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University of Southampton

Faculty of Social Sciences

Economic, Social and Political Sciences

**The Politics of Memory: An Extended Case Study of the
Memory of Crisis on Wikipedia**

by

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Abstract

Faculty of Social Sciences

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Nina M Schuller

Numerous studies of memory on Wikipedia focus on edit wars (conflict between editors) relating to memories of war, atrocities and protests. There has been limited investigation of how other forms of social crisis are (re)constructed - including with regard to the interests, and involvement, of those groups more likely to be at risk of negative outcomes from crises. Processes of social and transitional justice (following crises) should include and empower these groups. Recent research on disaster risk reduction also suggests that memory (re)constructions contribute to preparation for future disasters, and it is important that the social choices interacting with disasters are considered as part of this. There is, however, limited evidence of how such issues are recognised and addressed in the (re)construction of diverse crises on Wikipedia - which feed into systems of automated forms of knowledge-making on the web.

To address the above, an extended case study is developed on the (re)construction of a major pollution event (the Great Smog of London). Critical discourse analysis of intertextuality (connections between texts through hyperlinking and other shared patterning) is utilised to move from a focus on micro level practices to macro and meta level findings on the ordering of Wikipedia and its interactions with other institutions. Findings evidence a layered, self-referencing formation across texts, favouring the interests of established institutions and providing limited opportunity for marginalised groups to interact with sustained (re)constructions of the Great Smog. Comparison to a previous study of the constructed memory of a crisis (the London Bombings 2005) reveals dynamics across Wikipedia that lead to an emphasis on connecting (re)constructions to institutional traditions rather than the potential usefulness of such (re)construction for those at higher risk of negative outcomes arising from repeated crises.

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Research Thesis: Declaration of Authorship

Nina Margaret Schuller

The Politics of Memory: An Extended Case Study of the Memory of Crisis on Wikipedia

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

<p>This work was done wholly or mainly while in candidature for a research degree at this University;</p> <p>Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;</p> <p>Where I have consulted the published work of others, this is always clearly attributed;</p> <p>Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;</p> <p>I have acknowledged all main sources of help;</p> <p>Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;</p> <p>None of this work has been published before submission</p>
--

Signature: Date:.....

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Definitions and Abbreviations

ANT Actor Network Theory. This is a theoretical framework from the field of science and technology studies.

CDA Critical Discourse Analysis. This is a theoretical approach to critically analysing texts and the social practices and ordering associated with them.

ECM Extended Case Method. Within this thesis, this refers to a theoretical framework supporting a critical approach to case studies which was developed by Burawoy (2009).

ERGO The University of Southampton's ethical approval system.

ISP This is numerical code (string of characters) setting out a unique address as required under standard internet protocols. The IP address provides some data to websites visited by a user e.g., the supposed location of a device, although not to the level of a person's physical address.

SCOT The Social Construction of Technology. This is a theoretical framework from the field of science and technology studies.

VPN Virtual Private Networks. These are technologies used to hide virtual identities on the web.

URL The URL is a user-friendly representation of an IP Address (see definition above).

Chapter 1 Introduction

1.1 The Research Problem and Its Significance

Scholars critically reviewing processes of transitional justice have called for greater recognition and inclusion of those most deeply affected by crises, rather than their subsumption into dominant hegemonic narratives (Björkdahl *et al*, 2017). From the perspectives of professional agents of transitional justice and Western liberalism it might be felt that painful communal memories can hold back recovery, democratisation and economic benefits (Misztal, 2005). Any perceived duty to forget, however, must be balanced with the duty to remember suffering (Habermas, 1997) and the interaction of memory with inclusion, accountability and learning. Various scholars (Björkdahl *et al*, 2017; Aboudeldahad, 2021) have highlighted that the failure to acknowledge the experiences and perspectives of those groups most likely to be at risk of negative outcomes through crises can 'create a hegemonic quality of the law', which 'risks being complicit in a renewed disenfranchisement' (Campbell and Turner cited in Jones, 2021, p.169). Misztal (2005, p.1328) argues for the importance of providing space for the processing of 'groups' painful memories and facilitating intergroup cooperation'. This could include the processing of repeated crises where individuals and groups would otherwise have little opportunity to address memory in a way that reduced the likelihood of further damage. Recent research on disaster risk reduction suggests that it is important the social choices interacting with disaster are investigated and addressed retrospectively, and processes of remembering and forgetting contribute to preparation for future crises (Monteil, Barclay and Hicks, 2020; Kronmüller *et al*, 2017; Fuentealba, 2021). Many of these studies, however, have given limited attention to the role of socio-technical memory in such processes.

Weedon and Jordan (2012, pp.143-145) described the concept of collective memory as 'narratives of past experience constituted by and on behalf of specific groups within which they find meaningful forms of identification which may empower'. Such dynamics have been said to apply in the case of hegemonic constructions of globalisation, with the web seen as potentially democratising 'the means of cultural production in ways that facilitated the articulation of marginalised formations of collective memory'. The visibility of pluralist counter-memories,

however, interacts with scholarship and archival activities focused on certain traditions. Molden (2016, p.137-138) has noted that one of the 'most recurrent metaphors of memory studies has been that of "history or memory wars"'. Following this tradition, many studies of the politics of memory on the web have been focused on so-called edit wars (Tkacz, 2015, pp.62-64), often with conflict concentrated between anonymous representatives of different national interests (Pentzold, 2009, Kaprāns and Makhortykh, 2017; Gustafsson, 2020). Saryusz-Wolska, Wawrzyniak and Wóycicka (2022) also recently identified scaled-up mnemonic wars interacting with other forms of identity, including gender and ethnicity. Scholars have investigated how memory wars are constructed and resolved, with particular attention to editorial hierarchies and power-editing (Tkacz, 2015; Smit, 2018), as widely evidenced across social media (Graham, Straumann and Hogan, 2015; Segesten and Bossetta, 2017; Bittner, 2017; Bossetta, Segesten and Trenz, 2018; Soares, Recuero and Zago, 2018; Wright, 2018; Crowston and Fagnot, 2018).

Rather than attempt to duplicate the above studies, this thesis seeks to extend understanding of social memory and focuses (a) on the degree to which marginalisation can be revealed on the web and its institutions and (b) how this interacts with (re)constructions of repeated disasters. This is with the intention of improving understanding of whether memory (re)constructions across Wikipedia and other institutions support the processing of such crises by marginalised groups - including those at higher risk of negative outcomes arising from crises. Having decided on my research problem, I then considered how to work with the web and its institution, decided on targeted research questions and the initial focus for their investigation. Further details are given below.

1.2 The Web and its Institutions as Memory

The web and its institutions have been conceptualised in many ways, including as information (*Berners-Lee et al*, 1992); architecture (Berners-Lee, Connolly and Swick, 1999), and public spheres (Hänska and Bauchowitz 2019; Saud and Margano, 2021). Memory has been associated with these concepts (Barnet, 2013; Maurantonio, 2014), as well as many others - such as identity, learning, trust and knowledge making, both at an individual and a social level (Misztal, 2005; Erll and Nünning, 2008; Tota and Hagen, 2016; Bernecker and Michaelian, 2017). This has

made memory a focus of study for web science (O'Hara *et al*, 2006; O'Hara, Tuffield and Shadbolt, 2008; Smith, 2008; Mayer-Schönberger, 2009; O'Hara, 2013; Ogden, 2020) and the social sciences (Miształ, 2005; Rosamond and Aguis, 2018). Leading web scientists (O'Hara *et al*, 2006, p.361) have identified questions that they have regarded as significant, including whether the web as memory would replace history, promote populist narratives, aid transitional justice, and balance individual and collective memory. Other issues raised included how memory narratives might be constructed, differ, and achieve a specific purpose such as 'retelling some key event in a group's history?' (O'Hara, 2013, pp.5-10).

Unlike concepts such as information and communication, memory is primarily defined through its association with the past (Werning and Cheung, 2017). The investigation of the construction of social memory can reveal choices made over time and the possibility of other choices (including as counter-memories of marginalised groups) that could have been made. These revealed possibilities can be referenced when making choices (within the present) about the future.

Contemporary memory studies (from psychology to the social sciences) recognise that such constructions engage with diverse social imaginations of space and time (Miształ, 2005; Bernecker, 2017; Perrin and Michaelian, 2017). Basing a taxonomy of memory on grammatical considerations - which vary across languages – would, therefore, be problematic (Werning and Cheng, 2017; O' Perez and Tavits, 2017; Buzsáki. and Llinás, 2017).

Memory as (re)constructed temporalised and spatialised possibilities has been investigated for its political dimensions. This has included explorations of memories of politicised boundaries (Anderson, 1983; Zhurzhenko, 2016), orderings (Winner, 1999, p.128; O' Perez and Tavits, 2017) and their association with social identity, learning, trust, legitimacy, truth and many other social concepts. Critical thinkers, including post-structuralists and post-foundationalists, have argued that such boundaries and orderings are open to contestation (Molden, 2016; Blakey, *et al*, 2022), while other scholars have identified changes in the spatialisation of memory (re)construction over time (Rosamond and Aguis, 2018; Gallinat, 2018).

In view of the above, it is unsurprising that there is no universal definition of memory, or the politics of memory, across all disciplines. Scholarship on these concepts span a large range of disciplines (ranging from critical geography to

linguistics) and generates a plurality of definitions and research findings (Thelen, 1989; Erll and Nünning, 2008; Tota and Hagen, 2016; Bernecker and Michaelian, 2017). There have been calls for the development of interdisciplinary memory studies that work with the full spectrum of experience (Van Dijck, 2007, Brown *et al*, 2009). Collections of interdisciplinary memory studies (Erll and Nünning, 2008; Keightley and Pickering, 2013; Tota and Hagen, 2016), however, evidence that many memory scholars remain located in one discipline and so take a particular position on that spectrum of experience. It has also been recognised that it can be difficult to cross some disciplinary divides due to differences in definitions, terminology and methodologies. Brown *et al* (2009, p.120), for example, noted that the 'boundary between psychology and the natural sciences and sociology and the study of cultural practices is probably the most difficult to cross'.

Some scholars have attempted to describe different waves of memory studies. (Rosamond and Aguis, 2018; and Gillinat, 2018). According to these descriptions, each wave has been accompanied by rescalings which are valued and privileged in their present. There have been studies that have associated collective memory with the space-time of the nation-state (Anderson, 1983, Nora, 1989). More recently others have drawn attention to counter-memorialisation (Niven and Paver, 2010; Maurantonio, 2014). Various theoretical and empirical studies have examined the significances of memory for democratic identity, including through international peacebuilding; transitional justice and democratisation following the traumas of war, atrocity, colonialisation, and the collapse of communism (Misztal, 2005; Molden, 2016, pp.137-138; Cole, 2018). Numerous studies of nostalgia and populist politics were produced in the wake of Brexit in the UK and the election of Trump in the USA (Thorliefsson, 2016; Fekete, 2017; Steenvoorden, and Harteveld, 2017; Kenny, 2017; Gaston and Hilhorst, 2018). There have also been studies of supra-national memory (Inglis, 2016; Gallinat, 2018), interacting scales of memory (Thorliefsson, 2016) and memory as a positioning strategy in international relations (Molden, 2016; Zhurzhenko, 2016; Bachleitner, 2019; Gustafsson, 2020). The field of transitional justice has been devoting increasing attention to memory politics, with reference to the entanglement of local and global (Ouaissa and Strohmaier, 2021). Scholars have described the significance of digital memory through drawing on some of the above traditions but reinterpreting these with reference to new patterns emerging through economic, technological and social change. This has included connecting memory formations to networks

and global scaling (Pentzold, 2009), hypertext and algorithms (König; 2020; Hoskins and Halstead, 2021, p.680), and new forms of institution (Smit, 2018).

Any institution or data on the web can potentially be investigated as politicised memory - ranging from web archives to search engines and social media (Smith, 2008; Hoskins, 2017; Smit, 2018; Zavadski and Toepfl, 2019; Ogden, 2020). The individual scholar sited within their discipline and social context, then draws on traditions of memory in their construction of such technology as memory.

Increasingly this is achieved through an interdisciplinary approach, with scholars drawing on diverse traditions while remaining within a specific disciplinary field. A substantial cluster of socio-technical memory studies, across disciplinary fields, have been concentrated on Wikipedia and edit wars relating to controversial subjects such as war, atrocity and protest (Pentzold, 2009, Ferron and Massa, 2011; Luyt, 2015; Kaprāns and Makhortykh, 2017). Memory scholars have been drawn to Wikipedia due to its reputation as a bulwark of the Open Internet (Tkacz, 2015, p.28; O'Hara and Hall, 2021, p.6). Page (2018, p.48) has observed that Wikipedia is viewed as most closely characterising 'aspirational aspects of sharing, openness, participation and democratic type processes of Web 2.0'. In addition, the extensive archive (mainly covered by creative commons licensing) generated on Wikipedia is viewed as significant by researchers and technologists who mine social data (Jatowt, Kawai and Tanaka, 2019, p.287). Wikipedia's data (particularly when extracted and converted into facts on Wikidata) has important functions within the Semantic Web (a global database of machine-readable data), the production of the so-called creative commons, and automated knowledge (Ford, 2015; Matsakis, 2018; Bukhari, Bashir and Malik; 2018; Maher, 2020). These functions have been aligned with a particular conceptualisation of memory as the collective (re)construction of the past through crowd-sourced editing - with social facts produced through such editing extracted and utilised within forms of automatic knowledge generation based on logic (Vrandečić, 2019; 2020).

Narratives of values espoused by Wikipedia and the so-called Wikipedian community of senior editors can be confusing to an outsider as they seem to encompass many contradictory positions. The Wikimedia Foundation acknowledges that funding for Wikipedia has come from a range of sources including individual contributions by users; charitable foundations and private companies, including Google and Amazon (Johnson, 2010; Wikimedia

Foundation, 2020). There are many Wikipedia articles and publications giving diverse views of the origin stories and values of Wikipedia and the Wikimedia. This includes the writings of its founders and elite editors (Lih, 2009; Reagle and Koerner, 2020, Sanger, 2022; Wales, 2022) as well as the writings of academics (Van Dijck, 2013, pp.134-153; Pentzold, 2009; Kopf, 2022). Wikipedian policy states that Wikipedia that it is not meant to be a democracy, a forum for free speech, bureaucracy, laboratory or battleground (Van Dijck, 2013, p.132; Wikipedia, 2021a), Key Wikipedian articles, however, describe a bureaucratic form of governance (Wikipedia, 2022a) and those contributing to the project have described it as a laboratory (Hill and Shaw, 2020).

Surveys by the Wikimedia Foundation and Wikipedian narratives claim to identify marginalisation (particularly around gender, language, and ethnicity) on Wikipedia and to address these, including through outreach events (Valentine *et al*, 2020, p.267; Reagle and Koerner, 2020; Wikimedia Foundation, no date). It would be difficult for the Wikimedia Foundation (no date) to claim to 'empower and engage people around the world to collect and develop educational content under a free license or in the public domain, and to disseminate it effectively and globally', without a commitment to identifying and addressing marginalisation. Narratives of such commitment interact with narratives of problematics, such as misinformation, that have emerged on the web. There is evidence, for example, that some interests use counter-memories to promote hate and violence while arguing victimhood (Wilson, 2022). It has been suggested that these problematics have recently led Wikipedians to 'revisit unfashionable models of hierarchy, rigidity, exclusion and intolerance' (O'Hara and Hall, 2021, p.65). Studies, however, suggest that hierarchical models, unfriendly to those without an in-depth understanding of community norms, have long been found on Wikipedia (Viegas *et al*, 2004; Rosenzweig 2006; Panciera, Halfaker, Terveen, 2009; Hecht and Gergle, 2010; König, 2013) and these may relate to a form of governance that was initially introduced to support the creation of a digital commons on the web (Kioupiolis, 2022, p.57-59).

Working with the above descriptions of Wikipedia as an institution and memory, and in the context of my research, I constructed a description of Wikipedia as an archival hegemony of diverse texts that could be (re)constructed through relations with other institutions and various layers on the Semantic Web. This ranged from

the surface text of articles which were highly visible through popular search engines, to less visible texts. This view of Wikipedia as memory recognised the complexity of the site's narrative, including its values, principles and governance, and links to the production of the digital commons and automated knowledge (Ford, 2015; Tkacz, 2016; Matsakis, 2018; Bukhari, Bashir and Malik, 2018; Maher, 2020; Vrandečić, 2019; 2020). Using the concept of memory (rather than deliberately neutralised concepts of information or communication) aided me in examining Wikipedia over spaces and times and recognising the possibility of different choices that could have been made in (re)constructions of crises.

Having decided on this approach, I chose a targeted research question that considered how a memory representation on a past crisis (the Great Smog of London) on Wikipedia interacted with other texts across spaces and layering. To address my research problem, I added a further research question focused on how this engaged with marginalisation. These questions are set out below.

- How are articles about past crises (re)constructed on Wikipedia with reference to other memory representations?
- How do the re(constructions) engage with marginalisation.

1.3 Developing the Methodology

As in the case of other scholars working in the social sciences (Misztal, 2005), the cognitive sciences and philosophy (Bernecker and Michaelian, 2017), I made the decision to work with memory as a social construct rather than a natural occurrence that could be objectively studied. This influenced my choice of a critical, constructivist methodological approach known as the extended case method (ECM) which enables the researcher to work with connectivity across sites and times (essential for studies of connective technologies such as the web), rather focusing on a contained case (Lai and Roccu, 2019). Unlike other well-known methodologies that can be used to explore connectivity (Hine, 2007), the ECM specifically recognises power inequalities and how these might change over time. Burawoy (2009) adapted the ECM to take account of the past and its reimagining and viewed sites of study as engaging with alternative orderings rather than laws of history.

Burawoy (2009) intended that the researcher begin in the field and start building a case through observations of local processes in a particular setting, such as a company or community. Observations and other data on local processes are then connected to macro relations of power, with specific attention given to gaps, anomalies, dominance, marginalisation and resistance (pp.56-58). A comparison with a previous case study undertaken on the site enables the researcher to recognise how their own research decisions and changes in context can lead to differences in findings about the same site. These differences can also be connected together to make observations about the site more broadly and over time. Through this approach, ECM studies 'become testimonies of the interdependence of individual experience and the broader social, political and economic milieu'. As such, the ECM attempts to 'subvert traditional understandings of theory development as confined to an elite or distanced scientific community' (Samuels, 2009, pp. 1607-1608).

At the beginning of the ECM, the researcher chooses to work with a theorist. Burawoy (2009) supposedly leaves this open to the researcher, but the form of the ECM (moving from micro processes to macro forces and recognising their reciprocity) aligns with Marxist-Gramscian theory (Tavory and Timmermans, 2009; 2014). Burawoy avoids this becoming a purely deductive approach by leaving such theory open to extension through modification in light of what is found in the field. I chose to work with methods that drew on the Gramscian theory of hegemony to extend existing theory on the politics of memory on Wikipedia and its interaction with other institutions. Other scholars have also used the ECM to extend theory in relation to a diverse range of concepts and topics (Danneels, 2002; Samuels, 2009; Lai and Roccu, 2019). These studies valued the ECM for its capacity to draw out marginalised voices and persisting injustices through processes of change. The following provides a brief definition of Gramscian hegemony theory and related concepts and how this has been related to the study of memory and marginalisation. It, should, however, be noted the main way in which I drew on such theory was through its integration into the structuring of my literature review, the construction of the ECM and a critical method of analysis (Critical Discourse Analysis). This formed part of the research framework I developed to address my research problems and questions.

Gramsci described a hegemonic project as one of social unity favouring a dominant class, including through the co-construction of what is viewed as thinkable (Gramsci, 1971, referred to this as ‘common sense’) and a particular form (Gramsci, 1971, described this as a ‘historic bloc’) which ‘exerts moral, intellectual and political leadership’ (Donoghue, 2018, p.395). Gramsci avoided economic determinism by describing how culture unfolds in the superstructural realm of state and civil society in a way that retains some autonomy, while remaining rooted in material production. Donoghue (2018, p.360) observes

that hegemony is constructed via dialectical processes between the material and socio-cultural. It is not simply about physical domination. Rather, ‘hegemony includes the *creation* of a “collective will” – not merely an economic class coming into its own or becoming aware of itself – *but the construction of a social-cultural unity*’ (Ives, 2005, 458)

Hegemony can be viewed as a site of struggle and may break down during periods of crisis (Robinson, 2005, p.560). In investigating memory, I drew on Molden’s (2016, p.127) understanding of hegemonic memory. Different elements (in constant tension and sometimes antagonism with each other) are contained within a hegemony and it decides what is ‘thinkable [through] the normative imposition of the legitimate language’ (Angenot, 2004, p.102). Molden, therefore, states that it is necessary to dig into the ‘discursive strata’ of the archive to reveal power struggles and inequalities that have become hidden within it and yet continue to interact with the present. This process may reveal political alternatives to linear, historic master-narratives. Molden (2016, p.131-133) proposes that the Gramscian concept of culture can be used to arrive at a new definition of ‘memory culture’ as the ‘always specific and contingent dimension of all social realms in which the meaning of the past is negotiated’. As such, consideration must be given to complex social forces which can go beyond mnemonic wars between nations or competing ideologies.

In my analysis of my data, I used Critical Discourse Analysis (CDA) - particularly the concept of intertextuality. CDA practitioners do not place their primary focus on what Gramsci described as the historic bloc, rather they give attention to ‘how the emergence and dominance of particular discourses help some blocs consolidate their power over others’ (Donoghue, 2018, p.395). CDA is viewed by its practitioners as

'a powerful tool in problematising constructions of language that (re)produce asymmetrical power relations between ruling and subaltern classes. It is rooted in critical social theory, drawing from thinkers such as Foucault, Bourdieu, Gramsci, Althusser and the Frankfurt School (Luke, 2002)'... Gramscian concepts – noticeably hegemony, but to a lesser extent common sense – are referenced regularly when situating CDA theoretically' (Donoghue 2018, p.393).

CDA scholars, including Fairclough (1995) and Donoghue (2018) have recognised the importance of language in Gramsci's analysis of power and the operation of power. This includes language as a framework of rules which are developed, and act, on groups in different ways. CDA incorporates analysis of intertextuality which has been used to explore various forms of politics (Donoghue, 2018). This has included international relations (Hansen, 2006), where it has supported awareness of the reinterpretation of meaning and knowledge in entangled contexts. With reference to the Bakhtinian theory, Fairclough (1992a, 1992b, 1995, 1999) argued that intertextuality (ways in which text refer, or do not refer, to other texts and their interactions within a body of literature) could be used to analyse connections between language and social contexts. This included through mapping' text on to the social networks of orders of discourse that the text draws upon, and the ways they are articulated together' (Fairclough, 1999, p.170).

CDA practitioners are currently extending their practices to social media (Unger, Wodak and KhosraviNik, 2016; KhosraviNik, 2022). They are increasingly paying attention to the construction of texts on social media and intertextuality across the online and offline realms. I drew on a CDA framework developed in Farrelly (2020) to explore continually changing patterns of connections and disconnections across texts on Wikipedia and other institutions. Following the structure of the ECM, my analysis moved from local observation to wider orderings. I began my analysis with a focus on the (re)construction of the most visible surface texts – as arrived at through popular search engines. I then moved on to investigate wider practices and patterns of discourse on Wikipedia through following out the hyperlinks (embedded into the text in an article) to other texts. Finally, I explored wider ordering of discourse across the web through examining similarities and differences in visual patterning across institutional memory representations.

During the above stages I investigated the power inequalities created through normative policing, sustained connections (and related disconnections) between texts, and other practices aimed at arriving at hegemonic acceptance, consent and legitimisation across spaces and layers of Wikipedia and the web. Most importantly, in terms of addressing my research problem and questions, I examined how this was accompanied by (re)contextualisations of the text. CDA analysis of intertextuality and (re)contextualisation can be used to signal the colonisation or appropriation of text. This can either be expressed as the reproduction of discourses (whereby no new elements are introduced), or alternatively discursive changes arising through new combinations of discourse (Jorgensen and Phillips 2002, p.7). I wanted to understand how such recontextualization was interacting with marginalised perspectives.

As I move from a localised text into wider orderings of discourse, I combined analysis of intertextuality with the Bakhtinian concept of the chronotope. Bakhtin (1981, p.84) developed the concept of the chronotope to describe the fusing of time and space with discourse. De Fina and Wegner (2020) have observed that the chronotope might be created through the manipulation of intertextual links and might be used to explore the relations between time and space and participation in mass communicative events and constructions of realities. The concept of the chronotope helped me to visualise my findings on forms generated through intertextuality and so describe them at a larger scale.

