'phenomenalism' is central given the key role that is played by 'data' in all grounded theory writings" (Bryant 2002). The ability to constantly compare, code and analyses data for conceptual relationships is the strength of grounded theory (Urquhart 2013; Glaser & Strauss 1967).

Using grounded theory allows a researcher to fully understand the phenomenon under investigation from the perspective of those persons immersed in it. It illustrates the importance of micro-aspects of an individual's social interactions, rather than macro aspects such as the interactions centered around the organization itself, and focuses the researcher on emergent meanings that are given to these social interactions.
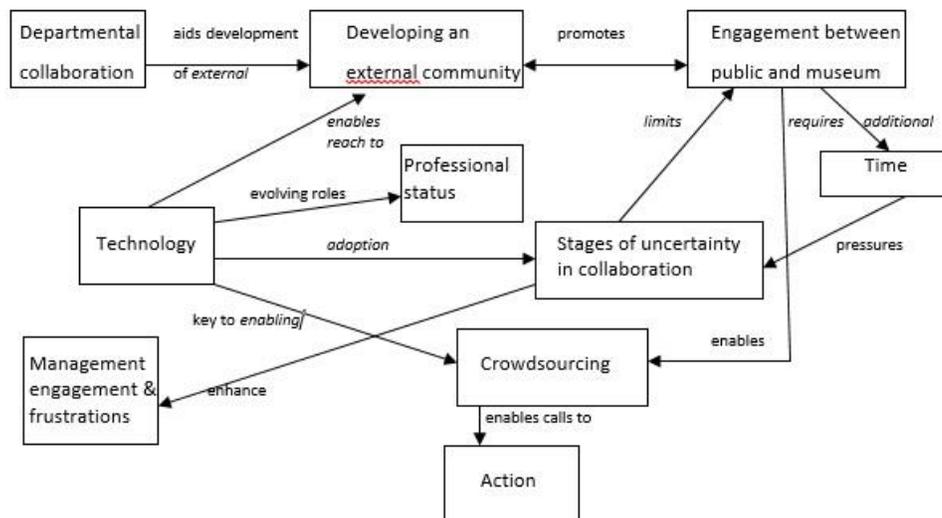
Figure 1. Relating Selective Codes

Initially, the Gioia et al. (2012) data structure of 1st order concepts, 2nd order themes and aggregate dimensions was considered as the framework with which to organize codes. However the coding framework provided by Urquhart (2013) was more aligned to the study style and ultimately used. Coding

was undertaken on a line by line basis, although often it transpired that this did not provide the depth required and further analysis was undertaken by breaking down lines into their individual concepts. Due to the volume of codes generated by this method, narrowing down of the open codes was necessary. This was achieved by evaluating each code against the concepts that the study was looking to understand, such as those applicable to crowdsourcing, social media engagement, communities and similar themes. Through an iterative process of reviewing transcripts and associated open codes, the selective codes were slowly developed. Understanding how the emergent categories related to each other to comprehend their impact allowed further analysis to be undertaken. Figure 1 shows the iterative diagram (Strauss 1987) that was used to relate the categories.

Further comparison and reviewing of the selective codes allowed the overall theoretical code to emerge. This code became the core theoretical code for the research as it encompassed all the elements of museum collaboration, or crowdsourcing, with the public as perceived by the study participants.

Findings

An emergent theoretical concept that has developed through this study, is that of a network of public. Initially it could be considered that what the participants may be witnessing was that of a form of network of practice (Brown & Duguid 2000; van Baalen et al. 2005; Agterberg et al. 2010; Wasko et al. 2009; Wasko & Faraj 2005). A network of practice is based upon a shared interest and mutual desire to collaborate, illustrating that "the common denominator of these groups - practice" (Brown & Duguid 2000, p.141) still remains. They are a virtual community allowing members to share knowledge through computer aided technologies, social media being the most common today. Teigland (2003) identifies that collaboration and engagement are the prerequisites required to form a community, whether that is internal to an organization or external. The virtual communities observed in networks of practice generally consist of members who are loosely connected through a shared interest, but are unlikely to know each other physically, which can also be illustrated through the nature of crowdsourcing. This is in line with Howe's (2008) revised definition of crowdsourcing as an umbrella term for interactions with the public over social media. Networks of practice can have enormous reach, extending both spatial and temporal boundaries. In the case of an external community, members are accustomed at understanding "that computer networks are also social networks spanning large distances" (Wellman & Gulia 2001, p.169). This understanding of the social nature of the Internet, allowing collaboration between anonymous participants, supports the emergence of networks of practice.