Both the use of Gramscian theory and the intentions of critical discourse analysis (Donoghue, 2018, p.395) require the connection of the analysis of discourse and ideational (cultural formations) to wider findings on material conditions. The restrictions of the Covid19 lockdowns meant that opportunities for working closely with marginalised groups were restricted. After investigating various research options, I chose to draw on my own positionality (as someone at higher risk of being marginalised on Wikipedia and more widely) and the findings of diverse scholarship to make connections between findings from my discourse analysis and the material conditions of marginalised groups.

1.4 Choice of Memory Representation

In the ECM, the researcher makes a choice of revisit, but the full significance of their case only arises towards the end of the research project. Lai and Roccu (2019) have described this as a case through construction rather than selection. A comparison of an earlier case study of a site and revisit to that site, is used to extend understanding of the site and its relations with wider forces. Initially this is through recognising the differences between the two cases, but later efforts are made to connection them together to recognise wider constructions of space-time and their politics. The researcher must return to the same site as the previous study, but as the focus of the research is on extension of theory through attention to differences, it is not necessary for both case studies to focus on exactly the same memory representation on the site, or draw on the same methodological framework (Burawoy, 2009).

Near the beginning of my PhD, I chose to revisit a case study on Wikipedia by Pentzold (2009). I chose Pentzold (2009) due to the dominance of this publication in electronic academic databases and related citations by scholars. Although Pentzold (2009) did not claim to investigate the politics of memory, he investigated the (re)construction of a memory representation in the aftermath of an atrocity (the London Bombings 2005) and explored conflict and consensus on the site through reference to CDA. Having identified Wikipedia as a site of initial interest, and Pentzold as a case study for comparison, I decided to focus on an article about a major pollution crisis taking place in London in the early 1950s. This was referred to as 'the Great Smog of London' on Wikipedia. My intention was to move away from dominant memories (often associated with what Western, male editors are interested in) on Wikipedia (Luyt, 2015 and Samoilenko *et al*, 2018) and in academic memory studies.

Rather than focus on so-called memory wars, I was interested in shared memory of environmental crises arising out of industrialisation, with such memory potentially having wider social and economic implications. Climate change, for example, has been strong associated with particular forms of historic industrialisation (the World Economic Forum, 2021; Kunkel, S. and Tyfield, D. (2021) and environmental disasters. I also wanted to investigate how the (re)construction of the memory of crisis might interact with sense-making by, and

about, groups who were more likely to more marginalised and at greater risk during crises (Thomas *et al*, 2018; Benevolenza and DeRigne, 2019).

Although the major pollution event that I chose to focus on was not contemporary, there was evidence that internationally scholars, media outlets (Zhang and Samet, 2015; Jha, 2015; Pillai, 2016; Czerwińska *et al*, 2019; Read and Parton, 2019) and political activists (Smogday.org, no date) had used it (through comparison) to try and make sense of contemporary pollution events. This had included debates over whether contemporary pollution events (a) were similar to the Great Smog, (b) should be tolerated as part of industrialisation or (c) alternatively addressed through regulation and other interventions as had been applied in the wake of the Great Smog. This meant that the (re)construction of the Great Smog could potentially be the subject of discussion and debate on Wikipedia and other institutions, including engaging members of marginalised groups who had access to the computers and the web. There have been other studies of (re)construction on non-contemporary events on Wikipedia which have evidenced intensive editing of articles (Luyt, 2015; Gustafsson, 2020).

There were similarities between Pentzold (2009) and my own case study. We both analysed a Wikipedia memory of a crisis in London using CDA. I, however, referenced a different (a) case study approach; (b) social theory, (c) Wikipedia article and (d) form of crisis. The term 'crisis' can include various types of events and so overlap with the term 'disaster' (Al-Dahash; Thayaparan and Kulatunga, 2016) - particularly where disasters are related to wider, social causes. If I had simply chosen the same Wikipedia article and methodological framework as Pentzold, this would have tightly tied my own research to a dominant tradition in the studies of the politics of memory on Wikipedia. Ferron and Massa (2011) had already carried out this type of consolidating revisit on the Wikipedia article on the London Bombings 2005. By choosing to loosen my tie with Pentzold (without completely breaking it), I was able to take my research beyond the confines of the traditions set by Pentzold (2009) and those that followed him. I followed connections outwards (through hyperlinked intertextuality) to explore a range of recontextualisations and reinterpretations of a memory representation across Wikipedia and the web - with reference to my own research questions. In doing so, I sought to apply my methodology to reveal marginalisation, resistance, as well as any attempts by people in marginalised groups to add and process their memories

about crisis. As someone who identifies with a number of groups that other researchers have evidenced as marginalised on Wikipedia, I also constructed my own memory interpretation.

1.5 The Significance of my Methodology

Within web science, and other fields focused on the study of science and technology, efforts have been made to adopt and adapt multi-site methodologies that take into account the connectiveness of social technologies (Hine, 2007; Ford, 2022). Leading social scientists engaged in the Web Science Project have also called for web scientists to 'critically about the interpretivist and post-foundational preferences of social sciences and the humanities and what these might mean, if anything for technical politics and engineering design'. Questions are asked 'about the nature of the web as we make and remake it, to think about its consequences in terms of difference and inequality and to think about if/how we can engage in shaping its future'. It was thought this might also lead to 'new forms of critical engagement and analysis...beyond 'familiar repertoires' (Halford, 2014).

In addition to using my methodology to address my research questions, I adapted a form of multi-sited methodology in a way that could be useful to those seeking to critically reveal power-inequalities and marginalisation on connective technologies, including over time. As part of this I sought to address criticisms (Tummons, 2021; Klein and Kleinman, 2002) that other methodologies widely adopted in science and technology studies have failed to give sufficient attention to power-relations. My adapted methodology may, therefore, be useful to those investigating or constructing web technologies who wish to reveal power inequalities, marginalisation and resistance and seek to give greater attention and resources to those who have been more likely to be marginalised in collective (re)constructions across Wikipedia and other institutions. This might include web scientists, CDA practitioners who are extending their practices to social media, policy makers and technologists.

1.6 The Structure of the Thesis

Chapters in the thesis include:

Chapter two, which sets out findings from iterative, extending literature scans on concepts within the conceptual framework for this thesis. This includes contemporary literature (mainly from computer science, web science and the social sciences) on the web as constructed socio-technical memory and its political significances - with particular attention to issues of marginalisation and related dynamics. This literature was used to inform the research topic and questions.

Chapter three which sets out a targeted literature review on politicised studies of memory on Wikipedia- with a detailed critical review of another case study of socio-technical memory on Wikipedia by Pentzold (2009). This is then referenced across other chapters of the PhD, including in a comparison between Pentzold (2009) and my case study (in chapter seven). A set of further studies of Wikipedia as socio-technical memory (following Pentzold, 2009) are also critically reviewed as site revisits. The chapter concludes with how findings from the literature review supported the addressing of the research problem and questions and were taken into the development of the methodology and its application.

Chapter four which provides the rationale for adopting a particular methodology and adapting it. This includes setting out how the methodology was developed in response to data and circumstances arising during the period of the PhD. As part of the extension of the methodology, various methods were tried, tested and extended. These processes are described in detail within this chapter. They also had implications for the development of the case study in chapters five and six.

Chapter five which sets out the local to macro stages of the case study. This includes setting out observations about the site (as part of the ECM approach), with particular attention to the spatial-temporal constructions on Wikipedia and how these might be experienced by less privileged editors and readers. A form of CDA analysis (focused on intertextuality and reinterpretations) is undertaken on samples of data from Wikipedia's article on the Great Smog of London (in all languages editions), related talk pages, and embedded hyperlinks. This is used to investigate local processes, including their interaction with power-editing,

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marginalisation and resistance. Such local processes are further connected to macro level orderings, where the data calls for this.

Chapter six which connects the local-macro findings identified in chapter five through to meta formations through investigation of intratextuality between institutions, including Google and Netflix and a range of traditional institutions acting as trusted sources across the Semantic Web.

Chapter seven which includes a comparison between my case study and that of Pentzold (2009). The comparison highlights differences arising from the positioning and methodological choices of the researchers, but also changes to Wikipedia and the web over time. Finally, differences across the case study are connected to generate findings across times and spaces.

Chapter eight concludes the thesis. The research questions are addressed in this chapter. The research findings evidence a layered, self-referencing formation across texts which favours the interests of established institutions and provides limited opportunity for marginalised groups to directly interact with sustained (re)constructions. Related policy implications and options for further consideration are briefly outlined as part of the conclusion

Chapter 2 Literature Review of the Construction of Contemporary Socio-Technical Memory and its Politics

2.1 Introduction: The Shaping of the Literature Review with Reference to the Politics of Contemporary Knowledge-Making

This chapter draws on the literature required to explicate the conceptual framework for this thesis - with reference to broad interdisciplinary scans across the concepts of the web, memory, and the politics of memory. Particular attention is given to memory as hegemony and the politics of memories of crises. Reflexive questions about the construction of digital searches and sources arose as I worked with my initial data samples from Wikipedia and other digital organisations. I started giving attention to the politics of language and citation (Kitchin, 2005; O'Pérez and Tavits, 2017; Hsieh, 2020; Kim, 2020) and realised that writing the thesis could engage with personal agency and resist the expectations of '*specific institutional venues and particular modes of action*' (Mitchell and Elwood, 2013, pp.33-34). I became increasingly critical of literature prioritised by popular search engines such as Google Scholar, although I continued to use such tools. Greater reference was made to hard copy versions of literature (from across times and spaces) from various libraries and bookshops, and efforts were made to have conversations with people across disciplines, organisations and localities. Efforts were also made to regularly break out of the PhD (e.g., through work placements) and then come back to it with a relatively fresh eye and revised online personalisation. After I had worked on organisational design, climate adaptation and resilience within workplace contexts, these became more visible in my searches -perhaps due to a mixture of changes in my search habits and online personalisation. Even with such precautions I remained at risk of continually meeting the same fragments of ideas and information that I had previously found through searches. I tried to counter such information loops through building up my understanding of memory as a (re)construction that remained open to critical review and reinterpretations. I drew on various scholarship as part of this, as set out below.

2.2 Memory as a Social-Technical Construct

Many scholars (across times and spaces) have given consideration to memory (Bernecker and Michaelian, 2017). During the twentieth and twentieth-first centuries, scholars practising in the social sciences and humanities (particularly in the West) have been highly influenced by post-structuralist perspectives of memory as constructed, archival and politicised (Foucault, 1977 and Derrida, 1996; Schwartz and Cook, 2003; Appadurai, 2003; Stoler, 2010; Verdoolaege, 2012; Molden, 2016; Sánchez Macedo, 2022). The French philosopher Halbwachs and his concept of collective memory has also become highly referenced across interdisciplinary memory studies (Gensburger, 2016). Within Halbwachs's conceptual framing of collective memory, the individual is the agent of remembering, but what is remembered is shaped with reference to pluralist understandings and present contexts and concerns. This framing of collective memory has become viewed by many memory scholars as holding political significance through its interaction with pluralist, democratic identity (Mitsztal, 2005).

Contemporary scholars, across disciplines, have come to regard memory as a social construct (Smith, 2008; O'Hara, 2013, pp.5-10; Bernecker, 2017, p.51; Smart, 2018; Ogden, 2020) which engages with different spaces, times (including past, present and future) and related identities (Bernecker, 2017, p.51). A widely cited source on memory as socially constructed and engaging with politicised temporal-spatial perspectives is that of Anderson's (1983) 'imagined communities' which describes how new technology (print media) supported the arising of the nation-state. Misztal (2005, p.1321) has also observed that:

the significance of memory studies increased in part to the cultural turn's proposition that history, as another form of narration, does not have any particular claims to truth and by the interactionist approach to use of biography in understanding our lives.

Memory has, therefore, become viewed as part of 'culture's meaning-making apparatus', often associated with the imagining of spaces and their boundaries. The understanding of memory as imagined has been also associated with large empirical literatures on false memories and memory fabrications (Ozubko and Fugelsang, 2011; Newman *et al*, 2020) leading to lengthy and complex debates

over whether it is possible to arrive at a truth (including as correctness) through memory (Bernecker, 2017, pp.51-60). Brogaard (2017, p.307) has observed memory is the sort of mental state that can self-justify or confer justification on memories, even where there is evidence that the memory is fabricated. Misinformation effects (both intentional and unintentional) have been found to occur easily in research participants, and to be more likely in social situations (Gabbert, Memon and Allan, 2003). It has also been noted that once false memories are implanted - by whatever method - it is extremely difficult to tell them apart from other memories (Shaw 2020). The cognitive sciences also evidence how social memory may engage with illusions of transitions between local elements and global shapes (Keane, 2018, pp.6-7; Fitousi, 2019; van Lier and Ekroll, 2020), including through the top-down processing of natural languages. (Goodman, Fries and Strauss, 2016). Research on convolutional neural networks (machine learning used for object recognition) has demonstrated these can be subject to local-global perceptual illusions in similar ways to human beings (Watanabe *et al*, 2018; Gomez-Villa *et al*, 2020; Doerig *et al*, 2020; Pang *et al*, 2021). Not all humans, however, experience illusions in the same way. Studies of visual illusions have evidenced that they can interact with culture, environment, neurodiversity and even the time given to observing them (Nisbett and Miyamoto, 2005; Caparos *et al*, 2012; Makris *et al*, 2021; Bressan and Kramer, 2021). Neural networks also vary in their processing of such illusions (Pang *et al*, 2021). Rogers (2014 and 2019), however, notes that visual illusions only remain regarded as illusions as long as they are viewed as different from schema that is widely socially accepted and expected to be experienced on a routine basis.

Although there is no universal definition of memory beyond recognising that it as a construction of possibilities that interacts with other the orderings and boundaries of other social concepts, many scholars choose a particular concept (or concepts) of memory with which to work with. Contemporary interdisciplinary memory studies tend to recognise traditional understandings of memory as stored or archival but have sought to supplement or extend this with reference to more 'open, fleeting, social and cultural practices of remembering and forgetting' (Brockmeier, 2010, p.5), and explored memory as narrative, conversation (Brockmeier, 2010, 2018; 2019), communication, culture and politics (Assmann, 2006a, 2006b, Misztal,

2005). Explorations of memory as extending beyond that of the traditional archive have also taken place within the field of technology.

2.3 Conceptualisations of Memory by Pioneering Technologists.

Schwartz and Cook (2002, p. 4-5) once observed that

"While cultural theorists and information technologists both embrace the notion of an archive as a store of information, the former conceives of the archive as a source of knowledge and power essential for social and personal identity, the latter views the archive as a neutral, even mechanical, accumulation of information for safe keeping (Schwartz and Cook, 2002, p. 4-5).

The above statement, however, underplays the interest that some pioneering technologists have had in the development of complex forms of social-technical memory. Bush (widely regarded as a pioneer of hypertext) envisaged a machine named the 'Memex' as a superior form of traditional archive. This was to mimic associative cognition and, address its perceived flaws such as 'transitory' memory and act as 'a device in which an individual stores all his books, records, communications, and which is mechanised so that it may be consulted with exceeding speed and flexibility' (Bush, 1945). Later generations of technologists attempted to move beyond the conceptualisation of the mechanical archive to describe complex, almost organic, forms of connectivity with a wider reach. Such descriptions referenced many disciplines including computing, the cognitive sciences, linguistics, humanities, but also a longing for security and immortality (Barnet, 2013). In contemporary literature, the concept of technologies as connective memory can be found across disciplines (Duch and Szymanski, 2008; Sparrow, Liu and Wegner, 2011; Busemeyer, 2015; Clowes, 2017; Storm, Stone and Benjamin, 2017; Kumar, 2021). Conceptualisations of social memory as archival, collective, connected, layered, open, and constantly changing can also be found the work of contemporary technologists working with web architecture and technologies.

2.4 The Connected Archive

Working with the web as connective, relational and layered, technologists (Renjith, Biju, and Mathew, 2021; Baeriswyl, 2021) routinely describe multi-layered or stacked networks. This includes stacks representing different generations of connected technologies. From an engineer's perspective new generations of technical languages and concepts must be able to connect to those of past generations, or the stack will be destabilised and potentially become non-functional. In this way the web and its institutions might be conceptualised as a deep learning system. Some technologists are then associate this with common sense orderings (Ghosal *et al*, 2021).

Within the social sciences, the idea of 'common sense' ordering is more likely to be challenged. Memory as 'culture's meaning-making apparatus' (Miszta, 2005, p.1321) has interacted with a range of other understandings - including Nora's (1989) concept of *Les Lieux de Memoire* (site of memory) and/or politicalised construction of space (Assman, 2006b). This has included the work of critical geographers on technologies as spatialised and politicised memory (Mitchell and Elwood, 2013; Kinsley, 2015; Ash, 2019). Other social scientists have also made connections to a range of formations drawn from across disciplines to reimagine memory in the Digital Age. There have been descriptions of online memory labour; capitalisation, habitus and new forms of institutionalisations (Hepp, Siorpaes and Bachlechner, 2007; Chun, 2016; Hoskins, 2017; Smit, 2018). Many have emphasised the connectiveness of contemporary formations of memory (Chun, 2008; Hoskins, 2017; Smit, 2018; Hoskins and Halstead, 2021) and online memory sharing across borders (Patino, 2018; Borst and González, 2019; Ponzanesi, 2020). Referencing a spatialised perspective, scholars have examined transitions from local components to global scales. This has included descriptions of how digital traces (as a form of memory) are compiled by organisations and exchanged or sold as representations of changing individual identity. Such representations then interact with an individual's online personalisation and may decide what representations are returned to them through online searching (Couldry and Hepp, 2017; Henman, 2022). Just as individual traces (as individual data-points) are constructed into understandings of the individual, data on many individuals can be constructed into understanding of the group (up to global level).

The above provides a fairly brief summary of different understandings of socio-technical memory across computer and information sciences, the social sciences and the cognitive sciences. There are, however, few descriptions of the web as memory that have attempted to combined understandings from computer science (i.e., the web and its technologies as technically constructed from networked stacks) with the understanding from the social sciences of memory as a social-political construct. Many studies of Wikipedia as socio-technical memory, for example, have tended to focus on social memory (re)construction (Pentzold, 2009; Ferron and Massa, 2011; Luyt, 2015; Gustafsson, 2020) through reference to edits and comments on talk pages by different (often anonymous editors), with less attention given to the wider technology. Where considered, this has often been restricted to examining the structuring of Wikipedia articles (sometimes across different languages), rather than its interactions across many layers and institutional relationships. My disciplinary field and research questions, however, required strong associations to be made between different social-technical memory representations across times and spaces - with particular attention given to marginalisation. I, therefore, sought a theoretical framework that would support such an approach, and decided to adopt and adapted Gramsci's concept of hegemony for this purpose. Further details on this are set out below.

2.5 The Web as a Constructed Archival Hegemony

Within the social sciences there are various critical perspectives that could support a combined disciplinary approach, including that of the concept of hegemony (Molden, 2016; Donoghue, 2018; Blakey *al et*, 2022). Through the framing of hegemony, it is possible to investigate memory and the unfolding of culture in the superstructural realm of state and civil society (e.g., academic institutions, media, museums, libraries, art galleries, etc), while recognising this remains rooted in material production. This can include the investigation of normative practices, power struggles, and inequalities operating across relational layering (Molden, 2016; Donoghue, 2018). Molden (2016) has proposed that civic institutions contribute to the consolidation and stabilisation of a hegemonic archival discourse framed as common sense memory. Analysis of such discourse is then needed to grasp the manipulation of such memory, with reference to narrators and the institutions that grant power to them.

The web scientist Jessica Ogden (2020) has noted that changes in conservation efforts over time can also indicate changes in what is valued within the archive. Sánchez Macedo (2022) further highlights the importance of provenance in archival practice, with the designation of provenance reinforcing the authority of one party over others. This is meant to support the evidential value of records and make visible the context in which they have been generated. Sánchez Macedo proposes that provenance can interact with Gramscian hegemony theory – for hegemony is “the recognition, constructed in the history and the subject always in discussion, of the legitimacy of a domination within the ideology shared by an imaginary or real community’ (Gilly 2007 cited in Sánchez Macedo, 2022, p.55). The forming of an archive can include curation as exclusionary practices. These may be selective, planned or random, and applied in various ways including the removal or destruction of texts and deciding which materials should be made more visible to archival users. Sánchez Macedo (2022, p.56-57) concludes that this calls for attention to the anonymisation of subaltern subjects within the archive, ‘along with the banalization of the social relations of inequality and violence that gave rise to the records’.

There are various contexts in which marginalised (or counter) memory has been investigated. There has been a particular focus in contemporary literature on the context of transitional justice following violence and the move towards peace and democratisation (Björkdahl *et al*, 2017; Cole, 2018; Clark, 2020; Jones, 2021; Aboueldahab, 2021). Such literature regularly references issues of decolonialisation and the perspectives of marginalised groups. Counter-memories, however, can potentially be investigated in any regime and in relation to a range of politicised issues. Molden (2016) observes that although authoritarian systems are associated with over-riding perspectives of memory (as singular histories), soft power expressed as homogenous memory can also be found in western regimes. This may be expressed as forms of mediatised memory where the majority of the population are not able to relate representation of the past to their direct experience (Barash, 2017). Molden (2016, p.135) suggests that counter-memory (challenging prevalent historic accounts) is more likely to ‘rely on a material basis of experience, given its lack of strong media support and other amplifying and reifying tools’.

There have been many studies that explore counter-memories, including of marginalised and traumatised groups (Stoler 2002, 2010; Bastian, 2013; Brown and Tucker, 2017; Aham-Okoro, 2020). These include a relatively small literature on online counter-memories (Liew and Pang, 2015; Brown and Tucker, 2017; Ndlovu, 2022). Online, however, counter-memories may also be subject to widespread mediatising effects (Saryusz-Wolska, Wawrzyniak and Wóycicka, 2022). In some cases, mediatised counter-memories promote excluding forms of nostalgia (Della Porta and Tufano, 2022), victimhood, misinformation, hate and violence (Wilson, 2022). In contemporary society, memory practices interact with the web as a mass, immersive communication technology, where memory may be opened to mass persuasion effects (Hill *et al*, 2013; Barash, 2017; Oschatz and Marker, 2020). Variables such as levels of education, trust, and social identity had been evidenced to interact with such effects (Hill *et al*, 2013, Coman and Hirst, 2015; Vlasceanu, Drach, and Coman, 2018; Goovaerts and Marien, 2020), suggesting that some people might be in a stronger position to critically evaluate and reinterpret mediatised memory narratives than others. This creates a complex dynamic where any argument for openness of debate must be balanced with the social need to the expression of hate and violence (potentially under the guise of counter memories), which is often directed at marginalised groups. It is a difficult balance to maintain, and there is the risk that this could lead to the suppression of memories of marginalised groups which may be highly significant for them.

A number of publications by web scientists have given attention to memory, its association with social identity, trust and truths, and recognised the problematics of misinformation (O'Hara and Shadbolt, 2005; O'Hara *et al*, 2006; O'Hara, Tuffield and Shadbolt, 2008; Mayer-Schönberger, 2009; O'Hara, 2013). In the current incarnation of the web (the Semantic Web), these associations are recognised in constructions developed to support the production of new texts. This includes the online generation of crowd-sourced social facts (e.g., through text added to social media) which are then extracted and used in the automatic knowledge-making through logic (Ford, 2015; Matsakis, 2018; Bukhari, Bashir and Malik; 2018; Maher, 2020; Vrandečić, 2019; 2020). Through this system, (re)construction draws on reciprocal trust between institutions, potentially leading to some pasts being privileged over others. Chun (2008) has referred to a 'sourcery' that gives users who master source code greater knowledge and power. Such sourcery, however, goes beyond the use of code to the understanding of how particular sources (and

the institutional traditions and interests they represent) are approved across the relational, layered architecture of the web. On the web this engages with interoperability between technologies. Such interoperability is designed into the architecture and governance of the web - as the organisation of relations between particular individuals and the sources (institutions) they represent. These sources include international communities, different language communities, bounded political regimes including nation-states, civil societies and private commercial interests. Anyone, or any grouping, that is mutually identified as trustworthy within the relational, layered structure of the current incarnation of the web is potentially given power through the ability to privilege certain sources and make alterations across multiple layers and sites to (re)construct the past and its possibilities. These (re)constructions then interact with choices in the present and expectations of the future (Smith, 2008). Such capacity could potentially be used to address fake news and other forms of misinformation. It could, however, also be used to generate social constructions that may privilege some and marginalise others, without this being noticed by the majority of web users (i.e., becoming viewed as common-sense ordering).