The impact of knowledge and expertise sharing within a network of practice surrounding a museum appears to be the same as for many other kinds of organizations. Agterberg (2010) investigated an intra-organizational network of practice, observing that four main activities were taking place: "asking questions, responding to questions, providing unsolicited information, and observing an interaction" (2010, p.90). These four activities can also be observed through the museum participants responses to collaborative engagements with the public, along with one additional activity; that of direct action. Such direct action can include transcribing documentation or taking part in a dedicated crowdsourcing project. However, whereas Agterberg was examining the intra-organizational network of practice from the perspective of globally dispersed organizations requiring a form of management control, this study has found that these activities are now also being witnessed outside of organizational boundaries, offering both a public-to-professional (museum participant), and public-to-public context. The network that has formed around museums is primarily based on the public's interest in those organizations.

Wasko et al. (2009) observed that there was little correlation between the individuals within the US federal law forum network providing help and their interest areas. What the study did show was that those providing the responses were either more senior lawyers or were sole practitioners seeking to enhance their reputations. With the network of public, there is a strong suggestion from participants of the study that no such enhancing of reputation seemed to exist. The engagement they experienced with the public appears to be an unconditional sharing of information in order to better understand collections and artefacts. With the information provider rarely receiving any kind of public acknowledgement through social media, it could be suggested that in a network of public, enhancing of reputation, or social capital (Preece 2004), would rarely feature.

One of the criticisms of a network of practice is that the members do not interact with each other directly, producing a loosely coupled system. Compared to a community of practice, this type of social system is considered by Brown and Duguid (2000) to produce very little knowledge and not take any significant action. Van Baalen et al. (2005) concur with this understanding, but go further by stating that in order for a successful network of practice to form, a set of defined criteria must be met. However, the findings of this study suggest that there are significant differences between this new phenomena, and existing academic understanding of the properties and components of networks of practice. This led to the conclusion that the museum phenomena was not best served by being defined as an enhanced network of practice, but instead should be given an alternative naming convention to capture the essence of what the museum participants are witnessing first hand: a network of public.

A network of public is enabled by, and dependent upon, appropriate information systems tools. The ability for individuals to make contact with professionals within museums has been successful through the remit of social media. Social media tools have provided a method by which the public can communicate with, and collaborate on, any number of tasks. These tasks can range from asking a question, to providing detailed personal accounts, or engaging in large-scale collaborative projects. This illustrates that the boundaries between crowdsourcing and networks of public have considerable overlap from the point of view of the study participants. Their perception is that engaging such networks provides crowdsourcing on a variety of levels, not just within the context of a specific project that they require the public assistance with. Technology can be as simple as social media tools such as Facebook and Twitter, through which the public ask questions, answer questions or share knowledge both with the study participants and each other. Alternatively, large-scale, dedicated crowdsourcing projects that have been designed specifically for a project with which to engage the public, can also be used. These are most commonly associated with defined tasks such as transcribing materials or entering data to build a knowledge base.

To summarize, the network that the participants observed:

- showed significant engagement by the public in knowledge sharing;
- provided collaborations through existing social media technologies, or dedicated platforms for specific projects;
- had no requirement for management control in order to share knowledge, or a knowledge broker to facilitate knowledge acquisition and dissemination;
- allowed the public to undertake clearly defined actions;
- had no discernible leader; and
- gained no apparent increase in reputation, or social capital, from collaborations.

This appeared to indicate that the network being perceived by the study participants went beyond the current interpretations and understanding of networks of practice and online communities.

The following sub-sections discuss the levels of engagement observed by the participants in a network of public.

Sharing Knowledge

The acknowledgement by the study participants that the public hold a vast amount of expert level knowledge, contradicts Keen's (2007) view of the 'cult of the amateur', showing that as social media use has increased around heritage organizations, experts can be found increasingly from within the public. Indeed, de Rijcke and Beaulieu (2011) provide an interesting example of a museum actively seeking knowledge from the public. An object was selected from the Tropenmuseum collection specifically as not much was known about it, "and the intention really is to learn from users" (2011, p.678), which was successfully achieved. In acknowledging that museum personnel are not the overriding experts, barriers relating to knowledge acquisition and dissemination have been broken down, both within the museums themselves, and also surrounding the public that they engage with. The primary channels for knowledge sharing were social media – Facebook and Twitter being the main two – allowing any number of activities to occur, from asking simple questions relating to an image or event, through to noticing errors in collections data and suggesting appropriate corrections, or sharing photographs and stories. This interaction was two-way between the museum participants and the public. Many examples were provided

of museum participants sharing information that they simply found interesting, regardless of whether the public were asking for such. Likewise, a number of examples of 'expert' public were discussed, illustrating that the museum participants were fully aware that there was a significant level of niche knowledge available beyond their own or that of their institution.

Focusing on online discussion forums dealing with US federal law, and extending Brown and Duguid's (2000) definition of networks of practice to "electronic networks of practice" Wasko et al. (2009, p.255) investigated a number of hypotheses. One of the results of their investigations showed that there was a generalized exchange of knowledge by a critical mass of individuals who provided the majority of responses within the network. This is contrary to the network of public where the open nature of the knowledge exchange through social media (as opposed to the more 'closed' nature of a forum that one must join to participate in), meant that responses could come from either museum professionals or other members of the public. There is no reason to assume that in a network of public, certain individuals were responsible for the majority of answers. Whilst study participants did notice that, on occasion, responses were from members of the public that they had interacted with or seen responding before, these interactions were not significant enough to suggest that those individuals were the main contributors. Indeed, the participants quoted examples of specific individuals within the public who had very detailed knowledge within certain areas, where it was more likely that they may engage with questions or discussions, but that was not to say that no other member of the public would also become involved. There is no empirical evidence from this study to suggest that contributions were from a core group of public.

Equally, verification of individuals within the museum network of public did not appear to affect how their knowledge contribution was perceived. In Ma and Agarwal's (2007) study of online communities, it was suggested that where community members verified their identities, other members of the community were more inclined to engage in knowledge sharing. In the case of changes to collection objects, the museum participants did engage the network individual further to confirm the information provided prior to making any change. However, this verification was not provided to other members of the network. Thus there was no evidence of any increase or decrease in knowledge sharing and engagement in this study linked to whether individuals were verified or not.

Taking Action

Within the museum context, there were many examples provided to show how significant action can be taken by the museum public. One of the museums within this study introduced a large-scale crowdsourcing project to gauge the appeal and involvement of the public community surrounding their organization, prior to launching a major collaborative project with a partner organization. The first project focused on transcribing unit diaries from those soldiers at the front during the First World War, and was a 'test bed' for how engaged the public would be in such a niche area. It proved very successful with the blog relating to the site announcing that over ten thousand 'citizen historians' had signed up in the first eight weeks since the project launched. Up to the end of March 2014, the effort put in by the crowdsourcing community equated to one person working forty hours per week for four years. This established to the study participants that the public were engaged as a networked community around their organization and were willing to take action and produce large volumes of work. Volunteers also became moderators on the discussion forum, taking on additional roles and managing questions asked by others within the community. The community, as a whole, were prepared to dedicate both time and effort to transcribing diaries, which formed the basis of the project. One study participant acknowledged that the project involved a steep learning curve and was considered a niche area for the public to be involved in. Despite such hurdles, the participant considered that the uptake by the public was good and individuals were prepared to put in the effort to learn the system. It also showed that the museum themselves are engaged with the community. This project was clearly centered round the public taking action to transcribe written content, and somewhat less about knowledge sharing - although that would still be a sub-set of the process itself.