The web scientists O'Hara and Hall (2021) have observed that engineers of the Internet adopted 'the openness principle, particularly at the transport layer' and that this 'ripples out to other values, and up and down the protocol stack' (p.51). This design was initially adopted to both support engineering functionality and socio-economic and political ideals. According to O'Hara and Hall, the vision of the Internet held by Silicon Valley engineers was aligned to open-source democracy. This was to be delivered through an Open Internet associated with participation and governance by the many, network effects and scaling up, but also decentralisation, pluralism, self-determination, free trade, movement and speech. Wikipedia has been highly associated with this project, the creation of a digital commons and ideal of moving beyond national boundaries. In theory, for example, Wikipedia was meant to be formed of language, rather than national, communities (Tkacz, 2015).

With the advent of Web 2.0 (supposedly designed to support user participation), various commentators proclaimed the arrival of digitalised or open-sourced democracy and proposed that an interactive web would support new forms of collaborative participation and decision-making as an alternative to traditional

structures of power (Rushkoff, 2003; Fuchs *et al*, 2010; Pentzold, 2009; Ferron and Massa, 2011; König, 2013). Web technologies, however, are constructed as stacks of previous generations and their traditions. Attention must be given to how such construction has drawn on wider traditions of memory, and the implications this has for the remembering of the marginalised. By the late twentieth century (when the web first emerged), for example, processes of forgetting associated with post-crisis recovery had become of particular interest to scholars. This followed the two world wars, the collapsing of grand narratives (such as colonialism and Soviet Communism) and the emergence of new democratic systems. The potential benefits of forgetting have been explored by scholars (Connerton, 2008; Singer and Conway, 2008) within this wave of memory studies. This is explored in more depth below, with consideration of how this might interact with the web, repeating disasters and marginalisation.

2.6 Forgetting as Openness or Silencing

Misztal (2005) has observed that western liberal thinkers have tended to favour the forgetting of trauma and related resentments. From this perspective a non-democratic past should be forgotten, so a cooperative, democratic one can emerge including through 'changing political and ethnic or cultural boundaries' (p.1320). In addition, solidarity or common ground might be found in the belief in the benefits of the development of a universal language (Yang *et al*, 2017) and/or the ideal of democratic deliberation (Risse, 2014; Nørby, 2015; Blakey *al et*, 2022) across different political perspectives. Some might then view the forgetting (or the reduce visibility) of differences, as required for the establishment of common ground.

To avoid fixity of social identity and traumas, social scientists (Dodge and Kitchin, 2005) and web scientists (O'Hara *et al*, 2006; O'Hara, Tuffield and Shadbolt, 2008; Mayer-Schönberger, 2009; O'Hara, 2013) have also emphasised the importance of forgetting for changing identities on an open web. Forgetting at content level is visually evidenced on the web every time a user hits a deadlink (Leetaru, 2017; Chen, 2018) or encounters the automatic message on a search engine flags that some results may have been removed under the Right to be Forgotten, in some jurisdictions (Stainforth, 2022). Computer scientists also use heuristics to generate

changes on the web, whereby entities may become more or less visible over time (Liang, Zhang and Xiao, 2017; Wu *et al*, 2018; Yao *et al*, 2018; Rodman, 2020).

Broadly a duty to forget has been viewed as something that should be balanced with the duty to remember suffering and communal responsibility for moral accountability (Habermas, 1997). Although the significance and benefits of forgetting have been put forward by a number of scholars working with memory (Connerton, 2008; Nørby, 2015), it has been recognised that it is not possible to infer forgetting from silence. Memory of past harm is closely associated with authenticity and identity and can help individuals move forward and even forgive (Singer and Conway, 2008) and care must be taken not to equate forgetting with exclusion or neglect. Questions also arise over how those who are not currently integrated into current systems to reciprocal trust and knowledge making can become part of its sustained, collective memory. This includes sources of information from emerging economies; those who do not have a written language, people with memory and language differences (who cannot simply be instructed in the norms of universal language games) and people (including in groups that are marginalised and at higher risk of poorer social-economic outcomes) living in conditions that are repeatedly subject to poorer social outcomes and crises over generations (Longley, Van Dijk and Lan, 2021).

In addition, arguments for social forgetting as supporting a democratic form of openness - during a deliberative move towards consensus - have been weakened by increasing criticism of the web as an open technology. Earlier claims that Wikipedia would change social, political and economic structures, have been criticised as being technologically deterministic. Kioupkiolis (2022, p.58) has noted that in recent years the 'celebration of openness, egalitarianism, inclusion, diversity and flat hierarchies' has been increasingly questioned in the case of the digital commons, Wikipedia and more broadly. Some social scientists continue to reference to the conceptualisation of the web and new media as public spheres - plural sites of communication, participation, cooperation and e-democracy (Hänska and Bauchowitz 2019; Saud and Margano, 2021; Smith and Niker, 2021). Others, however, have become more focused on the web as an enabler of capitalist accumulation, exploitation and surveillance (Srnicek, 2016; Zuboff, 2019; Fuchs, 2020) and challenged the relevance of public sphere theory to the social media (Kruse, Norris and Flinchum, 2018). Advocates of digitalised democracy

have become more likely to recognise its problematics (Krasodomski-Jones *et al*, 2022; Kioupkiolis, 2022). Deliberative democracy has also become subject to criticisms, including that it is too 'rigid, slow and hierarchical' and at risk of producing distorted communications and institutionalised exclusions (Landemore, 2021, p.4; Staab and Thiel, 2022). Staab and Thiel have noted that studies of deliberation have rarely considered issues of inequality and disempowerment.

Unable, or unwilling to quickly address the problematics of the web through educating everyone (including those in marginalised groups) to adopt critical thinking, many regimes are relying on enforcing normative memory through increased regulation of regional webs and the strengthening normative editing. It has been argued, for example, that problematics emerging on the web, such as misinformation, have led Wikipedians to 'revisit unfashionable models of hierarchy, rigidity, exclusion and intolerance', and openness is no longer associated with equality of outcomes and engineering functionality in the way it once was (O'Hara and Hall, 2021, p.65). Peer to peer governance on the web, however, has long operated along hierarchical lines (Viégas *et al*, 2004; Swarts, 2009; Tkacz, 2015; Kioupkiolis, 2022), with disagreements taking place over the significance of openness versus normativity and security, and retention and deletion in the face of deliberately subversive editing (O'Hara 2004; Luyt, 2022).

Researchers have found evidence of wide-scale power-editing on Wikipedia (Kittur *et al*, 2007; Panciera, Halfaker and Terveen, 2009; Kostakis, 2011; Matei and Britt, 2017) and other platforms (Graham, Sabbata, and Zook, 2015, Segesten and Bossetta, 2017; Bittner, 2017; Boseetta, Segesten and Trenz, 2018; Soares, Recuero and Zago, 2018; Wright, 2018; Crowston and Fagnot, 2018, p.90). These studies suggests that normativity is enforced on the web by a relatively small group of editors, potentially editing across multiple platforms. These editors have been associated with particular personal characteristics - as being from the Global North, male and technologically skilled (Rosenzweig 2006; Luyt, 2105; Bittner, 2017).

A side-effect of such power-editing is the constraints it then puts on sustained engagement in (re)constructions. Studies of Wikipedia, for example, have demonstrated that the content produced by power-editors tends accumulate and be sustained over time, while content by other editors is directly deleted or overwritten (Viégas *et al*, 2004; Swarts, 2009) and new editors often decide not to

continue editing due to negative responses from some committed Wikipedians (Luyt, 2022). Many groups of people remain marginalised in its sustained constructions (Roued-Cunliffe, 2017; Crowston and Fagnot, 2018; Benjakob and Harrison, 2020). On one hand this might create an effect comparable with Durkheim's theory of solidarity - whereby collective memory, as a form of legitimised, authoritative, social fact, is characterised by persistent content (Misztal, 2003). A drive towards Durkheim type solidarity (as representing a particular set of regional interests), however, might generate resentment (Salmela and Capelos, 2021), see pull back and fragmentation at global scale (O'Hara and Hall, 2021) and even contribute to system-wide cascading failures (Török and Kertész, 2017; Smolyak, Levy and Vodenska, 2020; Valdez *et al*, 2020) due to top-down induced interdependencies with limited regard for localised conditions

Going outside literatures on memory from web science and interdisciplinary memory studies project, I identified a literature in the field of disaster risk reduction on the politics of memories of disasters. This highlighted the importance of individuals being able to process memory of environmental disasters in place-based communities. This literature identified how memory (rather than normative, enforced forgetting) could be vital in post-disaster situations. It highlighted how politics (including of incompetence and corruption) and marginalisation might become hidden in hegemonic narratives, but their visibility were key to how communities mitigated, and became resilient against, repeating disasters. A summary of this literature is provided below. This is also connected into my case study on a memory representation of an environmental disaster and its engagement with marginalisation.

2.7 Memories of Environmental Disasters

Many of those working in the field of disaster risk reduction recognise that to understand environmental disasters and how best to address them, it is necessary to investigate how they are constructed as memory. A sense of disaster can be described in various ways including through social organisation and practices, language and memory (Sørensen and Albris, 2016). This can include hegemonic struggles over the cultural unfolding of memories of disasters (Hoffman, 2002). Memories of disasters can anchor disasters in the past and so reduce the likelihood of them being viewed as useful sources of learning in the present

(Monteil, Barclay and Hicks, 2020), including in terms of preparedness for future disasters (Sutton *et al*, 2020; Fuentealba, 2021, p1). Alternatively identifying a disaster as unprecedented can detach a disaster from the rest of social life into a separated space-time container (Walshe *et al*, 2020; Gerster and Maly, 2022). Many disasters, however, are not discrete one-time events.

It has been argued that disasters 'reflect the characteristics of the societies in which they occur (Tierney, 2007, p.518) and 'are not so much objective events as subjective ones that can be privileged or erased according to a sense of selective memory or collective amnesia' (Bankoff, 2004, p.34). Rather than view disasters as singular events, Monteil, Barclay and Hicks (2020, p.297) have proposed that forgetting disasters can help explain the "reproduction of drivers of vulnerability despite a recent experience of disaster". A drive towards forgetting as part of disaster recovery approaches can also fail to recognise that traumatic memories may be very difficult for those who have experienced trauma to completely forget. Monteil, Barclay and Hicks (2020, p.288) note that although

silencing the risk of disaster is part of a strategy to support some dimensions of the recovery process, it can prevent sustainable recovery by hindering the learning process...In the context of disaster risk, the processes of remembering and forgetting contribute to individual and institutional strategies implemented to prepare for future risks and learn from past disasters. Importantly, forgotten elements can re-emerge involuntarily when reminders arise and can impact future actions, negatively or positively (Oliver-Smith *et al*. 2016).

Disaster risk reduction literature is, therefore, increasingly recognising the importance of connecting environmental information to personal and collective memory, not only in terms of scientific drivers, but in terms of convincing communities to prepare for hazards and reduce risk (Cuaton and Su, 2020; Klimeš *et al*, 2020). Post-recovery efforts can include establishments of memorials (connecting to online materials) as sites of social memory for disaster prevention education and intergenerational learning - although gaps between disasters may impact on their effectiveness (Imamura *et al*, 2019). There can also be a push to improve data collection (including on interdependencies) and develop resilience through focusing on major infrastructural hubs and early warning systems. It has, however, been argued that 'modern societies may have a 'blind spot' regarding the

theory of disasters in history, potentially due to the current focus (and arguably over-reliance) on techno-centric early warning systems' (Schenk, 2015). Nakasu, Ono, Pothisiri (2018, p.32) found that root causes for deaths for the 2011 Great East Japan Earthquake and Tsunami disaster in the Rikuzentakata municipality included: problems with evacuation, an ageing population, a normalcy bias resulting from memories of a similar disaster, and excess reliance on infrastructure and warning systems. Martinez, Costas and Ferreira (2020, p.308) have observed that 'the separation of environmental threats and cultural perspectives on solutions can result in misleading mitigation and adaptation efforts'.

The memory of not being previously subjected to major environmental disasters, can also have major implications for risk reduction in the present. Traditionally western narratives have been of environmental crises being concentrated in communities outside the western region. Numerous industrial environmental disasters, however, have taken place in the western region since industrialisation. Repeating climate related disasters such as flooding are also increasingly found across European coastal areas (Martinez, Costas and Ferreira, 2020) and in other developed economies. Such dynamics potentially engage with memory in a complex temporal-spatial manner. Communities undergoing environmental disasters are forced to revisit (and potentially abandon) traditions based on many centuries of experience, learn from direct experience and link this to direct action in the present (Harms, 2012; Boret and Shibayama, 2018). In addition, they must recognise that environmental crises may alter or worsen over time (de Guttery and Ratter, 2022).

The field of disaster risk reduction includes numerous studies on post-disaster memory and marginalisation. These argue that 'disasters are processual phenomena driven by multiple drivers of disaster risk and leave a myriad of traces on affected areas' (Fuentelba, 2021, p1). Fuentelba observes that

According to anthropological work on disasters..., culture reflects the ambivalence of 'eventness' and processual views in particular ways. The extent to which vulnerable groups, disaster victims and people at risk in general establish different interpretations of their experience of disasters is relevant to their behaviours' (p.2).

People in marginalised groups known to be particularly negatively affected by environmental disasters including: women (Yadav *et al*, 2021); ethnic (Hendricks and Van Zandt, 2021), sexual and gender minorities (Gillard, Gorman-Murray and Fordham, 2017); indigenous groups (Kronmüller *et al*, 2017); disabled people (Kailes and Lollar, 2021; Stein and Stein, 2022; Taylor *et al*, 2022) - including older disabled people (Nakasu, Ono and Pothisiri, 2018; Naito *et al*, 2022) and those with lower incomes (Hallegatte *et al*, 2020). Many of these groups are also at greater risk of being digital excluded (Broadband Commission for Sustainable Development, 2017; Ofcom, 2019b, Blank and Dutton, 2019; French, Quinn and Yates, 2019) and/or marginalised on social media sites like Wikipedia (Roued-Cunliffe, 2017; Crowston and Fagnot, 2018; Benjakob and Harrison, 2020). Some groups may also have a higher likelihood of having low levels of literacy and be oral language dependent (Dodson, Sterling and Bennett, 2013), and those with cognitive differences may have diverse spatial-temporal perspectives which interact with information processing and memories (Wu *et al*, 2021). Considering the above groups as a whole, they represent a substantial percentage of local/global populations.

In recognising those groups at higher risk of repeated crises, care must be taken to avoid reproducing common-sense associations between marginalisation and vulnerability to ever worsening climate-change. Instead, there is a need to recognise the social complexity of such concepts in any construction of environmental disaster/crisis. Fuentealba (2021, p.2) has identified how disaster vulnerability and memory interacts with 'historic processes of injustice and marginalisation of certain social groups'. Barbosa and Coates (2021, p.10) have also found that an over-emphasis on a top-down narrative of past causation and future risk anticipation could lead to forced displacement and related resentment. They have argued that

First, a top-down sovereign power seeks to control narratives on disaster, allowing it to intervene in the present through retrospection (recreating the past to instigate a linear view of progress towards modernity) and anticipation (of desirable and undesirable futures). Through the production and control of emergent narratives on future risk, the state creates agendas that in other circumstances would be unfeasible. Second, the chronopolitics of disaster

encompasses alternative or subaltern counter narratives that make visible “subvisible temporalities and spatialities of slow violence’,”

Oliver-Smith *et al* (2017) notes that retrospective analysis of disasters rarely mentions technological failure, or social, economic, political or cultural causes. Those who attempt to draw attention ‘to such factors are often edited out, marginalised or ignored, as they may strike sensitive chords among authorities and special interest groups’ (p.469). They may also be ignored as they are not viewed to be newsworthy. Oliver Smith *et al* argue that governments and the private sector tend to favour disaster response over prevention as they are more able to capitalise (politically and otherwise) from disaster response. During emergencies, normal forms of institutional accountability may also be put aside. This opens up the possibility of corrupt, as well as poor institutional, practices which could weaken resources and increase future risks, particularly where there are then active attempts by elites to induce social forgetting and serve political agendas (Lewis, 2015; Boughey, 2020; Coraiola and Derry, 2020). Within this model, many direct experiencers become excluded, and crises continue to propagate and escalate.

Oliver-Smith *et al* (2017) concluded that there needs to be a fundamental change in the understanding of disasters in the media (including social media) of how disasters are shaped by human choices (i.e., are anthropogenic).

disasters are perhaps best understood as the unfolding of systemic pathological changes [over time]. They may also be seen as clear and relevant symbols, representations and indicators of skewed development... Their causes are deeply embedded in societal history, structure and organization, including human-environmental relations (p.470).

Working with the above understandings of how disaster could be reconstructed as memory in a way that acted for or against the interests of marginalised groups, I considered how the construction of Wikipedia as memory might interact with this. To support such analysis within my case study, I undertook a literature review on Wikipedia as memory which worked with it as a layered, relational archival construct. The rest of this chapter sets out the findings of my literature review through describing several layers of Wikipedia including.

- (1) Wikipedia articles and their interaction with social practices and power-inequalities.
- (2) The narrative of governance generated by Wikipedia and those studying it.
- (3) The ordering of the Semantic Web.

2.8 Wikipedia Articles and their Interaction with Social Practices and Power-Inequalities.

Luyt (2015, p.1876) highlighted criticisms that Wikipedia articles were 'narrowed by a limited historical imagination that [gave] precedence to political and military history, especially the feats of great men, over social, economic, or environmental history'. A similar observation was made by Ayers (2020, p.98), who suggested that this might reflect the interests of Wikipedians rather than the population at large. Samoilenko *et al* (2018) found that articles on national histories covered entire timelines of large western economies, but only a limited number of decades in the case of other economies. Tripodi (2021) also evidenced that biographies about women which meet Wikipedia's criteria for inclusion were more likely to be considered non-notable and nominated for deletion than men's biographies.

Loveland (2019, p.385) estimated that 'in the opening years of the twenty-first century, more than 90 per cent of the contributors to the Britannica and Encyclopédie Universalis were men', and evidence suggests that men (in the Global North) have produced much of the content on Wikipedia since its inception. In 2006, Rosenzweig (p.127) observed as

attention devoted to Asimov hints, Wikipedia's authors do not come from a cross-section of the world's population. They are more likely to be English-speaking, males, and denizens of the Internet. Such bias has occasioned much discussion, including among Wikipedians.

Experienced Wikipedians and personnel at the Wikimedia Foundation have long been aware of data suggesting the presence of power-editors (Rogers and Sendjarevic, 2012). Big data studies have found that a small number of Wikipedia editors are responsible for much of the activity on the site and that this has been a persistent finding over time. This has included findings of power editing earlier in the development of the Wikipedia (Kittur *et al*, 2007; Panciera, Halfaker and

Terveen, 2009; Kostakis, 2011). Empirical studies had found that on 'Wikipedia, only 25% of registered users have edited 10 times or more, and 2.4% of users have contributed 80% of the edits. Arazy *et al.* (2017) found that 89% of Wikipedia editors were active only in a single article' (Crowston and Fagnot, 2018, p.90). It could be argued that power editing (whether by human or bot) across Wikipedian language communities and Wikimedia projects is deliberately encouraged by the linking patterns and templates of Wikipedia, including Interwiki linking and automatic Wikipedia statistics. Studies have also identified that those who start as intensive editors are likely continue, while the activity of other editors tail off. But 'with the exception of invoking community norms to explain their edits [these intensive editors do not] do more work, better work, or more community-oriented work over time' (Panciera, Halfaker, Terveen, 2009). Wright (2018) found similar patterning (of intensive editors using normativity to overwrite the words of others) on other digital organisations. Normative power editing across open access online projects may have deliberately encouraged by the governance mode adopted for peer-to-peer applications. This was meant to be based on flexible, merit-based hierarchies that supported the digital commons, while refusing edits that threatened the integrity of the system (Tkacz, 2015; p.88-95; Kioupiolis 2022).

Some big data studies of power-editing on Wikipedia have suggested that such editing could be seen an illustration of power-law distribution (i.e., the Pareto Principle), with reference to similar patterns found in across volunteering and other forms of civil participation (Crowston and Fagnot, 2018, p.90;), or even naturally arising of leadership (Matei and Britt, 2017). Other findings suggested that power-editing might be an expression of ideological beliefs. One study (Bittner, 2017) found that a small number of editors generated most of the content of OpenStreetMap (an open access, crowd-sourced online organisation focused on mapping). Bittner invited 40 of the most active mappers in the Gaza region (all Israeli) to take part in interviews and then interviewed a small, self-selected sample. Bittner found their socio-demographics mirrored those found in studies of editors of other digital organisations i.e., male, between 30-40 years of age and with degrees in technical or natural sciences. According to their responses they were employed in the tech sector or in academic science departments, and they were all ideologically committed to open data. Many also claimed humanitarian motivations. Bittner noted that although efforts had been made to draw in

Palestinian mappers into the project, these were undermined by the concept of a neutral point of view. Bittner concluded by stating that OpenStreetMap was reproducing existing orders and the antagonistic structure between Israel and Palestine, including through edit wars. These, however, were occurring within the same national (Israeli) community, as there was no domestic community of Palestinians mappers. It should, however, be noted that Bittner did not include information on how participant identity was verified (he seemed to have mainly taken information from websites), or how he worked critically with data generated by digital organisations. There have also been reports of some highly active editors being banned from Wikipedia for nationalist editing, and harassment of other editors (Harrison, 2019; and Cimpanu, 2021).

The Wikimedia Foundation (2021) regularly publishes community insight research that focuses on the diversity of editors, and this has repeatedly demonstrated underrepresentation of women, various ethnicities, and those based outside the Global North. Wikipedia studies of diversity draw on big data and rely on responses from tens of thousands of randomly identified digital representations of registered Wikipedia editors. Other surveys by the Wikimedia Foundation have relied on visual assessment of editor's identities, for example of their racial identities (Valentine *et al*, 2020, p.267). Scholarship (Hecht and Gergle, 2010 and Miquel-Ribé and Laniado, 2018) has also observed that there had been indications that cultural differences between Wikipedia language communities have been regarded by some technologists as error, rather than indications of diversity.

The under-representation of women on Wikipedia has been investigated by scholars over a number of years (Roued-Cunliffe, 2017). Crowston and Fagnot (2018, pp.97-98) found that, within their sample, 'being female reduced the likelihood of being a sustained contributor as well as the number of edits' and 'being older predicted a higher level of contributions as well as a lower likelihood of being a meta-contributor'. Graham, Sabbata, and Zook (2015) mapped out the editing of Wikipedia articles and found regional disparities - with Europe and North America contributing the majority of the content and Africa contributing only a small percentage of the world's total. Graham, Straumann, and Hogan (2015) proposed that such disparities mirrored historic, geopolitical inequalities. Although there have supposedly been improvements in the representation of users in developing economies (the Economist, 2021), content continues to be

concentrated in the English edition (Dittus and Graham, 2019). Beyond studies on gender, geographical location and language community, there is limited literature on other equality issues on Wikipedia e.g., in relation to age; sexuality, and disability (Miquel-Ribé and Laniado (2021).

Relatively little is also known of Wikipedia reader identity and issues of marginalised -as was the case for previous hard copy encyclopaedias (Loveland, 2019). Twyman, Keegan and Shaw (2017, p.10) case study of Wikipedia noted that they did not 'have data on the demographic attributes of editors or readers in [their] dataset. While prior work documented disparities in participation [they did] not know whether or how the readers and editors [of the article they were researching reflected] these broader trends'. Singer *et al* (2017) observed that there had been very little research on readers of Wikipedia. The researchers attempted to use geolocation data to produce insights from a big data set on readers, but geolocations provided through web addresses cannot simply be seen to equate to human identities. Little, therefore, is currently known of how editors (beyond those with high public profiles) and readers experience Wikipedia.

The reliance on online data and contact with digital representations by many of those studying inequalities on Wikipedia has contrasted with traditions of social research that seek to directly access marginalised people in order to collect information on their experiences and viewpoints. Such research will specifically seek information on the times and places where people are most likely to be present, recognise and address possible barriers, and build research processes around such understanding (Pratt, 2019). This form of research has sought to empower such groups - moving them away from identities associated with vulnerability and marginalisation towards being empowered in terms of their chosen identities. Wikimedia and Wikipedia, often in partnership with other organisations, have been attempting to encourage editing of Wikipedia by users in developing economies and under-represented groups (Maher, 2017; Wikimedia Foundation, 2017) through running blended (offline/online) events known as edit-a-thons. Often, however, this has involved drawing diverse groups into Wikipedian space-time (e.g., office spaces, or events run by Wikipedians in cultural institutions). Marginalised groups, however, face many barriers - and the space-times of institutions may not be seen to operate to their interests. One study found that only 1% of newcomers continued to edit Wikipedia after an edit-a-thon

(Farzan *et al*, 2016). Gluza, Turaj and Meier (2021) have also identified problems with communication, complex policies and unintuitive interfaces in their recent study of an edit-a-thon and highlighted that these were problems that Wikipedians had been aware for many years.

A book was recently published on diverse perspectives of Wikipedia (Reagle and Koerner, 2020). This included articles by those attempting to (a) encourage new editors from diverse groups (e.g., through Wikipedian edit-a-thons), (b) decolonialise Wikipedia, and (c) recognise different perspectives of knowledge-making, including post-structuralism (Vetter, 2020). Other contributors highlighted the unfriendliness of Wikipedia to new editors (Evans *et al*, 2020) and its biases towards male, western viewpoints (Vrana, Sengupta and Bouterse, 2020, p.244). Such writings suggested that some people engaged with the Wikipedia project wished to open up Wikipedia to wider users, but in a market driven economy the desire to socially and politically open up Wikipedia could interact with the desire for economic expansion, and potentially become subsumed within the drive towards profit. The Wikimedia Foundation's attempts to reach out beyond the Global North seem to converge with western companies becoming increasingly interested in emerging economies (many with growing populations of young people). It has, for example, been noted that Wikipedia's development of articles in languages used in the Global South, could potentially be of use to commercial digital organisations such as Google (Matsakis, 2019). Ideas of addressing equality and diversity issues, also seem counter to the desire of some Wikipedians to create a universal system of automated knowledge-making through translating stripped down content from Wikipedia into machine readable units (Maher, 2020; Vrandečić, 2020). The well-known Wikipedian and technologist, Vrandečić (2020) has supported the creation of an abstract, universal system and stated, 'perceived knowledge diversity in different language projects is ineffective at best and harmful at worst' (p.182).

The above summarises various studies of normative practices on Wikipedia (particularly power-editing) and marginalisation that seem to mirror historic power inequalities in the offline realm. Such dynamics are complex and interact with the wider governance of the web. According to highly visible narratives on the web (including Google Scholar), the Wikipedia project was key to the development an open-source web and digital creative commons. Openness to participation from

any users was not meant to result in anarchy, but rather initial text production was to be followed by a process of quality assurance (Viégas, Wattenberg and McKeon, 2007; Tkacz, 2015; Kioupkiolis 2022). Such a process, therefore, needed to be associated with an institutionalised form of regulation of some kind. This is further explored below.

2.9 The Narrative of Governance Generated by Wikipedia and Those Studying It.

(A) Institutional Governance

Various scholars have examined Wikipedia's values and regulatory structures in depth (Johnson, 2010; Van Dijck, 2013, Tkacz, 2015). Some academics (Van Dijck, 2013; Weltevrede and Borra, 2016; Smit, 2018) have referred to Wikipedia as a platform. Van Dijck (2013, p.133), however, also noted that some 'criticized its gradual institutionalization, while Gillespie (2010, p.349) observed that the terminology of 'platforms' could lead to the mystification of institutions. In recent years, it has become increasingly difficult to separate so-called platforms (run by organisations with online and offline presences) from cultural institutions (e.g., museums, archives, charities and universities) which have extensive online presence and are integrated into systems of online and offline reciprocal trust. All these institutions present a service to individual users, commercial industries, media producers, partners and policy makers, and increasingly rely on commercial income including through trading and advertising (Cronin, 2021; Carrigan *et al*, 2022). All could potentially be viewed as part of a wider hegemonic bloc.

Wikipedia sits under the umbrella of the San Francisco based Wikimedia Foundation which receives funding from both commercial and third sector sources (Van Dijck, 2013, Wikimedia Foundation, 2020). The Foundation also oversees a number of other online projects including Wikidata. Wikipedia was set up before the establishment of the Wikimedia Foundation, and Wikipedia's mission has been retrospectively aligned with that of the Wikipedia Foundation's (to promote free education). Accounts of Wikipedia in its early stages of development suggest that its values were not clarified and debates took place between Wikipedians on whether or not to adopt a funding model-based advertising income. This was in a similar way to other open access, online organisations (Tkacz, 2015, pp.150-176).

Early statements from Wikipedians such as Jimmy Wales used the expression 'free access to the sum of all human knowledge' (Slashdot, 2004) rather than referring to education. It remains unclear what benefits Wikipedia actually delivers, and to whom, in practice.

Mainstream Wikimedian and Wikipedian visualisations and narratives (e.g., see figure 1 below) describe how certain wikimedians (as the Board and Affiliates) sit at the top of a wider governance structure. The Wikimedia Board of Trustees is given a role in developing strategy and consists of trustees in a similar way as many commercial and third sector organisations (Meta: Wikimedia, 2022a). As in the case of many contemporary global organisations there is an emphasis on recruiting trustees who belong to groups that have faced historical discrimination and underrepresentation. Subject matter expertise, however, emphasises understanding of technologies and knowledge sectors (Wikimedia Foundation, 2022-2023) and many of current trustees have connections to academia and/or major companies. There is an ongoing position for the person that the Wikipedian hierarchy acknowledges as the founder of Wikipedia (Jimmy Wales). Other trustees are appointed by the senior editor community, Wikimedia affiliates, and other members of the Board. Under the Board are various committees across Wikimedia and Wikipedia. This includes committees for different language communities and arbitration committees run by senior editors which impose solutions (including banning editors) on disputes between editors.

(B) Governance through Principles, Policies and Procedures

Wikipedia (as a voluntary community) does not have the type of formal governance structure which has been constructed for the Wikimedia Foundation. Rather its governance is integrated into the construction of Wikipedia as a technology (a Wiki) and an editorial hierarchy. Wiki technology is said to have been constructed to enable participation, modification, branching out and exchange between small local communities (Stakić, 2009). Pages on Wikipedia are related to one another, including through hyperlinks embedded in the text which take users through to other Wikipedia pages and external sources.

Wikipedia articles provide descriptions of the complex layering of administrative articles (each with their own talk pages), templates, and editors on Wikipedia. Administrative articles are unlikely to be read by the majority of readers that access Wikipedia and are instead aimed at those wishing to become experienced, normative editors. These articles include information the main principles (or pillars) of Wikipedia (Wikipedia, 2021b), which were put in place at an early stage in its development and said to have been influenced by Wikipedia's founders. The pillars include that (1) 'Wikipedia is an encyclopaedia'; (2) editors should practice a neutral point of view through the inclusion of 'majority points of view'. (3) content should be free to access, use and distribute; (4) there should be respect and civility between editors; and (5) there are 'no firm rules'. Verifiability comes through citation of reliable institutional sources, rather than the expectation that sources can provide truths (Wikipedia, 2021c).

C) Operational Policies and Procedures

There are further layers of content, conduct and technical policies sitting underneath the five key pillars. These policies are approved by experienced, Wikipedians. Underneath the formalised policies there are a range of other types of articles which have not received the same level of formal approval as the main policies (Wikipedia, 2023a). In addition to the policies there are many pages on technical projects and operational level editing e.g., relating to namespaces. According to mainstream Wikipedian narrative (Wikipedia, 2022b, sustained), a namespace is a computing term used to describe 'a set of signs (names) that are used to identify and refer to objects of various kinds'. These are 'commonly constructed as hierarchies'. Namespaces are unique and so can be easily

identified and are meant to ‘avoid name collisions between multiple identifiers that share the same name’. Namespaces also separate data into core sets - those intended for public viewing (e.g., popular articles), and those intended mainly for the eyes of the experienced editing community (e.g., pages about editing practices).

(D) Editorial Hierarchy

Alongside the hierarchy of namespaces is a hierarchy of editors. Several academics (Van Dijck, 2013; Tkacz, 2015; Smit, 2018) have paid particular attention to the hierarchical structures of Wikipedian editors, including experienced editors who accumulate greater privileges on Wikipedia. Tracz (2015, p.88-95) sets out how some have viewed this as a form of ad-hocracy, and it has been suggested that such structures are common in peer-to-peer socio-technical systems. Kioupkiolis (2022, p.57-59) notes that

Bauwens (2005b) has likewise affirmed that the ‘third mode of governance’ in peer production is ‘characterized by flexible hierarchies and structures based on merit that are used to enable participation’. Digital commons promote transparent processes, consent, direct access, participation, individual freedoms and respect for community norms. We can imagine these values infusing ‘conventional politics’ with an ‘ethic of open accountability’ and consent. Their political sensibilities can further ‘freedom without anarchy, control without government, consensus without power’ (Lessing quoted in Bollier, 2008: 9)...peer governance may also involve a ‘transparent heterarchy’, whereby maintainers or ‘editors’ undertake control and refuse contributions which imperil the integrity of the system (Bauwens, 2005b; Bauwens *et al*, 2019).

Editors can accumulate privileges (rising through the editor ranks) through normative editing that is approved of by the so-called Wikipedian community (experienced editors). Higher levels of privilege include special tools and rights for deletion (rollbacks), page protection and blocking other users. Senior editors, such as administrators, are also given the power to award or remove other editor’s privileges (Van Dijck, 2013; Page, 2018; Smit, 2018; Wikipedia, 2022a). As editors become more normative in their practices, it is also more likely that the content

they produced will be sustained, or reinstated after deletion, by other normative editors (Viégas *et al*, 2004; Swarts, 2009). Ford and Wajcman (2017, p.520-522) noted

that those whose editing is enhanced by the use of automated tools are much more effective contributors than those who use only the default tools'. In addition, article deletions are managed by a small number of committed editors and the majority of articles deleted under the criteria of 'no indication of importance.

According to the narrative of Wikipedia, editors include bots. There are hundreds of bots on Wikipedia, with some making millions of edits. These bots are approved by a group of senior Wikipedian editors and must adhere to a Wikipedian bot policy and the general norms of Wikipedia (McDowell and Vetter, 2022). Scholars working with Actor Network Theory such as Gieger and Ribes (2010), Van Dijck (2013, p.137-140) and Tracz (2015, p.111-119) have described cooperation between humans and bots (particularly around identifying and addressing vandalism) on Wikipedia as a form of socio-technical system. Bots have also played a major role in the development of articles in some language communities in a way that supports the production of machine-readable data. Vrandečić (2020, p.179), an elite Wikipedian, has identified that

To maintain the structured data, bots were created—software agents that could read content from Wikipedia or other sources and then perform automatic updates to other parts of Wikipedia. Before the introduction of Wikidata, bots keeping the language links between the different Wikipedias in sync and easily contributed 50 percent and more of all edits in many language editions. Wikidata allowed for an outlet to many of these activities and relieved the Wikipedias of having to run bots to keep language links in sync or to run massive infobox maintenance tasks... a small number of contributors working on intricate template code and developing bots can provide invaluable support to contributors who focus more on maintaining articles and contributors who write the majority of the prose.

Zheng *et al* (2019) found that bots could have a negative or positive impact on the continuance of inexperienced editors on the site. ClueBot NG (one of the most active bots on the site programmed to detect and revert vandalism) was found to

have a negative impact on continuance. XLinkBot, which reverted links that violated copyright policy, sent informative messages to those creating such links and was found to be less likely to impact negatively on continuance.

Many edits by committed Wikipedians (human and bot) focus on structuring, spelling and grammar corrections. Scholars and other actors have long sought to associate practices of language with recognised authority i.e., through established authors, institutions and particular genre of text, including the encyclopaedia (Rasoamampianina, 2012, p.36-41). Ease of use, correct grammar and spelling, traditional forms of structuring, and reference to trusted institutional sources can also contribute to an impression of authority and related trust. As in the case of memory, however, there are contestations over definitions of trust and it has become strongly associated with belief, reliance and community (Wang *et al*, 2016; Simon, 2020; Brüggemann and Rödder, 2020). Research suggests that the focus on traditional forms of authority could reinforce trust in Wikipedia among some groups. Rowley and Johnson (2013), for example, found that such factors influenced the degree of trust student participants had in Wikipedia articles. A study of a small sample of students (Lucassen and Schraagen, 2010) also found that trust in Wikipedia articles was strongly associated with the number and quality of references, pictures and the text (including comprehensiveness, correctness and length), while Wilkinson and Huberman (2007) found that ‘trustable’ articles tended to have more editors, edits and comments. Their findings evidenced that

a small number of articles accrete a disproportionately large number of edits. ...edits correspond on average to an increase in article quality. The feedback mechanism of edit accretion thus results in a small body of high-quality articles. These high-quality articles deal with topics of high visibility or relevance, while the vast majority of Wikipedia articles are relatively infrequently edited and have far lower visibility (p.160).

This might suggest that articles that are high disputed (gaining more edits) might be viewed as likely to reach higher levels of quality than other articles. Other studies have proposed that conflict on Wikipedia provides ‘a generative friction, regulated by references to policy as part of a coordinated effort within the community to improve the quality of articles’ (Osman, 2013, p.1)

Incorrect spelling and grammar are also seen by Wikipedians as a way of identifying possible subversive edits (Wikipedia, 2021I). Experienced, subversive editors, however, are likely to be aware that they can use spellchecks built into their browsers, and my analysis of subversive edits in my case study suggested that some subversive edits seemingly conformed with Wikipedian norms.

Contemporary bots are becoming less likely to make simple spelling or grammatical errors (unless they are programmed to give the appearance of human flaws) and are constructed with reference to the Semantic Web and its so-called trusted sources. Overall, any heuristic of human authority is potentially open to being integrated into technologies, including unfriendly or subversive technologies. Indeed, technologists will specifically seek to integrate such heuristics as this is likely to make their products more valued to those who want to be viewed as authoritative.

The emphasis that experienced Wikipedians place on traditional forms of authority is most likely to operate to the benefit of those (whether human or bot) who have been highly educated according to traditional educational values. In contrast, those in marginalised groups who are less likely to receive the same level of formal education and/or struggle with literacy for other reasons, could find it difficult to create sustained article content or rise through the editorial hierarchy. They might also be more likely to be viewed as vandals on Wikipedia due to spelling or grammatical errors. Escalations in the policing of language norms could, therefore have a highly negative impact on the inclusion of some marginalised groups and individuals, without necessarily addressing what Wikipedians refer to as 'bad faith' editing. In addition, the focus on heuristic trust signals such as correct spelling and grammar, repetitions, photographs, and other 'variables that increase the ease of perceiving, understanding or recalling an idea' could support the global construction of 'illusions of truth' (Newman *et al*, 2020, p.1) which fail to act to the benefit of marginalised groups at localised level.

(E) Sources of the Main Text, Verifiability Recentism, and Notability

The texts most likely to be visible to general users of Wikipedia are articles on popular themes, ideas, findings, events and individuals (Wikipedia, 2023b) which Wikipedian norms require to be constructed out of reliable sources. According to Wikipedian policy (Wikipedia, 2022c) the combination of Wikipedia's core policies of no original research, neutral point of view and verifiability is meant to 'determine

the type and quality of material acceptable in articles'. Although Wikipedian and scholarly narrative often emphasises the above set of policies as being core to the operations of Wikipedia, choices of articles and their content also routinely interact with Wikipedian policy on notability. To create the first version of any article, Wikipedians must evidence that the subject of such articles are 'worthy of notice' (Wikipedia, 2023c). This means that articles tend to focus on entities that have been widely mentioned in sources (trusted by Wikipedians) over a significant period of time. Although notability 'does not necessarily depend on things such as fame, importance, or popularity', these may still 'enhance the acceptability of a subject'. Ford (2022) has also observed that Wikipedian policy was specifically created in relation to notable, historic events and that this includes the need to evidence that an event has had a long lasting and wide-ranging effect and is major or unprecedented. It is not clear how such policy interacts with understandings from the field of disaster risk reduction that disaster events can be shaped by human choices and 'are best understood as the unfolding of systematic pathological changes' (Oliver-Smith *et al* (2017, p.470)

The texts of popular articles are meant to be constructed out of content (or summaries of content) taken from what committed Wikipedians view as trusted/reliable sources rather than original research. Original research includes primary sources as 'original materials that are close to an event and are often accounts written by people who are directly involved'. Under Wikipedia policy, such accounts are disallowed unless they amount to commonly recognised facts (i.e., a form of common sense, and/or backed by reliable published sources). It is also stated that 'passages open to multiple interpretations' should be precisely cited or avoided. The Wikipedia article on its no original research policy (Wikipedia, 2022c) includes the statement

The inclusion of a view that is held by only a tiny minority may constitute original research. Jimbo Wales has said of this:

If your viewpoint is in the majority, then it should be easy to substantiate it with reference to commonly accepted reference texts.

If your viewpoint is held by a significant minority, then it should be easy to name prominent adherents.

If your viewpoint is held by an extremely small minority, then—whether it's true or not, whether you can prove it or not—it doesn't belong in Wikipedia, except perhaps in some ancillary article. Wikipedia is not the place for original research.

What is not made clear is how this translates into practice e.g., what if you are one of a small number of experiencers of a disaster event (say 10,000s)? Under the above policy those experiencers might be viewed as a tiny minority, with precedence then given to the formalised perspectives of notable professionals (in media, academic and other institutions) that may be located a substantial distance from the disaster area.

Primary sources are considered problematic on Wikipedia as they are thought to be potentially self-serving, misinformation, plagiarism, and open to legal challenge (i.e., in the case of copyright violations and allegations against living persons). An English language Wikipedia content guideline article (Wikipedia, 2021d) provided guidance on reliable sources, including sources to be avoided. This included a section entitled 'Age matters' which considered the relationship between historiography, mediatisation, and truth claims. It was noted, for example,

With regard to historical events, older reports (closer to the event, but not too close such that they are prone to the errors of breaking news) tend to have the most detail and are less likely to have errors introduced by repeated copying and summarizing. However, newer secondary and tertiary sources may have done a better job of collecting more reports from primary sources and resolving conflicts, applying modern knowledge to correctly explain things that older sources could not have, or remaining free of bias that might affect sources written while any conflicts described were still active or strongly felt.

Wikipedian narrative (Wikipedia 2021e) states that some Wikipedians argue against relying heavily on news sources as this emphasises facts about present events over a historic perspective of knowledge which can clearly identify why some events/entities are more notable than others. The initial construction of articles out of 'hot news', however, is tolerated, with experienced Wikipedians recognising that news brings in new readers and editors. Experienced editors are encouraged to access a newsworthy article once the initial rush of edits is over

and 'initiate comprehensive rewrites' focus on the notability of the event, key facts, and links to related issues. What is sought is the 'timeless facets of a subject' as recognised by Wikipedia consensus', which would remain relevant into the future, including during 'a ten-year test' i.e., how would the article stand up to scrutiny (by Wikipedians) in ten years' time? The identification of 'timeless facets of a subject' raises questions over how understanding of disasters develops on Wikipedia in relation to specific contexts, and over time.

An article presented as a 'supplement' on 'perennial sources' for the English language edition (Wikipedia, 2021f) provided information on how reliable certain sources were considered to be. On the 17 September 2021 there were 360 sources on this list. The majority of these were English language publications, many of which were online. These did not include academic journal sites, but rather related to media, popular, or institutional publications. Some sources were likely to be excluded as they represented user-generated content. 55 of the sources had been deprecated or blacklisted, 102 were categorised as generally unreliable and in 87 cases there was no consensus over categorisation. This left 116 which were considered generally reliable. In some cases, the decisions on categorisation strongly linked to Wikipedian norms such as no original research, which meant that self-publications were considered unreliable. Others were downgraded due to a perceived lack of fact-checking e.g., in the case of Baidu Baike (the Chinese online encyclopaedia), or for distributing misinformation. There were, however, also examples of obvious political judgements being made. Western broadcasters such as the BBC (a national broadcaster) and ABC (previously a national broadcaster) were listed as 'generally reliable', but several sources strongly associated with the Chinese Communist Party had resulted in no consensus or had been deprecated. In many cases, sources covering politics were (a) not considered reliable, or (b) there was no consensus, or (c) some editors felt the sources were biased due to how they reported or were funded.

The category of generally reliable sources contained several sources strongly associated with the Christian religion including 'Desert News' (owned by a subsidiary of the Church of Jesus Christ of Latter-Day Saints), 'Christian Monitor', and 'Religious New Service'. Playboy was also on the list of the generally reliable. Wikidata and Wikinews were identified as unreliable sources, aligning with the tendency for Wikipedian editors to view Wikidata as less robust in terms of

carefully checked factual information. Many of the sources categorised as reliable were English language, and/or based in the US, Britain, or Europe. Other studies have found that American publishers dominated Wikipedia sources, with many sources from the traditional news media and government (Ford, 2022).

The above indicated that those who were members of a core Wikipedian grouping (the elite editors who decided which sources were trustworthy) had a preference for English language sources (particularly those located in the US), including some odd choices for sources for contemporary knowledge-making. Committed Wikipedians use automated citation tools (Wikipedia, 2021g, sustained) which might draw on such sources. In addition, the requirement for articles to be within copyright could constantly drag content of articles about non-contemporary events back to sources fifty or more years old. Potentially this could act as a highly conservative force which could then be extended into the re(construction) of events through the relational, layered structure of the Semantic Web and contemporary knowledge-making practices that draw on this. This system might be particular problematic for marginalise groups that have traditionally had limited social visibility - including in mainstream academic and media publications.

(F) Knowledge and Power on Wikipedia and the Semantic Web

The policies and processes of Wikipedia, as described above, suggests that editors who followed the global norms (as policed by normative, experienced editors) can accumulate trust and make their way up Wikipedia's hierarchies' by absorbing and applying Wikipedian norms (Pentzold, 2010, p.1; Tracz, 2015). In theory, this could mean that senior editors have little decision-making power (Tracz, 2017, pp.120-122). They, for example, would only be able to construct articles out of what the Wikipedian community had identified as trusted sources. Page (2018, p.67) pointed out that on

Wikipedia, the entitlement rights of the tellers downplay the editor's identity outside the site. In doing so, the tellership rights project an idealised separation between the representation and roles of the teller within the context of Wikipedia and the wider socio-cultural contexts in which the tellers are also positioned.

Such a narrative, however, could distract from the possibility that some individual editors or institutions could accumulate power within this system. Power

inequalities, for example, might also arise through distinctions between editors who have technological skills and those that do not. Ford and Wajcman (2017, p.250) have noted that

The developers of software tools and developers and users of bespoke code are even more likely to be male than are editors. The proportion of female employees in the product and engineering team at the Wikimedia Foundation is about 25%. Some work has been done to address gender disparities in editing, such as a preference that editors can set so that the software uses gender neutral words whenever possible when mentioning them. The majority of female editors, however, do not advance to the stage where they can configure the system in this way.

In addition, some editors with technological skills could potentially edit across a range of layers including technical articles (e.g., on common templates), rewriting technical mark-up and code, and programming the bots. They might power-edit across many online institutions (including multiple projects under Wikimedia and other sites such as OpenStreetMap, etc) and layers of the Web with an understanding of how trusted sources could be established and used to construct a particular representation. Power-editing across sites could also potentially be used to raise an individual editor's profile across the web, with implications for their public and commercial profiles.

Those able to influence various media sources trusted by the Wikipedian community and the wider Semantic Web could seek to extend their influence through such a system. Various studies of Wikipedia (Pentzold, 2009; Smit, 2018) have evidenced the degree to which normative editing relies on reposting material from traditional media sources. Studies have found that many posters of content on the web repost and reference content from the traditional media as a source of authority and/or disagreement. Taking copy across national media into Wikipedia may enable the spread of national stereotypes, as happened in the case of print encyclopaedia (Loveland, 2019). Page's (2018) case study of Wikipedia articles on the Meredith Kercher case exposed how stereotypical content on the defendants was drawn (over time) from national medias into articles. Page concluded by stating that it would be expected to see differences across Wikipedian language editions - varying according to national and political contexts. She also noted that 'the connection between Wikipedia and its cultural contexts' were 'indirectly

mediated through intertextuality and through interactions between its editors, shaping the shared stories which emerge in the articles' (p.81).

Other scholars have highlighted the intertwining of the news and digital technologies including Twitter, Google and Wikipedia (Keegan, Gergle, and Contractor, 2013; Kanhabua, Nguyen and Niederée, 2014; Ferron and Massa, 2014; Twyman, Keegan and Shaw, 2017; Keegan, 2020). This intertwining is potentially coproduced by the search behaviours of individuals and interoperability of digital applications.