The willingness of participants to take action to ensure that data are accurate was illustrated by another participant. The public were asked to examine hundreds of photographs of First World War tanks and identify the individual tanks. The participant clearly saw and recognized the levels and areas of expertise

of members of the public engaged with that project. There were members of the public who could be identified as experts in their field, providing highly detailed, verified information on specific tanks. This would appear to illustrate the desire to participate by taking action, which is an area that has been extensively explored in academic literature (Zheng & Yu 2016; Harindranath et al. 2015; Wiggins & Crowston 2011; Malone et al. 2009; Schauer et al. 2015; Kollock 1999).

From discussions with the study participants, it could also be suggested that action does not have to be such a large-scale undertaking as assumed by the examples above. It can also be through lower-level engagement, which they still considered as a form of crowdsourcing. An example being of one of the museums posting images on Pinterest and Flickr of a potential one hundred objects that they were going to put on display. They then publicized this to the public and asked them to vote for which objects they wanted to see. The public responded with over fifty-two thousand votes. This example was particularly interesting as the museum participant expected certain objects to be included in the top ten of items that their audience wanted to see. Much to their surprise, none of the top ten objects the public chose were items that the museum is renowned for displaying. This allowed them to make considered decisions about their exhibitions based upon their audience feedback, and not on what they 'thought' the audience wanted to see. If it were not for the action taken by the public in responding to the request for their input, the museum would have continued focusing on collections that their audience were not as actively interested in, or engaged with.

Sense of Urgency

With social media openly available to the masses, levels of interaction using such technologies have increased (Fischer & Reuber 2011), providing a means to ask questions to seek confirmation of knowledge at any time. As one participant observed, the public ask questions as they occur to them, even if it's not occurred to the museum that something may require clarification. This example illustrates that there is no longer a requirement for a sense of urgency – or time limit - in order for the public to engage with the museum, and vice-versa.

Through observations of questions raised by the public over social media, and responses given by the museums within this study, an understanding of the vast variety of information sought was gained. Rarely did a request appear that had any 'deadline' associated to it. One study participant observed that some questions the public ask are relatively simple and take a matter of minutes to respond to. Increasingly though, the participant noted that it can take some time to produce a response or verify information received. A number of participants commented that they felt a personal sense of pressure to respond to questions quickly, even though no such requirement for a speedy response came from the questioner. Many interactions were observations, images and confirmations. The fact that the public can ask a question of museums purely 'out of interest', without a specific deadline or requirement for an answer, illustrates that no sense of urgency needs to exist for the interaction between the museum network, and the institution itself to happen.

However, a sense of urgency could be beneficial for specific crowdsourcing tasks. In the case of projects with defined timescales, encouraging a sense of urgency to complete the task may help get the task accomplished by exerting the pressure of a deadline (Quintane et al. 2013; Gallaugher & Ransbotham 2010; Partington 1997). At the time of this study, none of the museums were engaged in time-limited crowdsourcing projects, so there was no sense of urgency in requiring the public to provide information within set timescales.

Fragmented Awareness

The notion of fragmented awareness, or knowledge gaps, asserts the belief that there is a person, or people, beyond ones existing network that will have information or solutions to problems (van Baalen et al. 2005). Whilst acknowledging that fragmented awareness is still a valuable aspect to building a public network, the study revealed that in the museum context, it does not necessarily always necessitate there having to be a 'problem' to find a solution to.

An example of fragmented awareness that led to a more comprehensive, and differing understanding, of an artefact was provided by one participant. Initially, they were rather skeptical of social media and someone irritated that their knowledge had been called into question regarding some exhibition material that was on display. However, after doing some research and checks, they found that the information that had been received from the member of public was indeed correct. It was at this point that they realized that the interactions between the public and museums over social media could be beneficial to both their own personal knowledge, and the collections they manage. This illustrates that fragmented awareness was used to allow the member of the public to provide additional information relating to an artefact that subsequently enabled a correction to be made to the understanding by the museum. It should be noted, however, that there was no sense of urgency illustrated.

Participants noted that fragmented awareness was also useful in public-to-public exchanges. There were times where they were considering how to respond to a question when another member of the public answered it almost immediately. This example shows how the engaged community can provide a solution to a query, without the requirement for a museum professional to be involved. Again, it should be noted that there appears to be little sense of urgency around the question/answer scenario.

There were a significant number of examples given by the participants of knowledge being presented by the public without the museum asking for help, or having a specific problem to resolve. It could therefore be concluded that whilst understanding that there are gaps in knowledge that is not a requirement for a network of public to form. The ties between individuals are strengthened through their commonality of interest in the museums themselves, not through the need to solve specific problems or fill knowledge gaps.

Knowledge Broker

A knowledge broker has been defined by Davenport and Prusak (2000) as those individuals that connect knowledge suppliers with those requiring it. Alternatively referred to as "boundary spanning individuals" (Tushman & Scanlan 1981, p.83), these persons understand where to seek knowledge, particularly beyond the boundaries of their own institutions. Corporate librarians are an example of knowledge brokers, uniting not only people to text, but also similar minded individuals across organizations. Similarly within commercial businesses, the manager is often considered to take on the role of a knowledge broker, or 'gatekeeper', gathering knowledge and filtering it out appropriately to members of their team (Davenport & Prusak 2000).

Within the museums that formed the case studies for this research, it could be noted from participants' responses, that neither managers nor librarians were involved in uniting individuals in order to share knowledge. Indeed, no single person, or group of persons, could be identified as a knowledge broker, suggesting that such an individual is not required by museums for internal and external associations. Whilst, for some organizations, the primary remit for engaging the public is provided by the social media department, the nature of such engagements is diverse and often down to the specific individuals that wish to be involved.

It would appear that the use of social media has enabled both internal museum stakeholders and the public to connect, view, share, and challenge knowledge. No specific individual is required to be in situ within the museum for this to take place. Even in early days of social media engagement, it was often museum stakeholders who identified themselves as being from a specific institution and encouraged subsequent dialogue, as opposed to this functionality being initiated from a centralized department, or dedicated individual.

However, concurring with van Baalen et al.'s (2005) findings on knowledge brokers within networks of practice, it could be argued that the need for a more centralized approach may become a requirement as the maturity of knowledge sharing collaborations are reached within the museum network. For example, individual contact may not be as easily achieved due to the levels of interaction now afforded by social media and, as such, it may become the sole remit of one specific department - the social media team, for example - to now coordinate responses with internal members of staff, and provide those responses to the public. One participant illustrates an example of why this could be the case when commenting that social

media is a fast route to an expert, and often questions are just asked without much thought for the effort that goes into a reply. Often, even when the participant has replied, another question will be asked almost immediately, suggesting that the member of the public feels they have the undivided attention of the museum employee to ask as much as they want. If the museum had a form of knowledge broker in place - albeit perhaps defined as the social media department or personnel - then that level of response expectation could be removed from the participant and provide a buffer between them and the public which, potentially, could dissipate the connection to 'the quick route to an expert'.

Knowledge Portal and Structural Holes

A knowledge portal is an Internet technology platform that has the ability to "bridge structural holes and contribute to the emergence of a network of practice" (van Baalen et al. 2005, p.306), providing indirect links between the knowledge requests and those being received in return. Burt (1992) suggests that bridging these gaps, or structural holes, between two individuals through a connection formed by an individual known to both (a knowledge broker), allows better knowledge exchange to take place. Contrary to this argument, Nooteboom and Bogenrieder (2003) suggest that retaining structural holes is useful in providing both a problem to be overcome, and an opportunity to share knowledge to do so. Having a level of cognitive difference is beneficial to knowledge collaborations. Within the museum network, structural holes are clearly evident from the participants' discussions. A participant may be collaborating with two members of the public on a specific task or information request, and yet it is unlikely that these publics will know one another on a personal level. This puts the museum participant in an advantaged position (Hanneman & Riddle 2005).

In their study of a US federal law forum, Wasko et al. (2009) also observed weak relational ties in the network, similar to the structural holes mentioned above. Although no direct investigation of this area was undertaken within this study, it would appear that the same could be observed in the network of public where multiple, anonymous individuals, sharing no direct connection that study participants' have observed, can provide responses or impart knowledge. Wasko et al. (2009) did, however, observe that members of the forum had strong relational ties to the network itself. It could be considered the same is applicable to the network of public. The study participants noted that an association to the museum of interest did encourage the public to engage with knowledge sharing and information offering within that specific form of community.