'In one common schema, a person might hear of news through social networking, conduct a search on the internet to get more information and end up being directed to a freshly edited article on Wikipedia. Indeed, monthly lists of the most read articles on Wikipedia show a significant bias toward breaking news' (Loveland, 2019, p.377)

The above, however, does not recognise that breaking news could interact with the wider ordering of Semantic Web and its institutions. A study of collective memory by Garcia-Gavilanes *et al* (2017) found that the triggering of page views of Wikipedia articles on both recent and similar past events took place even where there were no hyperlinks between two Wikipedia articles. The researchers stated the cause of this remained an open question as their data did not provide explanation of the underlying mechanisms. They went on to highlight '*a high correlation between search volume on Google and visits to Wikipedia articles related to the search keywords*' (p.1). Miz *et al* (2019) built models to investigate Wikipedia page viewing behaviours that deviated from the norm. Subgraphs containing linked pages on Wikipedia closely related to an event that triggered a sudden increase of visits during a short period of time' (p.1290). The researchers used trending search topics on Google Trends 'as a ground truth indicator of the anomalous activity of the visitors on the web' (p.1291). They applied their approach to a major sporting event and three crises and noted that there was 'a striking correspondence between the detected anomalies (from Wikipedia data) and Google Trends. In all the examples given in their research paper, the anomalous activity on Wikipedia and Google Trends curves [reached] their maximum at the same time and [had] a very similar shape' (p.1279).

The intertwining of Wikipedia and Google has been recognised for some years (Carr, 2009; Rogers and Sendijarevic, 2012, Van Dijk, 2013; Ford, 2022). Loveland (2019) noted that as encyclopaedia moved from hard copy onto disks, users came to rely more on search engines such as Google. This then tied projects such as Wikipedia together with search engines. The relationship, however, is not necessarily a simple one. Yagci *et al* (2022) have summarised research findings suggesting that the degree of commonality across different search engines varies across different search engines, time periods and geographies. Yagci *et al*, undertook a recent comparison of the top results from Google, Bing, DuckDuckGo, and Metager, using 3,537 queries from Google Trends from Germany and the USA. They found that news dominated in the German results, while sports and news dominated in the USA results. When comparing the top domains for each search engine for German search results there was a clear preference for Wikipedia across all of them, although the frequency of Wikipedia results was lowest for Google. Other top search results focused on news services. In the US, the frequency of Wikipedia results was highest on Google (more so than in the German results), with Wikipedia being the most popular domain across all search engines.

The relationship between Google, Wikipedia and social media sites interacts with the current incarnation of the web (the Semantic Web) and the technology stacks and system of reciprocal trust that it relies on, which may vary by region. Unless the Semantic Web was constructed to effectively enable the integration of perspectives of marginalised groups, mainstream regional institutional perspectives (particularly those from major established media sources) would be likely come to dominate wider social narratives and online production of social facts and automated knowledge on crises/disasters. The next section considers the construction of the Semantic web, including the formation of relations between institutions that has emerged on it and the degree to which this supports the unfolding of archival discourses that recognise and empower those at greatest risk of repeated disasters.

2.10 The Ordering of Computing and the Semantic Web.

Any institutionalisation requires techniques to support and enable its growth, including through consolidating certain forms of authority, diffusing these and

making them visible. Within the technology sector there are a range of techniques that can offer support for institutionalisation. These include tools for stabilisation and reproduction, but also techniques that give the impression of the generation of novelty. Kallinikos (2006) examined the self-referential tendencies of contemporary information technologies and proposed that information growth was a form of intensive 'institutionally orchestrated game' (p.100), whereby novel information (as *news* or difference) was constantly sought, but immediately began to depreciate in perceived usefulness. This then triggered the need for the generation of further information, supported through

The development of complex organizational and technical arrangements...thereby participating in the self-referential, self-accruing nature of information processes that characterize the contemporary world in general and organizations in particular (pp.108-109).

Such systems are prone to being backward facing. Recently Pentzold, Kaun and Lohnmeier (2020) highlighted that the utility offered by data driven futures (as prediction) came at a price of being inherently backwards facing and conservative. Recursion (as a repeating sequence of instructions where a problem is broken up into smaller elements which can be decided and combined to solve the original problem) might present similar issues, unless care is taken to 'avoid recursion as a form of infinite nesting, and logic models are constructed that avoid logic conflicts, recursive loops and paradoxes' (Alesso and Smith, 2009, pp.32-35). Studies of the politics of memory have long evidenced that elites have used backward facing futures to bolster the myth of shared memory and identity, including that of nation (Kenny, 2017; Bonacchi, Altaweel, Krzyzanska, 2018; Gaston and Hilhorst, 2018). More recently similar dynamics have found in relation to global brands (Rana *et al*, 2021). Barash (2017, p.265) has argued that such patterns are used in mass media as 'a primary vehicle of political identification', but this can lead to the denial of reality of events through generating fragmented recollections that are illusionary but promote the belief that they are based on 'direct experiences, capable of symbolically configuring the coherence of events as a whole'.

Hypertext can be constructed into complex patterns (Bernstein, 1998) and software designers regularly make use of repeating pattern called pattern languages (Cunningham and Mehaffy, 2013; Dawes and Ostwald, 2017). Early descriptions of pattern languages were included in the semi-mystical, deeply nostalgic writings

of the architect Christopher Alexander (1979). Later his concept of pattern languages was influential in the development of the hierarchically compressed structures of object orientated programming - used to describe relations between objects and classes in computing (Alesso and Smith, 2009, pp.224-225). Class-based languages in object orientated computing are built around the idea that the world can be modelled as (1) identified entities; (b) their state and behaviour; and (3) how they behave with one another. The object definitions and interactions then inform the business logic layer in software engineering, which regulates the interaction between the presentation layer (visible to users) and the data layer (Sheriff, 2020).

Pattern languages have been criticised on value driven, aesthetic and scientific grounds (Dawes and Ostwald, 2017). There have been efforts to create bottom-up designs to avoid pre-programmed orders (Venners, 2005), but a recent meta-analysis (Wedyan and Abufakher, 2020) of pattern languages found their effects were concentrated on maintainability. Wiki technologies reference pattern languages, as do many other technologies. Cunningham and Mehaffy (2013) produced the designs for wiki technologies alongside claims that their patterns were pluralist, democratic, open to evolutionary change (as indicated by 'greater accuracy and usefulness of time') and could be used 'to create useful ontological models of a portion of the world, as a more formalized subset of language' (p.6).

According one Wikipedia article, Wikipedia is generally recognised as one of the most high-profile examples of wiki technology (Wikipedia, 2022d). The designers of wiki technologies (Cunningham and Mehaffy, 2013) described Wikipedia as publishing a linked network of encyclopaedic articles, each on its own web page (p.2). The encyclopaedic pattern is one that has long been of interest to technologists. As far back as 1945, Vannevar Bush wrote a paper on the potential of a machine (the Memex) to act as 'enlarged intimate supplement' to the memory of scientific researchers. He envisaged 'wholly new forms of encyclopaedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the Memex and there amplified'. The equating of associative trails with memory is also found in the development of a hyperlinked technology called the Semantic Web.

Berners-Lee *et al* (2001) published a paper on the development of the Semantic Web that suggested it would enable the move towards a web of machine-readable data. Berners-Lee, Connelly, and Swick (1999) stated that

the Semantic Web must permit distributed communities to work independently to increase the Web of understanding, adding new information without insisting that the old be modified. The web language XML specifies the syntactic constraint called well-formedness. Well-formedness is a fundamental tool for allowing documents to include extended information while remaining processable by older "down-level" applications.

Although this relationship with older generations is generally integrated into software engineering and the web, web scientists such as Berners-Lee intended it to be both universal and supportive of the properties of local systems – allowing the processing information across ‘vastly different systems’. To align with this, the Semantic Web was not constructed to assert ‘truths’, but rather these were meant to be evaluated in particular localities/contexts.

Berners-Lee *et al* (2001) noted that to avoid problems arising from Gödel's theorem of incompleteness, ‘traditional knowledge-representation systems generally each had their own narrow and idiosyncratic set of rules for making inferences about their data’. Semantic Web technologies, however, were to accept ‘paradoxes and unanswerable questions’ in order to achieve versatility. The aim was to create a language that expressed data, rules for reasoning about the data, and allowed for rules from any existing knowledge-representation to be exported onto the web. In addition, the logic had to be

powerful enough to describe complex properties of objects but not so powerful that agents can be tricked by being asked to consider a paradox. Fortunately, a large majority of the information we want to express is along the lines of "a hex-head bolt is a type of machine bolt," which is readily written in existing languages with a little extra vocabulary (p.26).

Such thinking, however, was challenged by the growth of the web into a social technology. Technologies drawing information from the web to logically construct knowledge interacted with information that engaged with Gödel's theorems of incompleteness and self-reference. During the 1930s, Gödel, ‘in a landmark effort, proved fundamental results about axiomatic systems showing that in any systems

there are propositions that cannot be proved or disproved based on axioms and logic rules of the system' (Alesso and Smith, 2009, p.27). In other words, some propositions cannot be proved or disproved, and so are undecidable. Legg (2007) further highlighted the problem of decidability on the Semantic Web, with inference needing to take place within a finite time period in an open rather than closed system. She also raised the issue of logical consistency, where the Semantic Web was to rely on deductive inference. It was, for example, to be expected that 'on an information space of the unprecedented size and democratic character of the web, one will find logically contradictory statements'. Other problematics were to include rapid change and the related issue of predictability, which were likely to arise due to changing datasets on the web. Transparent versioning was proposed as a possible solution. Legg also observed that 'the final major challenges facing the Semantic Web are not technical so much as political' and noted 'the philosophical possibility some (albeit surprisingly few) commentators have raised-namely, that the structure of information might form part of its meaning' (p.419).

Others working on e-government also noted that information overload from many diverse resources and outdated knowledge would cause problems, and that this would need to be addressed through structured meaning while retaining general access for web users. These general users were seen as the new generation of crowdsourced knowledge providers who would replace the use of experts (both in particular fields and the use of semantic programming technologies) in the building of semantic ontologies. This was partly as a nod towards democratic participation, but also because such experts were in short supply and did not always keep structured information up to date (Wagner *et al*, 2006; Vrandečić and Krotzsch, 2014). A visual of the construction of the Semantic Web stack is set out as figure 2 below. This demonstrates its layering of technical concepts and languages and suggests that such layering has implications for the definition of social concepts on the Semantic Web. Trust, for example, is shown as reliant on unifying logic, proof and encryption within this technology stack.

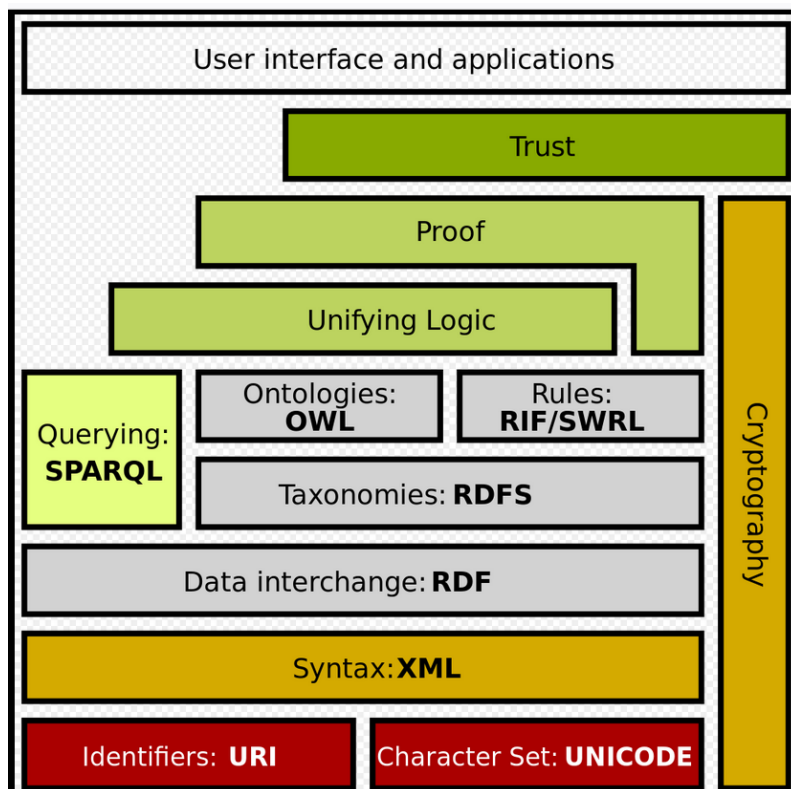


Figure 2: The Semantic Web Stack (Marobi1, 2014 CC0, via Wikimedia Commons)

Alesso and Smith (2009, p.247) observed that the ‘highly structured layering of many languages to deliver logic and machine-processing may well be an overdesign of the future Web architecture’. This threatened to create level of unsolvable complexity. It was, therefore, felt that ‘It may be more likely that as the layers of the Semantic Web evolve, a surprisingly simple but elegant alternative using adaptive software or patterns of something totally unexpected may offer a startling solution’. The authors suggested that patterns, as found within ‘highly structured, repetitious environments’, could provide solutions that could be used and reused repeatedly (pp.224-227). The rest of this literature review explores the idea that the solution may have been found in the form of a relational encyclopaedia – drawing on the patterning of Wikipedia - as this offered a way to pragmatically work around the problematics of the Semantic Web.

Rosenzweig (2006, p.123) had noted that Wikipedia could be used to support question answering services and enable users to distinguish between what seemed like very similar entities. In the same year, Poe (2006) observed that ‘A Polish Wikipedian named Krzysztof Jasiutowicz made an arresting and remarkably forward-looking observation. The Internet, he mused, was nothing but a “global Wikipedia without the end-user editing facility’. From such a perspective Wikipedia

might be viewed as a fractal of a relational web, or an encyclopaedia within an encyclopaedia. By 2012, the Senior Vice President of Google Engineering, Amit Singhal (2012) wrote that Google was developing a semantic technology called the 'Knowledge Graph' (a complex form of relational database capable of visualising vast numbers of relations as graphics) which would use public sources including Wikipedia and Wikidata. In one Wikipedia article it is stated that.

In May 2012, Google added a project called the Google Knowledge Graph, which produced knowledge panels alongside traditional search engine results. Later, results from querying the knowledge graph complemented string-based search in producing the ranked list of search results as well. A large amount of the information presented in the knowledge panel infoboxes is retrieved from Wikipedia, Wikidata, and the CIA World Factbook' (Wikipedia 2021h, sustained)

Ford (2015, p.15) has argued that the use of Wikipedia and Wikidata in the Google Knowledge Graph was an attempt 'to establish Google as a source of facts rather than an indexer of unverified information, and validated Wikipedia as an authoritative source of those facts'. Wikipedia and Wikidata would become central to a type of social solidarity project based on sustained social facts. A narrative of these as democratic facts was then dependent on the perception of Wikipedia as a decentralised, pluralist producer of collective, public knowledge (Poe, 2006).

Cunningham and Mehaffy (2013) recognised that in some cases knowledge could not automatically be conceived of as encyclopaedic. In the case of knowledge of climate change, for example, some details and predictions could be uncertain. In such cases, they called for a form of federated knowledge whereby consensus emerged out of a large network of pluralist voices. They saw federated publication methodologies as allowing 'overlap - duplication of work by parties who might have different needs, concepts and approaches – in the same way that a plural and democratic culture also allows overlap' (p.2). This was to create a form of shared knowledge-making within a democratic context. Maher (2020, p.339), a CEO of Wikipedia, has described how

The future of Wikimedia offers this platform an opportunity to evolve from a supporting function to a strategic one, offering new knowledge formats, structured knowledge, new service layers, federated knowledge hosting, and

augmented intelligence— an indispensable piece of infrastructure for the essential support system for free knowledge.

There have also been indications in the literature of what has emerged in practice. Findings from both my literature review and research project suggested that many western institutions including libraries, museums, archives, academic and governmental institutions, traditional media outlets, and digital companies, formed a relational system (or database) through the Semantic Web. Processes of online remembering (or forgetting) and the adding of novelty then arose out of self-referencing in a similar manner to the pattern of construction of articles on Wikipedia.

Vrandečić's (2019) description of the relationship between Wikipedia, Wikidata and other institutions also hinted at such a relational or self-referencing system of trust. Wikidata is an open access knowledge graph that stores structured data that can be read by both humans and machines and automatically generates answers to queries through processes of inference. Wikidata does not rely on Wikipedia for all its data, but rather draws on a wide range of institutional sources (Vrandečić, 2019). Vrandečić has referred to these as 'authority' databases, where it is possible to access information 'that can be trusted'. Ayers (2020) has also stated that libraries across the world are interlinked with both Wikipedia and Wikidata. Wikidata now provides a source of machine-readable data that can be used across Wikipedia articles, with Wikipedia templates able to automatically pull data values from Wikidata (Hetherington, 2018, Krishnan, 2018; Turki *et al*, 2019).

Several recent studies have indicated of the scale of interdependence between Google, Wikipedia, and Wikidata (McMahon, Johnson and Hecht, 2017, Vincent *et al*, 2019), although it should be noted that such studies tend to be triggered or supported by the Wikimedia Foundation (e.g., McMahon, Johnson and Hecht, 2017, p.143). The studies have highlighted that Google is using Wikipedia data in their knowledge graphs, but with limited reference to Wikipedia. As Ford (2020) has noted, without properly sourcing Wikipedia content the whole online system of relational trust is put at risk.

Recently when Google were challenged over blocking online worldwide abortion services provided by 'Women on Web', a Google spokesperson stated that they had 'learned that sites that demonstrate authoritativeness on a topic are less likely

to publish false or misleading information so if we can build our systems to identify signals of those characteristics, we can continue to provide reliable information' (Oppenheim, 2021). Google previously stated they use a system of 'Expertise, Authority, Trust' and referred to evaluating trust signals from sites using a combination of different algorithms. In December 2021, Google published extensive general guidelines on how this operated in practice (Google, 2021). Information gathered as part of my literature review and case study, however, suggested that Wikipedia's narrative of openness and its visible signals of trustworthiness (Rowley and Johnson, 2013) were being relied on to provide legitimacy, authority and trustworthiness in the case of Google and other online and offline institutions. Loveland (2019, p.387) has observed that Wikipedia's 'brand name acts as quality assurance for users and it consolidates information into a single article per language on every subject. It also claims authority across all subjects'.

It, is therefore, unsurprising that Wikipedia has been described as 'probably the most popular and the largest source of organized and structured knowledge on the Web' (Jatowt, Kawai and Tanaka, 2019, p.287). Hill and Shaw (2020, p.162) have further stated that 'Wikipedia has become part of the mainstream of every social and computational research field we know of (p.161) and referred to Wikipedia as a laboratory for researchers. Wikipedia and Wikidata are also of major interest in the field of natural language processing due to their provision of an 'enormous, multilingual data set, written and categorized by humans about a wide variety of topics'. Keegan (2020) has written that the value of Wikipedia (for technologists) is seen in terms of its network of hyperlinked articles rather than its articles, while Vincent *et al* (2019) have evidenced that Wikipedia user generated data has added value to the popular web institutions - 'Stack Overflow' and 'Reddit'. YouTube has also been said to link 'to Wikipedia as a form of fact checking; voice assistants such as Alexis and Siri draw their information from Wikipedia; and in June 2020, Facebook added Wikipedia boxes to its search results' (Avieson, 2022; Ford, 2022). In addition, Wikidata interlanguage links are being used to construct multi-language knowledge graphs (Wu *et al*, 2018), and as an open resource it can be accessed by anyone developing semantic technologies including search engines, browsers, recommendation systems, and natural language processing. (Kaffee *et al*, 2017). According to Sheth, Padhee and Gyrard (2019, p.68)

Today, Tech giants including Microsoft, Siemens, LinkedIn, Airbnb, eBay, and Apple, as well as smaller companies (e.g., ezDI, Fraanz, Metaphactory/Metaphacts GmbH, Semantic Web Company GmbH, Mondeca, Stardog, Diffbot, and Siren) are using enterprise Knowledge Graphs (which are often proprietary but may incorporate public knowledge such as DBPedia).

The system of knowledge graphs requires curation of data by ‘thousands of employees’ using a mixture of ‘manual, semi-automatic, or automatic approaches’ and draws on

‘semistructured and structured data (DBpedia, YAGO), unstructured data (NELL), HTML web pages, books, and microdata annotations on the web (Google’s knowledge vault), public collaborative data like Wikipedia and Freebase (Yahoo’s KG), collaborative manual editors (Wikidata), etc (p.69).

Matsakis (2018) and Bukhari, Bashir and Malik (2018) have identified that artificial intelligence researchers frequently use the Wikipedia data to train algorithms or teach digital assistants. Katherine Maher, an executive director of the Wikimedia Foundation, confirmed that most western AI systems relied on Wikipedia as the source of training data for facts and that their

content powers hundreds of semantic web services and knowledge graphs, including those maintained by Google, Apple, and Yahoo! Our traffic data is used to track the flu virus, analyse changes in the stock market, and predict which movies will top the box office. Our structured and linked data platform, Wikidata, is used to organize datasets from the Library of Congress to the Metropolitan Museum of Art (Maher cited in Matsakis, 2018).

A Semantic Web, therefore, seems to have become integrated into claims by technologists that they are developing cutting edge technologies - including artificial intelligence. Beyond supporting claims of free knowledge and combating misinformation, this knowledge-making system (held up as participatory. and almost democratic, through the use of crowdsourcing) may have reduce the possibility that investment will be redirected away from the technology sector i.e., content produced by AI becomes more likely to be viewed as legitimate and socially acceptable.

The system also protects and promotes the interests of all the institutions that are viewed as trusted within a self-referencing Semantic Web. There is also the possibility (this is a speculation on my part) that some power-editors across open access technologies could seek to create data that supports and simplifies the construction of technologies through making it appear that automatically produced knowledge is universal and highly consensual. Pluralist technologies are complex (and expensive) to design and maintain and unlikely to appeal to all those wishing to retain accumulated wealth and power. If such activities were taking place across the Semantic Web, they would be unlikely to support the participation and empowerment of marginalised groups, including those at greatest risk of negative impacts during repeated disasters. The tendency for pattern languages to value maintainability, together with practice examples across the web e.g., Wikipedian tendencies to overwrite content on marginalised groups (Tripodi (2021), suggests that information intended to support the interests of marginalised groups might be viewed as untrustworthy on the Semantic Web unless it came from highly established institutions.

Power dynamics on the Semantic Web also seem to mirror those of contemporary institutions which have undergone a series of structural reforms over recent decades, including the decentralisation of authority and control, flattened structures, and increased spans of control. The intent has been to create relationships through informal, horizontal communication channels (Menon, Chowbury and Lukas, 2002, p.319; Park, 2019). Available findings suggest that that reforms are associated with new problematics. The flattening of structures, for example, has been found to increase the likelihood of conflicts and negatively impact on the capacity for response to crisis (Park, 2019). Sørensen and Torfing (2021) observed that the early utopian expectations of networked governance had given away to more nuanced understanding, including of its problematics. This included issues of recruiting and motivating participants, retaining trust, power asymmetries, conflicts, tunnel vision, lack of accountability beyond the self-referential and chaotic processes including 'overlaps, iterations, feedback loops and jumps' (p.1593). The main problematic identified was that even where consensus was reached, networked governance lacked the structure and capacity to implement, evaluate results or enable democratic accountability. Such problematics are likely to act as barriers to members of marginalised groups to in the processing their experiences of repeated disasters and attempts to hold

particular actors to account for corrupt or ineffective decisions and practices. Such accountability has implications for decisions in the present that could contribute to, or mitigate future disasters, as well for transitional justice related to past events.

Recently concerns have also been expressed over the Semantic Web fragmenting into regional, ideological webs (O'Hara and Hall, 2018) - with each regional elite seeking to produce its own version of an encyclopaedic system of relational trust and reproduction. Beyond the western regional web, there is evidence of entanglements between online encyclopaedia and dominant regional search engines. In the Russian region Yandex (the dominant Russian search engine) and Google interact with the media and online encyclopaedias. Zavadski and Toepfi (2018, p.23) found that

In the case of actualised memory events (i.e., events that are highly present in the dominant media discourse and thus important to the country's memory politics), major pro-regime mass media and, to a lesser extent, large encyclopaedias dominated the search results of both Yandex and Google.

Russian publications also evidence that Wikipedia and Wikidata sets are being investigated for use within Russian language knowledge graphs (Korablinov and Braslavski, 2020). I found indications from a range of grey materials that Russia and China were engaged in early work on the Semantic Web and related vocabularies - perhaps at a time when there was a more optimistic outlook on global relations. More recently, however, vocabularies have been increasingly inhabited by major US based technology companies (Schuller, 2021a, p.13)

In China, the online encyclopaedia (Baidu Baike) is owned by Baidu which also operates the main regional Search Engine (Gustafsson, 2019). Gustafsson's (2019) case study of socio-technical memory suggested that the Chinese online encyclopaedias Baidu Baiku and Hudong Baike operate in a different way from Wikipedia. Gustafsson described the Chinese Communist Party as attempting to control Chinese collective memory in a way not seen in the West, and yet his descriptions of the operations of the Chinese digital organisations identified similarities between the construction of Chinese online encyclopaedias and Wikipedia. Across Wikipedia and Chinese online encyclopaedias an elite editor group (either described as volunteers or staff) decide what is sustained, but it is

possible for a researcher to following changes over time, including contentions between editors. Gustafsson concluded that the editing of articles on the Chinese Great Famine played down governmental responsibilities for the disaster, but the neutrality principle of Wikipedia also limits the degree to which governments and other political interests can be held accountable for domestic, anthropogenic disasters. Gustafsson proposed that the level of editing on Wikipedia, compared to that found in articles of Chinese online encyclopaedias, suggested greater levels of pluralism and participation, He, however, not give detailed consideration to hierarchies, power-editing, and the sustaining of edits on Wikipedia over time. Gustafsson questioned the concept of Wikipedia as a global memory place because of domestic alternatives in some states, but his research hinted at the possible operation of a Chinese regional, relational web. Gustafsson, for example, found activity taking place on Weibo (another Chinese organisation) that seemed to be stimulating editing of articles on Hudong Baike.

Other studies suggest that data from the Chinese language Wikipedia is extracted and used within Chinese knowledge graphs such as CN-DBpedia, PKU-PIE and Belief Engine, together with data from Baidu Baike and other Chinese online encyclopaedias. In the case of the 'Belief Engine', belief values are assigned to this data. The Chinese knowledge graphs use techniques referred to as knowledge fusion and global consensus, but this is fusion and consensus associated with the Chinese language, and instructions on how to make use of knowledge graphs based on languages other than English (particularly Chinese) have been promoted as part of the Chinese global investment programme One Belt, One Road which has been associated with geopolitical goals (Schuller, 2021a, p.18).

2.11 Conclusion

This chapter has explored how certain traditions and norms have interacted with the construction of Wikipedia as layered, relational archival memory. The literature suggested that senior, experienced editors (linked to power-editing across the site) may recognise that memory (of past events) is socially constructed but adopt normative policing which is found across other institutions engaged in peer-to-peer networks (Bittner, 2017; Kioupkiolis, 2022). This policing focuses on the need to demonstrate notability, neutrality and use of verifiable (institutional) sources rather

than draw on original research. Through such processes the content of less experienced editors is likely to be disconnected from the text of articles (a form of forgetting). Such policing (and related forgetting) may be viewed as offering various benefits, including reinforcing the impression that Wikipedia offers coherent, socially constructed narratives and facts that can be regarded as authoritative and legitimate (as common sense) from the perspective of certain forms of authority. This includes traditional academic forms of authority and the ideals of open, deliberative, democratic authority. This might be viewed as: supporting a move towards consensus and solidarity at global scale; protecting copyright, and the countering of misinformation by unfriendly agents. It could also be used to support the production of socially authoritative and commercially viable semantic technologies.

Less attention seems to have been given by Wikipedians (over time) to: the duty to acknowledge and remember those who experience suffering through various crisis/disaster; recognising social change (that does not simply draw on media stereotyping) and ensuring the network remains open to new joiners who have yet to accumulate trust in a self-referencing system. It is also unclear what efforts are being taken to ensure the social facts produced through this self-referencing system will be useful to those who are most at risk of negative outcomes through repeated crises. Perhaps unsurprisingly, in view of this, the literature review suggested the ideal of a global semantic web had collapsed into fragments (regionalised semantic webs following encyclopaedic patterning and drawing on established, regional institutional sources).

Although marginalisation on Wikipedia is now regularly recognised by some of those engaged in the Wikipedia project, this remains a longer-term problematic linked to offline marginalisation, but also the normative construction and policing of the site and the governance model developed for peer-to-peer systems (Kioupiolis, 2022). Various literature (Bittner, 2017; Evans *et al*, 2020; Vrana, Sengupta and Bouterse, 2020; Gluza, Turaj and Meier, 2021) suggests that this model interacts with marginalisation through promoting the experiences and perspectives of those who have already accumulated trust on the web (often males with technical skills) over new joiners (more likely to come from socially marginalised groups). Traditional forms of authority, often drawing on socially out-of-date/copyright institutional sources, combined with regionalism and nationalism,

are also poorly placed to support present day, locality-based memory sharing by individuals in marginalised groups that are most at risk of severe impacts from environmental disasters. Drawing on findings from the field of disaster risk reduction, it is proposed that such memory sharing would need to enable discussion of social vulnerabilities, technical failures, social, economic, political and cultural causes over time. It would also need to enable accountability (at various scales) and the development of individual and group understanding that could help prevent, mitigate, and prepare for similar future disasters.

The above represents findings from broad scans of literature on the politics of socio-technical memory. These were undertaken to strengthen my conceptual framework (focused on the politics of memory on Wikipedia and the web) and research questions on how the construction of memory representations interacted with the socio-technical construction of Wikipedia (across layering and relations with other institutions), with particular attention given to how such construction might interact with marginalisation. My chosen case study method drew heavily on Burawoy's (2009) Extended Case Method also required me to reference previous visits to the same site and changes taking place over time. I, therefore, undertook a targeted literature review of other studies of the politics of memory on Wikipedia (set out in the next chapter of this thesis). This then informed the development and delivery of a case study which directly addressed my research questions.

Chapter 3 The Targeted Literature Review

3.1 Introduction: Choice of Study for Comparison

Applying my methodology (the Extended Case Method), I sought to extend existing empirical findings on the politics of memory on Wikipedia. This included identifying and undertaking a detailed critical analysis of a previous case study of Wikipedian memory. I undertook a targeted review of Wikipedia as politicised memory (early Summer 2020), with the assistance of academic databases. In order to access both social and technical literatures, searches on '*Wikipedia AND memory AND politics*' (all years) were undertaken through the 'IEEE Xplore' and 'ACM' digital libraries (academic databases for the computer sciences), Ethos (the multi-disciplinary database of PhDs held by the British Library), and the Web of Science (a multi-disciplinary database). The Web of Science returned five items, and the ACM database returned 1000s of publications, but none had '*Wikipedia AND memory AND politics*' in the title or abstract. 100,000s of further items were returned by the ACM database on the search terms '*Wikipedia AND History*' suggesting many technologists were more likely to conceptualise Wikipedia as history than memory. No items were returned on '*Wikipedia AND counter-memories (or counter memories or counter memories)*', or '*Wikipedia AND memory AND disaster AND environment*' from the Web of Science. Further searches were then undertaken on the Web of Science on '*Wikipedia*' AND '*Memory*' combined with '*Shared*', '*Collective*', '*Public*' and '*Social*'. This returned around 30 publications, and 20 of those judged to be the most relevant (in terms of my research questions) were used in the targeted literature review. The search on the Web of Science database highlighted an article by Christian Pentzold (2009) as an early and influential article. According to digital databases (the Web of Science and Google Scholar) his case study had been cited more 50 times across qualitative and quantitative research. This included most of the publications identified in the targeted literature review. No other article about shared or collective memory on Wikipedia had this level of citation.

The targeted literature review suggested clusters of memory studies concentrating on spatialised aspects of memory, although these changed over time. Rosamond and Aguis (2018) proposed several waves of cross-disciplinary memory literature

developed during the nineteenth, twentieth and twenty-first centuries. In each wave, memory research reflected the politics of a certain form of space. Earlier attention to nationalist politics gave way to a focus on global processes, the world wars, the Holocaust, and the falling back of grand narratives including colonialism and communism. Rosamond and Aguis described the most recent wave as focused on digital memories of warfare. During this period, Pentzold's (2009) case study (focused an article on Wikipedia about the London Bombings 2005) had been repeatedly cited in other articles on socio-technical memory. This included studies within international relations (Gustafsson, 2020), cultural and media studies (Dounaevsky, 2013; Smit, 2018); health sciences (Ferron and Massa, 2011, 2014) and information and computer sciences (Kanhabua, Nguyen and Niederée, 2014; Luyt, 2015; Twyman, Keegan and Shaw 2017). Pentzold had also been cited by a range of leading interdisciplinary memory theorists including Hoskins (2009), Brockmeier (2010), and Van Dijck (2011). Like many other high-profile studies of memory, Pentzold (2009) was published in the Sage Journal of Memory Studies.

I, therefore, decided to focus on Pentzold (2009) as a previous site visit within my methodological approach – the Extended Case Method (ECM). Earlier in the PhD, I had used the literature review to look for gaps in the research that might be addressed through my own research and attempted to construct a research project that differed from those of previous scholars. This was partly to meet the requirement for original research demanded from a PhD thesis. I, therefore, intentionally sought to avoid simply copying the focus, methodology and methods of other scholars who had researched socio-technical memory on Wikipedia. I, however, lacked the understanding that would have allowed me to critically evaluate their work in depth, at that stage. It was my attention to the gaps and anomalies arising in my own research (as demanded by the ECM) that drew my attention to similar issues within others' research. After completing my initial analysis of data samples taken from Wikipedia, I returned to case studies identified in my targeted literature scan to go through them again line by line and undertook a detailed, critical review based on my new experiential understandings. I then rewrote the literature review (which had already been taken through numerous iterations) in a way that sought to draw out orderings and forms constructed by others, and related problematics. The detailed critical review of the

work of others (particularly Pentzold, 2009) then provided the basis for the comparison between case studies that formed a major element of the ECM.

3.2 The Positionality and Use of Theory by Pentzold (2009)

I initially found Pentzold's (2009) to be a highly accomplished paper - well written, eloquent and highly interdisciplinary. Pentzold wrote his case study within a particular context. I critiqued it from this perspective (his present), rather than the time when I was undertaking the literature review (in my present). I gave particular attention to the thinking and findings of other scholars that would have been available around 2009. These provided the alternative perspectives that Pentzold (2009) could have accessed at that time, although these may have been less available to him than they were to me within my present. In addition, it should be noted that the following was written with the intention of critically reviewing Pentzold (2009), rather than Pentzold's entire academic career.

Pentzold is now a senior academic, but around 2009 he was a successful, early career researcher (Pentzold, 2021a) who was seeking to be recognised in the field of memory studies. Pentzold (2009) understood that those working on interdisciplinary memory studies were seeking institutional status. Gensburger (2016) stated that the institutionalisation of memory studies had called for 'precise, trans-disciplinary theoretical and methodological tools, specifically adapted to the study of memory'. Pentzold (2009, p.256) proposed that his analysis could contribute to 'the methodological and methodical formulation' of this new academic field. The attempt to institutionalise memory studies intertwined with a growing interest in digital technologies and the web, with numerous academics starting to explore memory as both social and technical (e.g., Hoskins, 2009; Van Dijck, 2011). Many of these academics went on to have highly successful careers in interdisciplinary fields.

Pentzold (2009) decided to take a constructivist perspective from the start of his case study, but he provided no statements of his positionality. In addition, although he recognised memory as socially imagined through a decentralised collective, the paper began with an intention to follow 'one line of argumentation to ground and elaborate the understanding of Wikipedia as a global memory place' (p.257). He also referred to the Wikipedia site as offering 'almost laboratory-like conditions' of memory work being performed by a large number of people' (p.264). There were

various constructivist approaches that Pentzold could have applied that aligned to such a perspective of Wikipedia. New institutionalism, modern constructivism, and rationalised deliberative theory, for example, would have been approaches available at the time that allowed scholars to experiment with deductive approaches starting from theoretical propositions about 'the way in which institutions shape politics' (Lowndes, Marsh and Stoker, 2018, p.58, 190-196). Pentzold (2009, p.256), however, chose to work with other traditions, including the theoretical premises, of 'collective memory', 'communicative and cultural memory', 'memory places', and the 'floating gap'. These were then drawn together as a theoretical framework of his own construction.

Pentzold began by summarising Maurice Halbwachs' (1877-1945) theory of collective memory as a form of social construction supporting collective identity. Rowlinson *et al*, (2010, p.72) stated that Halbwachs was widely credited with 'introducing the concept of collective memory into contemporary usage' and this became integral to the institutionalisation of memory studies from around 2007 onwards. Gensburger (2016) later proposed that this institutionalisation partly took place as a reaction against previous memory booms, particularly against what was perceived as the reifying of memory. Rowlinson *et al* (2010, p.72) noted that sociologists at the time, such as Olick and Zerubavel also drew on Halbwachs to formulate 'a distinctive sociological paradigm for the study of social memory' that resisted what was perceived as 'the predominant methodological individualism in the social sciences'.

Halbwachs applied the concept of collective memory to a range of contexts from domestic to the religious, and Erll (2010, p.308) proposed that the concept could be used to describe factual knowledge, shared concepts of time and space, symbolic ordering and orientation. Pentzold (2009, p.258) recognised that Halbwach's theory was highly complex, and supported pluralist rather than universal memory, but then stated that Halbwach's conceived of memories acting 'like social order parameters' into which individuals placed their thoughts. Others have interpreted Halbwachs in a different way. Legg (2005, p.482), for example, emphasised that Halbwachs proposed that collective memories were pluralist and had focused on how institutions and contexts favoured some recollections over others, while Santos (2001) criticised Halbwachs for inattention to politics, power, and individual agency.

Pentzold (2009, p.258) also emphasised that the idea that Halbwachs saw the recollections of the past as being decided by present concerns, particularly 'predominant discourses'. Working with Halbwachs, Pentzold (within his present time) did not give consideration to social circumstances in which Halbwachs wrote on collective memory. As a successful European academic writing before the Second World War, Halbwachs (1952) recognised a degree of hegemony that would be considered socially and politically conservative by many of those living within contemporary democracies that support equality and diversity. Halbwachs, for example, wrote

It is all in vain to criticize dominant opinions, to show that they no longer respond to the situation of the present, to denounce their abuses and to protest oppression or exploitation. Society will abandon its ancient beliefs only if it is assured of finding others (p.187).

If Halbwachs had survived the Second World War (rather than dying in a concentration camp) he may have considered how best to challenge or resist certain forms of memory/traditions. Gensburger (2016) also argued that memory theorists (within institutionalised memory studies) tended to reference the theory of Halbwachs without attempting to understand it in depth, and that many interdisciplinary scholars used interdisciplinarity to promote the study of memory by their own discipline. In the process, Gensburger claimed that they had translated Halbwachs concept of memory into a form of history. Gensburger suggested that this might have partly happened because Halbwachs was first encountered by many Anglo-American scholars through the work of the historian Pierre Nora.

ErlI (2010, pp.305-309) observed that Halbwachs drew on 'objects and topographical sites to provide structure' in his attempt to examine collective memory going far back into the past, and it was this interest in 'mnemonic space, objects and media' that paved the way for later memory theorists such as Pierre Nora, and Aleida and Jan Assmann. According to ErlI, these later theorists became viewed as some of 'the key protagonists of the European discussion' of memory research by the 1980s and 1990s. Theorists of the 1980s and 1990s, however, came to be criticised for emphasising the national, and ignoring other scales of memory. Pentzold referenced Pierre Nora's (1989) concept of symbolic sites of memory ('Lieux de mémoire'), but did not considered how Nora differed

from Halbwachs, or reference criticisms of Nora by contemporary scholars. By the time Pentzold was writing his case study, Nora's concept of the 'lieux' had been accused of emphasising national identity (that of state ideological apparatuses) and in the process excluding pluralist memories - such as those of former French colonies, immigrants, and other scales of memory (Legg, 2005, p.483). Nora's 'lieux' was also said to exclude the question of reception and the possibility of resistance (Tai, 2001). Later in his case study, Pentzold (2009, p.264) stated that the concept of the 'lieux' needed to be adapted to Wikipedia, and rather than being viewed as a symbolic site of memory, Wikipedia was a place where the 'discursive fabrication of memory' took place. This, however, did not update the concept of the 'lieux' to recognise contemporary concerns around emancipation and inclusion.

After summarising the work of Nora, Pentzold went on to reference the work of Jan and Aleida Assmann who developed Halbwach's concept of collective memory as consisting of two, staged elements. The first was the memory of living generations - as diffuse, short-term, 'communicative memory' (e.g., as found among family and friends). This would supposedly transform over time (around 100 years) into a collective or 'cultural memory'. It is not intended to replicate the work of Pentzold (2009) but reading some of Aleida Assman's work referred to by Pentzold (2009) evidenced that she recognised politicised memory and associated it with cultural memory (Assmann, 2006a). She also understood that new technologies could tend towards the nostalgic, even when it was claimed they were dramatically different from the past (Assmann, 2006b). Drawing on Jan Assman's work, Pentzold (2009, p.258) described cultural memory as differing by 'its formality, fixed organisation, objectivations, buttressed communication situations and the specialisation of its bearers, that is, it has a limited participation structure consisting of administrators, custodians, etc'. This, however, did not clarify how cultural memory differed from the past interpretations of memory (including that of history, or traditional archives), or how it could avoid engaging with stereotyping, prejudices and soft forms of politics (Erl, 2010, p.305).

The final theorist fitted into Pentzold's framework was Jan Vansina (1985) and his theory of the floating gap. Pentzold (2009, p.206) described this as moving between communicative and cultural memory - where 'the recent past that is expressed in interactive communication by-and-by recedes more and more into the background while the information becomes scarcer'. Pentzold proposed that

the relations between Wikipedia articles and talk pages could be analysed as a floating gap. As in the case of Nora, Vansina worked with the theory and methods of a traditional, western school of history. Newbury (2007) noted that while Vansina recognised plural visions and the importance of context, he still believed in the possibility of a single coherent history. Pentzold (2009) wrote of Vansina viewing memory as 'always a matter of agreement in a social network' (p.262). Newbury (2007, pp.252-253), however, observed that contemporary scholars sought to avoid seeing narratives as 'simply containers for historic facts'. Instead, they should be seen as 'both the products of history and producing history'. As such they could engage with 'the cultural construction of power, gender and performance', and greater attention should be given to the storytellers, narrative acts, and audience, and narratives as arenas of struggle'. Pentzold, however, did not specify how he would up-date the concept of the floating gap to recognise contemporary understandings, including of emancipation.

There were indications that Pentzold may have felt that the memory theorists he had referenced did not automatically fit to the context of the web. Pentzold, for example, recognised that the definition given by the Assmanns (located in the fields of Egyptology and literature studies) might not be appropriate to the context of online memory (p.259). Pentzold decided it would be more 'more appropriate to borrow Olick's (2008b: 158) broad concept of collective memory as a 'wide variety of mnemonic products and practices'. This raised questions of whether Pentzold was referencing the traditions of Halbwachs, Nora, or the Assmanns, or instead creating his own framework focused on the contemporary mediatisation of memory. Similarly, rather than attempt to adapt and align his own methodology with those of Halbwachs, Nora, Vansina or the Assmanns, Pentzold simply referenced contemporary discourse theory (set out below). Arguably this disconnected his use of theory from practise, without explanation.

3.3 Pentzold's Methodology: Use of Critical Discourse Analysis

Pentzold (2009, pp.255-261) proposed that Wikipedia texts (as discourses) could be analysed as 'the social construction of knowledge about the world' and that Wikipedia offered a 'model of discursive fabrication of memory'. Pentzold may have been influenced by contemporary thinking (of his time) on deliberative democracy, including a Habermasian ideal of a 'transmission of information from

the outer periphery of diffuse public opinion to the centre where decision-making takes place' (Landemore, 2021, p.3-10). An argument then could have been made that this aligned to the transition from communicative to cultural memory on Wikipedia. Pentzold, however, did not reference Habermas in his case study, rather he referenced discourse theory. Discourse theory cannot be detached from its theoretical and methodological foundations (Jorgensen and Phillips, 2002, p.3; Lin, 2014). With reference to social cognition theory, it might be expected that Pentzold would have mainly drawn on forms of discourse theory strongly associated with social psychology. Instead, Pentzold mainly referred to the work of Fairclough (1995; 2003) and Wodak (2000) who were more strongly associated with critical discourse analysis. Pentzold did not acknowledge, in his case study, that such theory made strong connections to notions of power and ideology and the revealing of oppressions. Wodak (2000) and Fairclough (2016) emphasised the power behind, as well as within, discourse, with Fairclough focusing on the relationship between the ordering of discourse and its social context (Jorgensen and Phillips, 2002, p.72).

Pentzold (2009) knew of Foucauldian discourse theory (Pentzold and Seidenglanz, 2006), but chose to rely uncritically on the most visible discourses generated by Wikipedia, as well as the politicised narratives of wikis from the designers of wiki technologies (pp.256-257). Pentzold's theory driven approach also meant that rather than focus in detail on what could be found in the text itself, he worked with an initial hypothesis of a global memory place. This included assuming that the discourse would evidence a transition from communicative to cultural memory, and that discourse theory would give him 'access to the examination of collective belief systems' and support the concept of an 'intertextual network structure' (p.264). He also described Wikipedia as enabling anyone to collaborate in the creation of an encyclopaedia. Dahlberg (2009) observed many scholars at the time were still working with cyber-utopianism and imagining the collapse of temporal and spatial borders through cyberspace and the web. Numerous articles were being published on Wikipedia in the 2000s which emphasised its cooperative and democratic credentials, and uncritically quoted narratives from Wikimedia and senior Wikipedians. Various scholars, for example, viewed it as a site where rationalised consensus and knowledge were reached through group interactions (Hepp, Siorpaes and Bachlechner, 2007).

Not all scholars at this time, however, were uncritical of such an approach. Dahlberg (2009), for example, recognised that cyber-utopias drew on political traditions. Benjakob (2020) recently observed that there had been popular and academic interest in Wikipedia's relationship with truth from at least 2005 onwards – with some criticising the organisation for being open to manipulation by the powerful, and/or being prone to errors or falsehoods. Rosenzweig (2006, p.119), a professor of history and new media (quoted by Pentzold, 2009), noted that Wikipedia had been both highly praised and criticised. He had also observed that Wikipedia's authors at that time were 'more likely to be English-speaking, males, (pp.127-128).

Pentzold (2009, pp.260-264) demonstrated awareness of Benedict Anderson's (1983) writings on '*imagined communities*' which described how new technology (print media) supported the arising of the nation-state. In utopian mode, however, Pentzold (2009) chose to ignore the possibility that Wikipedia might intertwine with national interests. Instead, he emphasised that access to different Wikipedia editions was decided by language skills, with English as the 'lingua franca of the Web' (p.264). He then presented Wikipedia as not being 'bounded by national frontiers', and as a site where cultural memories could draw on a model of the encyclopaedia as decentralised world knowledge (pp.256 – 257). Pentzold acknowledged that the vastness of the web (as an archive) could lead to social forgetting but suggested that the web went beyond traditional media and could lead to 'new patterns of the formation of tradition'. Wiki technologies supposedly offered a form of collaboration that would support the web to challenge tendencies towards bias in the production and distribution of the mass media and generate new patterns of 'knowledge production through online cooperation'. In the process, Pentzold equated mediatised memory with knowledge, rather than considering that there might be a difference between the two. Overall, he gave limited consideration to how the encyclopaedia (including as Wikipedia) might interact with traditions of politics.

According to Pentzold, new discourses of memory would be created and continually updated on Wikipedia. Pentzold described how vast stored archives of texts combined with hypertext and many different actors engaging in dialogue offered 'networked global remembrance', but also divergent interpretations of the past and 'evolution'. He worked with the expectation that (according to graph

theory) there would only be a few sites such as Wikipedia that would receive attention on the web (pp.262-267). Pentzold, however, did not chose to explore the complexities of this, including limited evidence for Wikipedia authors from diverse backgrounds being active on the site, or the possibility of accumulation of privileges. Rather he left mention of 'cultural and regional imbalances, dominated by info-elites and subject to power plays' to the notes section of his 2009 publication (p.268).