Van Baalen et al. (2005) also assert that having a knowledge portal in place provides for a more efficient manner "to transfer and exchange knowledge" between participants, along with a "reciprocity in knowledge sharing" (2005, p.306) which, in turn, leads to a network of practice being formed. In the case of the museums engaged with this study, the knowledge portals that were in place consisted of the social media platforms being utilized by the public, such as Twitter and Facebook. These platforms were 'open' with all knowledge freely visible to any individual who chooses to follow or interact with them. As one study participant commented, the public know how to use them and so they use them all the time without having to learn something new.

Additionally, the large museum (M1) had a separate, dedicated knowledge portal to crowdsource information on a specific project they are currently undertaking. The portal is open to the public to upload and add their contributions to, along with museum stakeholders, and is available to specific museum participants and academics (upon request) to interrogate the data. The two remaining museums had no such dedicated platform at the time of this study.

The exchange of knowledge between the public and the institutions was freely taking place, contrary to Kollock's (1999) assumption that this form of exchange is a greater risk to the knowledge giver. It therefore appears that a dedicated knowledge portal, as discussed by van Baalen et al. (2005), to remove the need for direct links between the knowledge sender and receiver and encourage reciprocity in knowledge sharing, is not a requirement in the museum context. An existing form of portal is currently available through social media technologies and it is this technology that leads to the emergence of the museum network of public.

Conclusion

The formation of a network of practice (Brown & Duguid 2000) is assumed to lead to limited levels of knowledge sharing, intra-organizational knowledge sharing that required some level of management control (Agterberg et al. 2010), a specifically designed knowledge portal through which to share knowledge (van Baalen et al. 2005), or some form of group leadership within the network (Faraj et al. 2015). This is contrary to the perceptions of the study participants and their observations of the emergent network of public.

Acquiring knowledge through collaborative engagements, or crowdsourcing, with the public is facilitated by the development of interest communities around museums. Communities, no matter how closely or loosely connected, sharing an interest, are the foundation of the emergent networks that heritage personnel are observing. The development of these electronic networks, through the contemporary use of social media, has allowed the formation of networks of public, functioning at a level where individuals can now interact directly if they so desire, and produce large quantities of knowledge. No longer do museum personnel have to reach out to their public to encourage engagement. Engagement is happening on an almost daily basis, without the need for specific requests, projects or assistance calls from museums.

The affordances offered by social media have allowed the definition of 'expert' and 'amateur' to become less clearly defined. Whilst acknowledging the position of museum participants as those providing verified knowledge, one also needs to acknowledge that many of the public that they engage with are also considered experts in their field.

Initially my research appeared to challenge contentions in literature surrounding the activities and actions of members of a network of practice. However, through developing and refining my coding using networks of practice as the conceptual framework, I have provided insight into the way in which museum participants understand the collaborations they are experiencing with their publics, through the diverse knowledge exchanges afforded by social media. Recognizing that there were significant differences between what the study participants were witnessing, and what was academically understood to be defined by a network of practice, provided me with realization that what the participants were experiencing was a new phenomena: a network of public.

My findings suggest that networks of practice (Brown & Duguid 2000; van Baalen et al. 2005; Wasko & Faraj 2005; Wasko et al. 2009; Agterberg et al. 2010), as currently understood in academic literature, have been extended and enhanced through the emergence of the network of public (Table 3).

The emergent network of public suggests that a diverse type of online community has been formed. The fact that the heritage audience are already part of an elective community, sharing a common interest in the subject matter and a shared desire to achieve objectives, certainly helps with knowledge sharing opportunities (Ridge 2013). The museum participants within my study are aware of the excellent opportunities afforded to them by a highly engaged audience, and are working hard to maintain levels of engagement that their public desire.

In order to understand how a network of public differs from a network of practice, Table 3 looks at a number of previously defined elements that academic literature has afforded to networks of practice and compares them to the emergent network of public.