Pentzold's research framework, therefore, was constructed out of various expectations of who and what would be present on Wikipedia. He also made use of a combination of memory and discourse theory which gave limited regard to differences in ontologies, epistemologies, or contextualisation. He went on to deliver his framework through applying inductive methods including coding and use of discourse and argumentation theory, while having expectations more aligned with a deductive approach. His findings are critically reviewed below. These are also further referenced in the chapter five of this thesis (the comparison between case studies).

3.4 Pentzold's Research Project, Sampling and Findings

Pentzold looked for evidence of a floating gap - the transition from communicative to cultural memory - in the dynamic relationship between a Wikipedia article on the London Bombings 2005 and related talk pages (where editors of the article posted comments). Pentzold, however, only sampled data (152 threads) from talk pages which had been posted during the first two days (7th and 8th July 2005) following the bombings and the creation of the English language article. In addition, he deliberately put aside consideration of editorial and technical edits and comments and narrowed his research to comments on the English language talk pages. Limited explanation for these choices was given. In setting aside what he categorised as related to technical issues, Pentzold identified what might be viewed as highly emotive content such as the interpretation of the term 'terrorism', comparison with other terrorist attacks, eyewitness accounts and expressions of condolences and confusion. His analysis seemed to assume that the posts on the talk pages were made by individual, human editors - even though he was only working with digital representations. This aligned with his belief that Wikipedia was

a global memory place where emotional trauma could be immediately processed by editors from diverse backgrounds (p.265).

Pentzold then applied argumentation analysis to the edits, with the assumption that 'Wikipedia discussions and editing activities are memory work where conflicting definitions of issues, actors and events collide' (p.266). Using this approach, he identified several arguments favouring the use of particular terms based on (1) definition of emotive terms (such as terrorism) through reference to particular sources; (2) reasonable consensus arising in relation to such definitions; and (3) common sense. Pentzold, further identified several arguments against the use of particular terms including (1) Inappropriateness due to lack of neutrality; or (2) biased sources; or (c) not following Wikipedian norms. He then suggested that the 'discursive negotiations on the talk pages' could be directly related to changes in the surface article. He, however, provided only one example of this (at 11.37 am on the 8th of July). This example was also given as proof that editors had reached consensus. His findings were presented within one page of the 11 pages of his publication, demonstrating the degree to which the case study was theory driven.

When I reviewed the sample that Pentzold accessed I found that many of these arguments, including where editors expressed intense anger, could be classed as engaging with technical and administrative issues on Wikipedia. Within a sample of comments (associated with the English language article) made on the 7th – 8th July 2005 (accessed between July - October 2021) a digital representation of a Wikipedia editor expressed the feeling that rather being part of a collegiate, normative process, he was being shouted down. A lengthy series of comments and edits made on 8 July 2005, around 00:00 and 00:40 UTC were associated with this. These related to various (heated) perspectives on whether the term 'terrorist' conformed to Wikipedian principles of neutrality (i.e., an administrative issue).

The sample of edits and comments suggested that most sources for the article were taken from the media - perhaps because at that time (so soon after the bombings), little other material had been produced. Without other sources, editors were left reliant on the media to decide so-called facts, as some pushed towards consensus. Many of the disagreements on the talk pages related to the appropriateness of using certain media sources, or disagreements about which sources were the most valid in terms of resolving disputes over terminology and

related Wikipedia norms and principles. Pentzold (2009) did not formally recognise the probability that engagement over the appropriateness of terminology and level of neutrality was likely to be mainly of interest to those directly engaged in the Wikipedia project, rather than others. Pentzold also chose to present Wikipedia text and editorial interaction as moving from pluralist conflict to global consensus. Supposedly, in the process, trauma was addressed and cultural memory arrived at. It is unclear how Pentzold came to this conclusion through reference to talk pages comments added in the two days after the bombings Pentzold should, for example, have been aware (when he took his sample) that many other edits and comments were added after 8th July 2005. This included comments that continued to debate the appropriateness of the term 'terrorist' within the article.

The above detailed review of Pentzold (2009) was produced with the intention of referencing it during a comparison with my own case study (in 2020-2022), as set out in chapter five of this thesis. I, however, also wished to explore how other studies of socio-technical memory had developed in the period between Pentzold (2009) and my own case study. Other case studies on Wikipedia as socio-technical memory were strongly associated (through citation) with Pentzold (2009) and other well-known western memory scholars (e.g., Halbwachs). Some of these case studies also recognised a similar spatial-emotional form of Wikipedia memory to that recognised by Pentzold (2009) and presented Wikipedia as being a site where diverse memories of traumas were shared, processed and solidified into consensus. There was, however, little evidence that most of these scholars had critically reviewed Pentzold (2009) before reinterpreting his work, rather they seemed to habitually recognise the form that he created. The following sections set out reviews of these case studies, while the conclusion of this chapter provides information on how issues, gaps and anomalies identified through this literature review were considered in the design of methodology and delivery of the case study.

3.5 Wikipedia Memory: Using the Past to Make Sense of Trauma

The Interdisciplinary scholars, Michela Ferron and Paolo Massa (2011, 2014) stated that their work followed Pentzold (2009) and began their article by arguing that Wikipedia was used to process emotional trauma in a negotiation between

past and present, and the transition from communicative to cultural memory. In their 2011 case study, the researchers identified that the significance of their study as meeting the need for empirical research to validate existing theories on collective memory at scale. Their case study concluded that there was evidence that 'Wikipedia [was] a global memory place' (p.1329). By 2014, Ferron and Massa were looking for evidence of repeating patterns at scale. Wikipedia was interpreted as a site where, through collaborative efforts, 'different stories, sources, interpretations, and points of view [were] organised into coherent narratives' (2014, p.41).

To enable this type of research, the researchers downloaded large digital files from Wikipedia and automatically accepting the data, categories and identifiers within these, and used these to identify patterns (i.e., around anniversaries of events). This aligned with the idea of collective memory as being strongly associated with collective identity and ordering. The researchers also worked with the belief that such dynamics were more likely on Wikipedia than other major digital organisations. Like Pentzold (2009), they assumed that Wikipedia policy was operative (i.e., it was neutral), and without being able validated the identity of users, they claimed Wikipedia represented diverse, mass participation. Ferron and Massa chose to describe memory on Wikipedia in terms of collective psychological processing rather than as culture or politics. This was the case, even though in their 2011 study they had noticed prolific individual editors, political views expressed by editors on personalised user pages, and edit wars. In their 2014 study, they also recognised that the mass media (commemorating previous events and connecting these to new ones) was interacting with user engagement and regarded 'mass media and collective memory formation as closely intertwined'.

At the end of their 2014 study, they outlined how their identification of patterning was to lead to further work using natural language techniques - potentially enabling the creation of technologies to automatically analyse mass-level sense-making following crises. Similar approaches were also to be found in several other case studies (Kanhabua, Nguyen and Niederée, 2014; Twyman, Keegan and Shaw, 2017) utilising so-called big data to explore the collective processing of memory. Emphasis was placed on quantified, generalised findings at scale (across many Wikipedia articles, usually in English) and the potential to use these within

the development of new technologies to assist human memory, sense-making and possibly shape behaviours.

Some of these studies went beyond considerations of contestation and consensus around memories of wars or terrorist attacks. They, for example, also included online memories of environmental disasters (Kanhabua, Nguyen and Niederée, 2014) and social movements (Twyman, Keegan and Shaw, 2017). The case study by Kanhabua, Nguyen and Niederée (2014) included page views of Wikipedia articles on earthquakes, volcanic events, typhoons, flooding, wildfires and other environmental disasters. The researchers identified that

The 2011 nuclear catastrophe in Fukushima did, for example, trigger the memory of the Chernobyl event happened 25 years before raising the Wikipedia event page views from about 9,500 views per day in the first two months of 2011 to up to more than half a million views per day at the time of the Fukushima disaster (around March 15, 2011).

They found evidence of a relatively high number of triggers (where new events of a certain type triggered page views in relation to a previous events of a similar type). Triggering in relation to the categories of Atlantic hurricanes and earthquakes. were almost as high as for views of mass murders. The earthquake events gaining the highest number of views (over 5%) were concentrated in China, Turkey, Japan, and Iran, The Atlantic hurricane events gaining the highest number of views (over 20%) were concentrated in Cuba, and United States.

Such studies evidenced that new crises seem to trigger peaks in editing of articles of past events on Wikipedia (Kanhabua, Nguyen and Niederée, 2014). Twyman, Keegan and Shaw (2017, p.6) found indications of 'a set of "early responder" editors [that] rapidly [came] together to contribute to and frame these articles' and then edited across a range of associated articles. There were also 're-appraisal around events of public mourning and commemoration' (p.10). Other studies found peaks in page views of articles about past events that seemed strongly associated with current events (Garcia-Gavilanes *et al*, 2017).

Several studies considered anomalies in their data. Kanhabua, Nguyen and Niederée (2014) observed that in their analysis of 5500 high-impact events from 11 different event categories there were examples of unexpected connections

between a new event and the triggering of page views of past events. For example, in the case of

the 2010 Baghdad bombing, nearly all triggered events [were] in the US, the top-ranked events being related to the September 11 attacks... Terrorism events happening in Iraq [were] linked to terrorist events in the US rather than to other bombings in Iraq.

With reference to anonymised big data sets, the researchers ascribed this to a cultural bias on Wikipedia (i.e., the prevalence of users of Wikipedia located in the USA). Other scholars of socio-technical memory have attempted to investigate data with more consideration given to varying interactions between differing localised elements, and these are critically reviewed below.

3.6 Wikipedian Memory: Re-enactments of Conflicted Pasts.

Although Pentzold (2009) only briefly explored conflict on Wikipedia, many other scholars have focused on conflicts between editors. Wikipedian narrative recognises such conflicts, but the ideal of Wikipedia is that, over time, an article will be improved by moving to a position of consensus and neutrality. Wikipedia's principle of a 'neutral point of view' (Wikipedia, 2021b) can be the focus of heated debates on article talk pages and may represent an attempt to create a global institution distanced from political (including nationalist) perspectives. Loveland (2019, p.76) has described how producers of print encyclopaedias in the twentieth century, who sought to extend their market beyond national boundaries, adopted similar principles of neutrality with varying degrees of success.

There are many examples of what seem to be nationalistic edit conflicts across language communities on Wikipedia. Rogers and Sendijarevic (2012), for example, produced a study on this phenomenon for the Wikipedia Academia. Their focus was on articles on the Srebrenica Massacre, and yet they did not directly recognise the possibility of a politics of memory. The scholars made use of a technological tool to compare the content of different articles and situated their work within literature on cross-cultural comparison and systematic bias. Other studies on Wikipedian memory by social scientists and communication scholars (Dounaevsky, 2013; Kaprāns, 2016; Kaprāns and Makhortykh, 2017; Makhortykh,

2017) have also focused on Wikipedia articles about post-communist countries but have been more willing to use the term 'politics'. Kaprāns (2016, p.159) stated that

social representation, as Howarth (2006) points out, is not a quiet thing, there is constantly a fight between hegemonic and oppositional representations over the meaning of reality. Therefore, political actors are prone to treat the most controversial representations of the past as a political resource which can mobilize people and maximize political profit.

As in the case of Rogers and Sendijarevic, these interdisciplinary studies compared similarities and differences in articles about the same topics (memories of past events) across language editions. Some viewed Wikipedia as a form of laboratory (Dounaevsky, 2013, p.137) as Pentzold (2009) had done. Makhortykh, (2017, p.42), however, noted the tendency for studies of Wikipedia as memory 'to focus on western European and American memories; only a few of them explore how Wikipedia is used to deal with the past in post-Soviet countries'. Makhortykh (2017) and Kaprāns and Makhortykh (2017) responded to this by developing an approach that recognised different language communities (particularly languages associated with ex-Soviet countries) on Wikipedia and comparing them to one another. This included comparison between narratives, and templates (e.g., tables of contents, infoboxes, and categories) that interacted with such narratives.

These case studies evidenced pressure points around associations between ex-Soviet countries, Stalinism (with implications for perceptions of Russia) and Nazism. Conflicts often centred on the English and Russian language editions of articles (Kaprāns and Makhortykh, 2017; Dounaevsky, 2013), which tended to be relatively well developed compared to others. Kaprān's (2016) study suggested that tensions had arisen between Russia and the European Union over the communication of memories of ex-Soviet states, and a transnational narrative of European history that sought to acknowledge past atrocities. Other scholars have observed that memory can be used to position (or recognise) different nations as victims or perpetrators of wars and other conflicts, with different narratives played out before domestic and international audiences (Assmann, 2006a; Bachleitner, 2019). This potentially creates a polarisation of victim and perpetrator, with many nations seeking to avoid the label of perpetrator and the accountability associated with this. This can be further combined with a polarisation of winner versus loser, or policer versus rogue – creating complex, relational space-time(s).

Case studies of shared memory on Wikipedia have suggested that individuals from different states vie with each other over the memories and identities of ex-Soviet nations (Dounaevsky, 2013; Kaprāns and Makhortykh, 2017). Makhortykh (2017) found that articles in different languages allowed individuals of different nationalities to rework memories in ways that suit their nationalist narratives. Dounaevsky (2013) study of Ukrainian history topics on Wikipedia pointed out that language use on Wikipedia interacted with national identity construction in the Ukraine. At the same time edit conflicts were taking place on Wikipedia, the re-editing of hardcopy history textbooks was taking place in the Ukraine. From such a perspective, rather than establishing new patterns of interaction to reinterpret the past, Wikipedia might potentially reproduce older interpretations. Loveland (2019, pp.85-88) observed that many print encyclopaedia were established, at least initially, as national encyclopaedia and viewed as supporting the status of nation. This included an example of a Ukrainian language print encyclopaedia which was set up to support a strong relationship between the Ukraine and the Soviet Union. This was produced in response to one that opposed such a viewpoint.

According to the norms set out in the main Wikipedian policies, articles are meant to be constructed out of trusted (verifiable) sources. The English language Wikipedia includes guidance on which sources are to be referenced, and many of them are in the English language (Wikipedia, 2021d, 2021f; 2021i). These include many sources from mainstream media, creating the grounds for further disputes. Smit's (2018) study of the Wikipedia article on the shooting down of the Malaysia Airlines flight MH17 evidenced contestation between editors over which national media sources were trustworthy. Both sides of the contestation drew on the Wikipedian principle of a neutral point of view. Smit found that 'the claim of neutrality [was] simultaneously applied by those in favour of including Russian views and those opposed to them, thereby actually drawing Wikipedia *into* the information war' (p.157). Kaprāns and Makhortykh (2017, p.186) also found evidence that references to external sources could provoke angry debates over whether a publication could be viewed as a reliable source, and the degree to which an author of such a source could be viewed as politically neutral. Smit concluded that conflict over sources was resolved through the editorial hierarchy of Wikipedia.

Studies of transnational contestation and conflict in the sharing of memory on Wikipedia have extended beyond ex-Soviet states. Gustafsson (2020) study of Wikipedia memory as narrative found evidence of conflicts of national perspectives in the production of Wikipedia's articles on the Second Sino-Japanese War in Chinese and Japanese languages. At a domestic level, Luyt's (2015) discourse analysis of the English language article on the Vietnam War found evidence of actors attempting to revise the outcome of the Vietnam War, with some arguing that America had won the war, or at least not lost it. Luyt noted that these contributors used the same arguments as revisionist historians, and that those identifying as Vietnam War veterans felt excluded from the site as those following Wikipedian policies rejected their contributions as being original research.

The descriptions of forms given by scholars investigating memory with reference to politics and bias differed from that of Pentzold (2009) and researchers drawing on big data. It might be tempting to argue that these case studies made more effort in cognitively translating diverse, localised elements into global shape (or vice versa). It should, however, also be noted that these studies mainly focused on languages as associated with national perspectives - potentially engaging with a habitual, top-down recognition (of nations). These scholars also chose to recognise differences expressed through conflict and so shaped the image of Wikipedia as a site where habitually recognised forms (nationals representing national interests) came into conflict with one another. Such formations potentially allow for greater fluidity and change than Pentzold's (2009) description of global consensus but do not necessarily leave much space for exploring or individual agency, or marginalisation. Some scholars (Dounaevsky, 2013; Kaprāns, 2016, p.169; Makhortykh, 2017) have suggested that Wikipedian user information (e.g., on their locations) could throw light on editors likely political positioning. On the web, however, any attempt to identify editors through information on their personal user pages or through web address information is open to being manipulation by others. Overall, many case studies identified in the targeted literature review recognised conflict between individual editors engaged with the administrative shaping of Wikipedia and/or representing national interests. Other issues of power were not explored. Issues of power and marginalisation were, however, made apparent in other literature on Wikipedia and my research questions and critical methodology demanded that attention be given to such issues. Rather than automatically recognise habitual patterns. I made efforts to question the literature

as I reviewed it and highlight any perceived problematics. These efforts are further detailed below.

3.7 Conclusion

A critical, interpretative analysis of previous literature must recognise the context in which such literature was produced. During processes of institutionalisation established scholarship may pressure younger scholars to align with particular theories and perspectives. Certain theorists tend to be fashionable in particular places, and at particular times (Gensburger, 2016). In developing my literature review and methodology, I also found evidence that many scholars working on Wikipedia became highly intertwined with Wikipedia, Wikidata and/or the Wikimedia Foundation. Keegan for example, was highly active editor of Wikipedia (Keegan, 2020). Pentzold (2021b) had also recently written of his 20 years' experience of 'hard working Wikipedians' as unpaid, volunteers.

It could be argued that contemporary, interdisciplinary memory studies and Wikipedian representations of the past have formed a relationship of coproduction - focused on memory conflict and post-conflict consensus within a relational, global, network, but giving limited consideration of issues of marginalisation and exclusion in the present. The 2021 conference of the Memory Studies Association on convergences, for example, was accompanied by a special edition on 'mnemonic wars' and conflicts (Memory Studies Association, 2021). Instead of a new interpretation of memory, it could be argued that these studies of memory conflicts represent the past being re-enacted as the present. Wikipedian editors, readers (including academic researchers) can then become both the audience and propagators of institutionalised memories of conflict between habitually recognised nation-states - and be drawn into a form of social gaming. This could potentially keep the memory of war alive in the present as a way of exploiting past victory (Rozhdestvenskaya, 2015), play into the hands of those who seek to collapse the past into the present for their own purposes (Fedor *et al*, 2017) and continue myths of conflict including through a mixture of fact and fiction. This would distract from choices in the present.

Within an academic setting, particularly among interpretative studies, a reflexive approach would call for researchers to consider their own positioning in relation to Wikipedia (Dodgson, 2019). This would include questioning the appropriateness of

acting as its advocate, but also giving attention to appropriate research strategies. Many studies of Wikipedia as shared or collective memory, for example, have chosen to research articles that have been identified of significance through Wikipedia e.g., in terms of number of views, edits, levels of controversy, etc. Often these have focused on war or other conflict. Early into my thesis, I fell into a similar mode when I allowed the forms of prioritisations used by various academic electronic database to decide my comparative case study. Only later did I become more questioning of such deciders.

Alternative methods for sampling articles exist. Within critical discourse analysis, for example, attention should be given to politics during choice of sampling. Scholars could also engage in a more critical approach to the narrative and policies of institutions, as well as the uncorroborated identities of digital representations. Assumptions of concepts such as self-generation or self-organisation should be reflected on and carefully tested, and highly deductive approaches avoided. Memory researchers might also seek a greater diversity of funders, so that memory studies are less focused on particular spatialised perspectives e.g., memories of nation or Europe. Studies of politicised memories other than international conflicts are relatively rare, and space-times beyond that of digital organisations have increasingly become side-lined. Many studies have also failed to acknowledge changes taking place on the web, including the move towards interoperable, semantic technologies and the implications of these for the making and sharing of memory. In the development of my research project, I attempted to address some of the problematics I had found in others research (see below) through the following:

- Retaining the awareness that I could not avoid perceiving socio-technical constructions (or fabricating them myself), my research intentions came to focus on making these more visible to myself and my readers, and critically interpreting constructions according to my choice of methodology.
- Clearly recognising of my positionality within a contemporary, critical, constructive approach - with consideration of pluralist narratives across past, present and future.

- Resisting the habitual recognition of formation i.e., as a particular construction of local elements into global shape, and instead seek to examine constructions from multiple perspectives/angles.
- Using a method for assessing the significance of the case which was not reliant on prioritisations signalled by either Wikipedia or institutionalised interdisciplinary memory studies.
- Developing a critical approach that attempted to maintain some distance from Wikipedia, Wikidata and the Wikimedia foundation (i.e., seeking to avoid automatically becoming an advocate for them) and remaining sceptical of digital representations.
- Remaining attentive to differences and anomalies rather than over-focusing on similarities.
- Being open to the possibility of Wikipedia forming any shape (e.g., in terms of ideology, interests, intentions, connections, etc), including through interoperability with other institutions.
- Staying attentive to associations between memory, history, identity, trust and knowledge, and any formations arising from these (i.e., open or closed, linear or non-linear, layered, hierarchical or non-hierarchical, reproduction or reinterpretation).
- Avoiding the assumption that all possible solutions to any problematics could only be found within Wikipedia and/or its sister projects.
- Extending my understanding of contemporary literature and the diversity of viewpoints found within this, while being wary of institutional 'fashions'.
- Avoiding of a highly deductive approach by following favourite theory. Instead, I deferred describing the full significance of my case until the very end of the PhD.
- Attempting to raise awareness of interoperability on the Semantic Web, and the role of Wikipedia within this, with different audiences and gaining their feedback.

As a result of the above, I came to work with an understanding of memory and forgetting that associated with my research intentions, questions, methodology and data. This recognised that forgetting is generally viewed as less useful for

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disaster risk reduction than the processing of memories in ways that mitigates the possibility of damage and death in the case of repeating environmental-related disasters. I took the above understandings into my methodology and case study, as described in chapters four to seven.

Chapter 4 Methodology

4.1 Introduction

The following sets out how I decided on the philosophical underpinnings of the thesis, as informed by the aims of the research and existing findings in the same topic area. I then describe alignments between this and the design of the research project, including the methods chosen. After careful consideration of various philosophical perspectives and methods, I decided to adopt and adapt Burawoy's (2009) extended case method (ECM). This required dialogue between the different elements of the thesis, but also continuous attention to anomalies and change, and a related need for restructuring and extension. The methodology chapter came to include aspects of its own delivery as I adapted it to unexpected circumstances (the Covid19 lockdowns), and trialled different forms of analysis within my research project. Details of this process are provided throughout this chapter.

4.2 Choice of Methodology

In choosing a methodology a researcher must consider questions relating to ontology and epistemology. Lowndes, Marsh and Stoker (2018, p.178) described key ontological questions as being 'what are the form and nature of reality and, consequently, what is there that can be known about it'. Further questions identified in relation to epistemology included 'can an observer identify 'real' or 'objective' relations between social phenomena - and if so, how?' In reviewing literature from across the disciplines, including contemporary empirical research from the cognitive sciences, I had identified the problematics of validating memory (Bernecker and Michaelian, 2017), and that human cognition might tend to top-down processing (Goodman, Fries and Strauss, 2016; Sikkens, Bosman and Olcese, 2019), false memories (Greene and Murphy, 2020), illusions of truth (Ozubko and Fugelsang, 2011; Newman *et al*, 2020) and failure to recognise change (Gunnell *et al*, 2019). In addition, scientific instruments fabricated by humans had also been found to present illusionary perceptions (Watanabe *et al*, 2018; Ward, 2019; Doerig *et al*, 2020; Gomez-Villa *et al*, 2020). If there was a 'real world', I felt that it was very unclear how

this could be evidenced by human beings and their fabricated instruments. Even a self-adjusting approach or attempts to build up an understanding through multi-perspectives would not necessarily result in what positivist science would view as objective or correct. With reference to findings from my literature review, I took the decision to adopt a constructivist approach. This remained open to the idea that humans could attempt to construct and share particular memory formations on the basis of accumulating power and resources, while those on receiving end retained the potential for agency and resistance. I decided to explore this through a critical perspective, but with the understanding that I was constructing my own interpretation.

My approach had to combine the critical (which included the belief in 'the causal power of unobservable structures', Lowndes, Marsh and Stoker, 2018, p.194) and interpretative constructive (seeking to 'explain events in terms of actor's understandings of their own contexts', p.196). As Lai and Roccu (2019, p.71) observe, critical approaches recognise the 'researchers own words and deeds contribute to the emergence of social facts' and are 'suspicious of uniformity, rather they focus on constitutive relations when showing how the things we know come to be'. They are focused on content, and power structures, and 'adopt a relational and iterative approach to sense making and knowledge production which link theoretical insights to the observation of the social world and put emphasis on producing layered accounts of human agency'.