The traditional form of online community is often understood to contain core members (Farzan et al. 2012; Chen et al. 2016) that contribute the majority to the community, along with more peripheral members, or lurkers, (Nonnecke et al. 2006; Zhang et al. 2007) who may just observe interactions but never get involved to the level of answering questions. Bautista (2014) observes that traditional communities of interest are hierarchical in nature and often members can feel social pressure to contribute and participate. However, the interest community surrounding a network of public is perceived as highly engaged by the study participants but without the pressures associated with more traditional communities and forums. This community appears to be comprised of many individuals who both ask and respond to questions, whether such questions are posed by other members of the public, or by the museum participants. Questions and responses are viewed on the specific social media that the public are

engaged with. This allows other contributors to become involved if they have additional information to offer. It also means that those without additional offerings are not obvious or noticed by other members of the network. However, it also makes identifying any specific type of community member, such as a leader or senior contributor, very difficult as there is such fluidity of individuals and engagement.

Network of Public	Network of Practice
Significant levels of knowledge sharing are available within a network of public.	Little knowledge is produced by members.
Positive actions can be taken by members of a network of public, often to influence or support museum decisions.	No significant action is taken by members.
Through the use of social media, there is no requirement for a time-limit on responses for members to engage with their chosen institution(s).	A sense of urgency is required to tackle specific problems.
Recognizing knowledge gaps assists with leveraging engagement, but is not a prerequisite for knowledge exchange to occur.	Fragmented awareness in a dispersed industry is a prerequisite for the network to form.
Knowledge is provided to a variety of individuals within the museums and subsequently disseminated by them as appropriate.	A knowledge broker is required to acquire and disseminate knowledge.
Knowledge that is shared in a network of public is frequently commented on, and added to, by other members of the network, and is not just directed to museum professionals.	Members rarely interact directly within the network.
Social media act as the knowledge portal, allowing the exchange of knowledge to occur between museum professionals and the public.	To develop a knowledge portal, an active knowledge broker is required.
Knowledge sharing is achieved through existing technology in the form of social media systems. No dedicated system is required.	Reciprocity in knowledge sharing is achieved through a knowledge portal
Almost no ability to develop social capital	Potential to enhance reputation (build social capital within the network)

Table 3 - Comparison between a Network of Public and a Network of Practice

Benefits of participation in collaborative projects are often understood as perceived values such as self-image, contribution to collective knowledge and recognition within the community (Wasko & Faraj 2005; Lesser & Prusak 1999). A second difference in the museum network of public, is that these values, or social capital (Preece 2004; Faraj et al. 2015; Wasko & Faraj 2005; Beck et al. 2014; Wang & Noe 2010), do not appear to feature very highly, if at all. This is primarily due to the manner in which the knowledge is shared. Majchrzak et al. (2013) observe that the affordance of networked-informed associating leads to increased social capital, and thus positive, productive knowledge sharing conversations take place among the community, through social network engagement. More usually in an online community, members join and ask questions or respond to those already asked. Types of questions are often sorted into headings and sub-headings, helping members focus on their levels of interest and knowledge.   This level of interaction begins to build social capital. Social capital within an online community can often be

presented as an individual becoming a senior member or leader (Faraj et al. 2015; Ganley & Lampe 2009) of such community. Within the community that has emerged around the museums, there appears to be no specific manner in which to enhance social capital amongst the community peers in order to build reputation. This is primarily due, again, to the nature of the interactions being openly available over social media with any member of the public or museum participants able to provide an answer. Thus interactions through these forms of social networks involve a vast assortment of audiences including academics, historians or simply interested parties wishing to learn about objects within museum collections (Marty 2008). With so many potential suppliers of information, building reputation would be difficult to achieve as questions posed can be so varied. Within the traditional online community, or forum, it is easier to become a 'subject expert' by responding to specific lines of questions which are categorized within the community itself. This is contrary to the way that the museum network functions.

These findings suggest that literature on electronic networks can be extended through the emergence of the network of public. They also show that many of the criteria associated with a network of practice are no longer applicable within the emergent network that is being witnessed by the study participants. From the observations that they have made surrounding the type of interactions they are experiencing, and their discussions on crowdsourcing and collaborative engagement, the networks as perceived by them, are considerably different from the existing interpretations of networks of practice (Brown & Duguid 2000; van Baalen et al. 2005; Faraj et al. 2015; Agterberg et al. 2010) in scholarly literature.

A final observation is that crowdsourcing has extended beyond the traditional academic understanding of dedicated projects to achieve specific goals. The museum participants within this study viewed crowdsourcing also as an umbrella term (Howe 2008) for engagement with the public. This engagement could be a simple as answering a posed question on social media, through to asking for specific help with additional rich stories surrounding objects within collections. It could be considered that crowdsourcing now extended to the myriad of interactions happening daily over social media between museum participants and their audience, not purely goal-based projects.

Limitations of the Research

In understanding the value that communities play in providing and disseminating knowledge surrounding museums, this study provides some understanding of the evolving nature of networks of public as perceived by museum participants, through modern social media technologies. Whilst areas of knowledge, crowdsourcing and communities of practice have all received much academic attention through their various contexts, networks of practice, or electronic networks, appear to have received less consideration, often focused on specific forums or group memberships.

The fact that this study centers around three Armed Forces museums located within the UK provides a limitation. The applicability of networks of public on other areas of heritage, both within and external to the UK, would provide new contexts to explore. Equally, to undertake a longitudinal study could provide better understanding of the impact of engaging the public as social media technologies mature, or new technologies materialize. Alternatively, it could be beneficial to gain access to the communities that are engaging with museums to assess why they are willing to provide so much information, often for little or no return on their knowledge investment.

Another limitation of the study concerns the network of public itself. The view of the community that has built around the museums, developing into the network of public, is one from the perspective of the study participants (museum stakeholders) and the researcher. It would be interesting to engage with the network and find out more about the individuals involved in such and their levels of expertise surrounding their chosen museum(s). However, it is appreciated that this could be a very onerous and, potentially, extremely difficult task to achieve, as it relies on those network members wishing to engage with researchers as opposed to their true interest area, the museums.

A further limitation is through the chosen method of analysis. Grounded theory is an interpretative method and as such, this study is based upon the researchers own interpretation of the transcripts of meetings with museum participants. Coding transcripts is also a very personal process, using not only the

words that have been transcribed, but memories of the people, location, feelings and emotions that were part of the meeting as a whole.

Further Research

From this study, a possible interpretation of the researcher's understanding could be that museums offer a unique opportunity to contribute to knowledge and understanding through open, two-way sharing. Such sharing is not necessarily based on any need or timescale, but more on interest and discovery. However, this could also be the case for many other non-profit organizations who are versed in using volunteers as part of their workforce. It would be relatively easy to extend these findings to other types of museums such as those dedicated to a specific locality or non-military collections. Once again, it can be considered that a proviso would be that there is still information to be unearthed – that of 'living memory' stories - in order for a similar style museum network of public to emerge. That is not to say that there are new findings surrounding ancient historical collections that could yet be discovered, but dealing with living memory events is likely to provoke higher levels of interaction.

Building on the emergent themes and theoretical contribution generated by this study, would allow future researchers to widen the heritage study groups and investigate whether the findings of this study are visible across different types of organizations. It is an interesting observation that the freedom of information and willingness to share may be something limited to non-profit organizations such as museums and NGOs. The open nature of this form of information sharing is not something readily associated with commercial business and thus may be peculiar to non-profits, although further research would be required to ascertain this fact.

With the increase in social media interactions taking place on a daily basis between museums and their public, a further area of research could be to gain a deeper understanding of the meaning of crowdsourcing through current technology use. Extending research beyond museums, to a variety of non-profit organizations, and gaining an understanding of their engagement with their public to gather and share knowledge, would be beneficial in exploring the definition of the term itself to consider whether in all cases it encompasses more than goal-based activities.

Some participants considered what it now meant to be a curator in the digital age. Many job descriptions for organizations external to the heritage sector now use curator as a title for a wide variety of roles. Future researchers may like to consider what it means to be a curator with the increase of specialized websites being self-published.

One implication for practice that has emerged from this research would be for local museums to gain an understanding of how to better position their interactions with the public. The enhanced view of networks of public that the study has afforded could be applied in order for them to further develop their own virtual communities and knowledge sharing opportunities.

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