Bornat (2013, p.39) has stated that critical approach is an appropriate strategy in memory research, as it directly tackles the assumption of the researcher's neutrality of memory and encourages the researcher to reflect on how their own assumptions and experiences of memory and identity interact with other people and texts. It has also been highlighted that to engage in memory counter to dominant constructions is a difficult task. Legg (2005) points out these memories are already a constitutive part of dominant memory, and Terdiman (1985) stresses the difficulty of denouncing a regime without being drawn into its rhetoric and thus negating the antagonism.

Rather than attending to a linear set of connections without question - as this could merely result in habitual perception of imaginaries which had been shaped by others - I sought to disrupt the formations I was working with to reveal possible anomalies

and repressions within these. Reflexivity formed part of this process, with the understanding that this was 'a methodological tool to account for the situated and embodied nature of knowledge production' (Subramani, 2019). This was appropriate to my constructivist approach, which did not seek to arrive at objective knowledge (Lowndes, Marsh and Stoker, 2018, p.190). In an attempt to avoid a form of interpretative approach that was subsumed and utilised within a positivism tradition (e.g., see King, Koehane and Verba, 1994), I retained the double hermeneutic (Lowndes, Marsh and Stoker, 2018, p.190). My thesis then gave attention to positioning, in recognition that 'we gain knowledge about the world only through our positionality' (Soedirgo and Glas, 2020, p.528). Acknowledgement of my changing positioning, and my attempts to disrupt my own interpretation of others' constructions, were integrated into the constant restructuring of my thesis through an iterative approach.

4.3 My Positionality

I am mature student, a carer and the daughter of parents who did not go beyond primary education. Many of my personal characteristics are those of groups that research has suggested are more likely to be marginalised on Wikipedia and in wider societies. I have had an extensive education (mainly funded by the state) but through my personal characteristics and those of close family and friends I have directly and indirectly dealt with many impacts of marginalisation and disaster. This has included the impacts of apartheid in South Africa, laws on homosexuality, industrial toxicity (including family members who experienced the Great Smog of London), chronic and terminal illnesses, low income, disability, severe domestic violence, and many other issues. This background led me into a range of policy and project roles focused on bolstering networked governance across a range of public and not-for-profit organisations - with a focus on equalities and groups most at risk of poor social outcomes. This included decades working for institutions - some of which I found evolved emancipatory narrative and practises, while others acted like zombies and used normativity in a way that encouraged neglectful, corrupt or other abusive practises. During my working life I have written a number of practice driven publications that have been published in peer reviewed journals. Many of these focused on justice, equality and diversity. I also wrote critically about networked

governance, through the lens of moving from theory to practice (Gilling and Schuller, 2007).

I originally came to the University of Southampton intending to investigate how people with memory conditions interacted with the web, including the potential to share memory with others and the risks that this might entail. Unfortunately, it turned out that it was not possible to take this forward at the University and instead I ended up focusing my research on social memory on Wikipedia and the Semantic Web. Early into my literature review I came across the concept of collective memory as associated with collective intelligence within the field of computing (Gea, Soldado, and Gámiz, 2011; Kvasnička and Pospíchal, 2015). I was reminded of a time when I had stood at a train station in London and watched one train after another smash into a formation of midges. They had formed over the track (perhaps returning to the same location at the same time each year) and reformed in the aftermath of every collision and mass death. It is likely that outlying midges on one side of this formation would have been hit by the train first, but almost immediately afterwards the midges at the centre would have also been killed. Only a small number of surviving midges that moved away from this formation avoided the repeated disasters. This brought a possibility into my work that shared space-time of large groups might not provide security in the face of repeating disasters. This possibility was revisited when I worked as a policy manager (at the Institution of Civil Engineers) on climate change and adaptation policy in 2022 and interacted with the shaping of final draft of my thesis.

I realised, due to my life circumstances, I would not be in a position to publish multiple articles from my thesis or go on to be an academic. This put me in a different position than many other PhD students. Without the PhD offering a route into work or other forms of social status, I had to find another motivation. I felt that the PhD potentially offered the opportunity to think more creatively and to share a different interpretation of memory (that of someone from marginalised groups) with others. I became particularly committed to making my journey as transparent as possible (including its non-linearity) and evidenced how I processed problematics as they arose.

4.4 The Research Design: Choice of the Case Study Method

Once I had decided on a methodology and considered my own positionality, I realised I needed to integrate this with descriptions of robust decision-making from a scientific perspective when explaining my choice of approach and methods. I read through various chapters in Denzin and Lincoln (2018) publication on qualitative research in the hope of finding an appropriate research method. As someone returning to academia after a long absence, I found the sheer range of methods available almost overwhelming. I, therefore, decided to focus on methods used within existing literature on memory, including shared memory on Wikipedia. In investigating methods used to study memory, I found that many interdisciplinary memory studies had been highly focused on theoretical concerns (Keightley and Pickering, 2013). Case studies, however, had become very popular. Brown (2019, p.113), for example, had found that most of the submissions to the Memory Studies Association First Book Award were case studies focused on a particular national or regional site.

According to Meyer (2001, pp.329-330) the case study allowed for the empirical examination of 'the context and processes involved in the phenomenon under study'. It was viewed as appropriate for exploring little understood processes and 'responding to how and why questions about a contemporary set of events'. The case study also allowed detailed exploration of many different aspects of a phenomenon (as a place, institution or person within these), and the relations between these and their context (Barlett and Vavrus, 2017). The single sited case study, however, had been challenged as running 'the risk of promoting a context as container notion, where the immediate temporal and geographic/place-based elements of the study are the only ones seen as relevant' (p.29).

My targeted literature review evidenced that many studies of socio-technical memory (including on Wikipedia) had been case studies. Pentzold (2009) was a relatively early and visible example of this. Although there are millions of Wikipedia articles on many types of past event, most of studies of Wikipedia memory (including Pentzold, 2009) focused on crises of war and other forms of conflict or strife. In addition, these scholars (including Pentzold, 2009) tended to view Wikipedia a site where mediatised forms of memory arose and were shared. They, therefore made limited

investigations of its relationship with search engines, other commercial digital organisations (van Dijck, 2013; McMahon, Johnson and Hecht, 2017; Vincent *et al*, 2019) and automated knowledge-making systems (Bukhari, Bashir, and Malik, 2018; Matsakis, 2018). Having found that the case study was widely used in the study of socio-technical memory and that there was the potential to extend such studies, I considered what type of case study to adopt.

4.5 Decisions on the Formation of the Case Study

There are few requirements guiding case study research (Meyer, 2001), but arguably consideration should be given to the fit between the type of case study and methodology. My adoption of a critical, constructivist methodology led me to focus on a method that would enable the development of a case during a research project, rather than seeking to decide its significance from the outset (Ragin and Becker, 1992, p.8). It turned out, however, that there were various types of constructivist case studies (Denzin and Lincoln, 2018; Barlett and Vavrus, 2017; Ridder, 2017). A critical, constructivist approach also required consideration of politics, particularly issues of power, and there was a need to avoid the case as a container scenario (Barlett and Vavrus, 2017, p.29). Hine (2007) had set out a number of different types of case study approaches (ethnographies) that sought to support middle range theories which tie the development of theory to observable social experience and avoid the case as a container. These types of case studies included the multi-sited case study approach (Marcus, 1995), the ECM (Burawoy, 2009) and Actor Network Theory (Latour, 1996). Hine noted that such approaches have been adopted within science and technology studies.

Several scholars (Van Dijck, 2010, pp.404, 412; Smit, 2018, p.25) working with cases of social-technical memory had referenced Latour's actor network theory (ANT) which was associated with science and technology studies. This had also been referenced within web science (Tinati *et al*, 2014). ANT rejected distinctions between entities and instead worked with connected nodes – with as many dimensions as connections (Latour, 1996). A critical methodology, taking account of politics, however, required acknowledgement of perceived distinctions (as differences). I had also decided to give attention to differences arising out the

temporal (Pocock, 1972; Lawson, S, 2011; Tregenza, 2011) as well as the spatial. ANT did not directly address the politics of time, but rather proposed that space, time, and importance were relational and contingent (Latour, 1996, p.372). In recent literature ANT had been criticised by scholars, including for a perceived tendency to 'gloss over manifestations of power and being apolitical' (Tummons, 2021, p.1). Within the field of management studies, Sage *et al* (2020, p.349) had also observed that ANT had been criticised for promoting a form of managerialism

that neglects encounters with emergent events (Thrift, 2008, p.112; Whittle & Spicer, 2008, p.617), imagined futures (Bear, 2013, p.24; Thrift, 2008, p.113), and indeterminate, and lingering, affects (Lamprou, 2017, p.1744; Thrift, 2008, p. 113).

Latour (1996, p.372) had responded to earlier criticisms of ANT by stating that 'in order to obtain the effects of distance, proximity, hierarchies, connectedness, outsidersness and surfaces an enormous supplementary work has to be done' but did not give examples of how or where this had been achieved.

Alternative socio-technical case study approaches to ANT included the Social Construction of Technology - SCOT (Bijker, 1993). SCOT had also been criticised for failing to take sufficient account of power relations (Klein and Kleinman, 2002, p.30), although Pinch (2009) had attempted to refute such criticisms. SCOT enabled consideration of change, but this was through historic analysis of how diverse perspectives of a technology were socially negotiated to arrive at consensus and stability (Bijker, 1993; Pinch, 2009). I did not want to start my work with the assumption that the diverse viewpoints of groups over a new technology would necessarily arrive at consensus. I felt, therefore, that both ANT AND SCOT were a poor fit with my intentions to study of the politics of memory on Wikipedia. Further investigations were then made into other methods, particularly case studies that both acknowledged the political, and change over time. This led to the identification of Burawoy's ECM as an appropriate case study approach for my research and then adapting it to my research needs as explained below.

4.6 Adopting Burawoy's ECM

Burawoy (2009) developed the ECM to avoid 'reifying external forces as natural and eternal, overlooking that they are themselves the product of unfolding social processes' (p.92), and sought to arrive at something other than universal, timeless laws. This aligned well to my research intentions to investigate the politics of memory. Burawoy also worked with both the social and technical. This was not in the context of the web, but rather through spending years working imaginatively as an ethnographer in the realms of the company and factory (in capitalist and communist states). During this time, Burawoy physically worked alongside people working in management positions and those labouring at factory floor level.

According to Burawoy (2009) the ECM was originally developed by the Manchester School of Ethnography 'in the towns and villages of central and southern Africa and situated field sites in the wider society and its history' (p.4). It sought to record what people were really doing, rather than what it would be expected that they should be doing (p.22). Burawoy developed the ECM as a global ethnographic approach engaging with participant observation, intervention and interviewing. He rejected the single-sited case study because of the need to recognise change at both local and other scales, stating that:

'The spatially bounded site, unconnected to other sites, is a fiction of the past that is no longer sustainable. A comprehensive revisit might involve following individual biographies, institutional trajectories and the reconstruction of place, locating them all in regional, national and also global transformation... With so many parts of the world dissolving, reconfiguring, and recomposing under the pressure of their global connections, ethnographic revisits with a global reach become more irresistible. The more irresistible is the global revisit, however, the more necessary is theory to track and make sense of all the moving parts...the only way to make sense of global forces, connections, and imaginations is to examine them over time' (pp.139-140).

Burawoy viewed the ECM as breaking down 'conventional oppositions: participant and observer; micro and macro, history and sociology, the theoretical traditional and

empirical research by bringing them into dialogue' (p.8). The ECM included four extensions as set out in table 1 below.

Table 1: Summary of Burawoy's ECM extensions

Stages	Burawoy's Extensions of the ECM
1	Direct interactions where the researchers and their research are made visible to research participants in the field. This generates reactions and change that then become open to identification and analysis. This can lead to the researcher questioning their assumptions and existing theory.
2	A movement beyond the social situation to social processes in recognition of external interventions and related organisations of power. This includes through a process of 'data reduction' accomplished through reflexive methods and drawing on existing theory.
3	Recognition that local knowledge of social processes acquired by the researcher in the field interacts with wider organisations of power relations in ways which are mutually constitutive.
4	Theory is referenced from the start of the ECM but is reconstructed towards its end on the basis of gaps and anomalies identified and explored during the research. The 'case' is then 'doubly constituted: realistically by the social forces within which it is embedded and the social processes it expresses, and imaginatively by the position we hold in the field and the theoretical framework we bring to bear' (Burawoy, 2009, p.203).

Recognition of differences over time is built into the ECM through a comparison with a previous case study of a chosen site. The revisit to the site and comparison with the work of another scholar demands engagement with theories and research literature as well as novel experience and data gathering. In the case of my thesis, such comparison was made with Pentzold (2009). The ECM revisit is not meant to be a form of replication as 'there is no search for constancy, but rather the emphasis is on understanding and explaining "variation" - in particular to comprehend difference over time' (p.647). It should be noted, however, that Burawoy also

referenced examples of revisits that had been used to extract what had not changed (p.128, p.136). This suggested that both differences and similarities could be considered through the ECM, but the focus should be on difference. Within the ECM, the 'constituting sites as cases of something leads us to thematise their difference rather than connection, which then poses the questions of how that difference is produced and reproduced' (p.202). Only as the case is constituted does it become possible to explore the connections, including connections across cases on the same site. This is enabled through movements across four different lens that combine constructivist interpretative (theory and positionality) and realist (context and process) perspectives (p.205). Application of the above (including through the use of theory, revisit and comparison) is meant to form a multi-case approach within the ECM (Burawoy, 2009).

Although Burawoy did not use the ECM to investigate the web, some of his cases were within socio-technical settings. Burawoy undertook ethnographic extended case studies in factories in the capitalist and communist regimes over a 20-year period. He began with some expectations of particular practices rooted in broader political and economic contexts, but then revised these expectations on the basis of his data, including during the collapse of communism (pp.198-267). During Burawoy's case study of the Zambian copper mining industry he found that his assumptions were constantly challenged and that he had to become more responsive to 'the flux of everyday life' and this led to changes in his questions (p.33). Acknowledgement of flux within the ECM consisted of two running exchanges – the first creating a continuous dialogue between theory, relevant literature, and analysis of the data, the second being informed by the first and continuously moving back and forth between data collection and analysis (Danneels, 2002, p.1101). This has been described as a form of deductive-inductive approach (Samuels, 2009, p.9). In alignment with my own reflexive positioning, Burawoy's development of the ECM sought to 'emulate a reflexive model of science that takes as its premise the intersubjectivity of scientist and subject of study'. This would 'valorizes intervention, process, structuration, and theory reconstruction', rather than 'reliability, replicability, and representativeness' (Burawoy, 1998, p.4).

Through working with Burawoy's ECM (2009), I rejected the idea that the past speaks to us as a 'series of messages that converge on some truth' (p.193) and

'rather than looking at the site as a way to understand the law of history' I looked at it 'as the foundation of an alternative order' (p.265). As well as acknowledging a politics through recognition of change as difference, Burawoy's development of the ECM took a critical stance in paying attention to different narratives and voices, and effects of 'domination, silencing, objectification and normalisation' - emerging as the case develops (pp.56-58).

Many previous studies of Wikipedia as socio-technical memory, including Pentzold (2009), had included limited reference to marginalised groups. In the ECM, however, 'researchers are meant to explore the many ways people both defy and reify the very structures that attempt to disenfranchise or oppress' (Samuels, 2009, p.9). Burawoy (2009) used the ECM to reveal how (a) cooper mine companies in Zambia perpetuated regimes privileging white employees, even after the breakdown of colonialism and regime change; and (b) changes in employee – employer relationships connected into wider macro-political and economic change. Beyond Burawoy, the extended case study had been used in a variety of studies across disciplines to study change and how this interacted with marginalisation and repression. Lai and Roccu (2019), for example, adapted the ECM model in a short study of marginalised communities to develop theory on socioeconomic justice in transitional societies. This suggested that the ECM could be adopted as a critical, constructivist framework for investigating the politics of memory.

Burawoy (2009) did not suggest that applying the ECM would simply result in automated correctness or confirmation, but rather that the researcher must adapt to the challenges raised in their findings. Through the ECM, Burawoy viewed the growth of knowledge as 'the imaginative and parsimonious reconstruction of theory to accommodate anomalies' (p.21). This process also held the potential for abandoning chosen theory 'and start afresh with a new, interesting theory' (p.53). Burawoy, for example, undertook ECM to investigate the shaping of capitalist macro-forces on the work environment. This followed a visit to the same site by a previous academic who had believed that micro-level empirical findings were of greatest significance. Once at the site (factory) Burawoy found different patterns than he had expected from Marxist theory and the previous site visit and had to reconsider his use of theory with reference to what he was finding in the field.

4.7 Criticism of Burawoy's ECM

The case study method has been generally criticised for lacking criteria for reliability (Barlett and Vavrus, 2017), but within an interpretative approach such criteria would be viewed as a constraint. As recommended by Burawoy (2009, p.17, p.21), as I developed the ECM, I focused on maintaining awareness of anomalies and contradictions in my own work and sought to address these. I started by considering potential problematics with the ECM itself. Burawoy brought Marxist-Gramscian theory (which he favoured) to his case-studies within the ECM approach. Tavory and Timmermans (2009, 2014) argued that, as a result, Burawoy's ECM was deductive, with the expectation that the theory would be proven. Others had referenced the use of a '*favourite theorist*' within the ECM (Burawoy, 1998, p.16; Eliasoph and Lichterman, 1999). This potentially restricted its application and development. Burawoy (2009), however, recognised that 'too often Marxism is trapped in the clouds, just as ethnography can be glued to the ground' (2009, p.8) and sought to go beyond this. He left Marxist theory open to reconstruction and at any point anomalies could be thrown up and call for new responses (p.188). In addition, Burawoy didn't state that the researcher was limited to using Marxist theory, and even claimed that through the ECM he stood on the very edge of post-modernism without tipping fully into it.

Burawoy made some criticisms of his own approach. In his first study (as a fairly inexperienced researcher) Burawoy used covert ethnographic techniques (acting as an employee of a Zambian Copper Mining Company) which led to him use his mathematical training to create linear programming that reproduced the very racial order that became the focus of his research (1998, pp.10-11). His final research paper was then used by corporate managers to discipline mine management (2009, p.46). Burawoy also noted that Ben Magubane, reviewing his case study, 'picked up of a normalising effect of 'succession' which overlooked the intense but silent struggle of decolonialisation'. Burawoy admitted that he did not give enough 'attention to cultural contestation that drew sustenance from beneath colonial regimes of power, modes of resistance discovered and celebrated by subaltern and postcolonial studies' (pp.60-61). Burawoy's experiences led me to recognise and

retain awareness of the risk of becoming an advocate of any organisation being studied or becoming too accepting of its narratives.

Towards the end of my PhD, I also came across Desmond's (2014) criticisms of traditional ethnographies focused on place or groups, including that of Burawoy's ECM. Desmond described the ECM as privileging the macro (global, causal and historic) over the micro (local, descriptive and current) (p.559). Burawoy (2017, p.275) then argued that 'micro processes are conditions of the macro; but they can also challenge or reconstitute the forces shaping them; they can even create conditions for macro forces to transform or crush micro-institutions'. Taking account of the criticisms of Burawoy's ECM which I found during my literature scans, I adopted and began to adapt the ECM for application to a study of Wikipedia as socio-technical memory. Table 2 sets out how this was implemented through combining the staged approach set out by Burawoy (2009) with adaptations that aligned with my own journey. The rest of chapter describes each stage in detail.

Stage	Burawoy's (2009) ECM combined with CDA	My Approach and Extension
1	<p>Choice of theory: The ECM begins with the researcher choosing a particular theory to extend. The structure of the ECM is influenced by Gramscian theory. CDA also integrates various critical theory, including that of Gramsci.</p>	<p>I used the ECM to extend theory on the politics of memory on the web with reference to Gramscian theory.</p>
2	<p>Choice of revisit: This requires the identification of a site and a previous case study on this site. This case study is then the focus of the revisit. CDA also often focuses on a particular past event and 'text produced in specific social practices and formations around a specific event' (Farrelly, 2020, p.368).</p>	<p>I chose Pentzold's (2009) case study of the London Bombings 2005 on Wikipedia.</p>

Stage	Burawoy's (2009) ECM combined with CDA	My Approach and Extension
3	<p>Local Observation and Data Gathering: In the ECM, observations and data gathering take place through offline ethnography.</p>	<p>During to the Covid19 lockdowns, I become focused on archival research - including examining the structuring of Wikipedia and data from the site. This data included text and hyperlinks embedded into the text.</p>
4	<p>Analysis of Local Processes, With Reference to Macro Formations: Burawoy leaves the ECM open to other compatible, critical, methods.</p>	<p>In the absence of a face-to-face ethnography, and in view of the limitations of working with anonymised data, I focused on using intertextuality to reveal the extent marginalisation could be made visible in the (re)construction on Wikipedia and the web.</p>
5	<p>Connection to Macro Forces: Connections are made between local observations and macro forces. CDA also supports investigations of layers of ordering that connect to surface texts. Such ordering may include a form of meta-discourse -which refers to itself rather than other texts (Farrelly, 2020).</p>	<p>An Extension to Meta Formation I used CDA and Bakhtinian concept of the chronotope in order to describe meta formations. This differed from Burawoy -extending the ECM to work with hyperconnected institutions on the Semantic Web.</p>
6	<p>Changes in Micro to Macro Relations over Time: A comparison is undertaken of two case studies (a novel case study of a site and the one it is revisiting) with the understanding that the researcher is not separated from their research. CDA can also be used to identify changes in emphasis through comparing one CDA analysis with another produced in a different time period, location, etc (Farrelly, 2020).</p>	<p>I undertook a comparison between my own case study and Pentzold (2009). We both used CDA to examine the memory of a crisis event on Wikipedia.</p>

Stage	Burawoy's (2009) ECM combined with CDA	My Approach and Extension
7	Extension of Theory: The findings from the ECM are used to extend theory.	I extended theory on the politics of memory on Wikipedia and the Web, with reference to Gramscian theory (as integrated into the ECM and CDA).

Table 2 The stages of my research framework

4.8 Stage One: Choice of Theorist

Burawoy (2009) stated that 'we don't start with the data, we start with the theory' in implementing the ECM (p.13). I, therefore, began by reading around a range of theories developed and used by scholars exploring memory. This included the work of theorists such as Halbwachs (1952), Nora (1989) Arendt (1961); Foucault (1977); Derrida (1996, 2005), and Stoler (2002, 2010), as well as the research findings of other scholars who had undertaken case studies on socio-technical memory. I decided to adopt a theorist (Derrida) who had written publications on memory (1986; 1996), the web (2005a), politics (2005b) and democracy (Patton, 2007; Haddad, 2013; Dinan, 2014). Derrida was unfamiliar to me as he was not widely referenced in my previous fields of study and practice. He had been cited within the field of memory studies (Olick, 2008; Hobuß, 2011; Hristova, Ferrándiz and Vollmeyer, 2020), but not by Pentzold (2009) or those who had written other case studies within my targeted literature review. Nor, as far as I was aware, was Derrida a favourite theorist of my supervisors. I, therefore, moved away from Burawoy's favourite theorist approach towards working with a theorist that I found challenged my pre-conceptions and who I had to work hard to interpret.

After working with Derridean thought for a number of months, I started to question my choice of theorist. Burawoy had begun his extended case studies with a deep understanding of Marxist theory. I, in comparison, only started working with Derrida during my PhD. I found out through my literature reviews that Derrida gave no instructions for undertaking research (Derrida and Caputo, 2020/1997) and had regarded the Encyclopaedia as statist rather than text (Rajan, 2007, p.142-143). I

came to realise that Derridean thought did not easily fit with the Gramscian-Marxist traditions drawn on by Burawoy in his construction of the ECM, nor with my focus on Wikipedia. I, moved away from specifically working with Derrida, although I retained awareness of the connections he had made between the construction of language, technology and memory. I then mainly relied on theory (particularly that of Gramsci) integrated into Burawoy's ECM and particular traditions of the CDA.

4.9 Stage Two: Choice of Site of Revisit and the Initial Focus.

Following Burawoy's (2009) ECM approach, once the theory is identified the researcher must choose a type of revisit. The most common revisit is the intensive comparison of one's own fieldwork with a prior study undertaken by another scholar on the same site. Flawed fieldwork is seen as simulating rather than discouraging the revisit (pp.646-647). I chose to compare two case studies that took place on the same site at different times (a focused revisit). In addition, I decided to reference other case studies on the politics of memory on Wikipedia that had taken place between the earlier visit and my own (a serial revisit), within my targeted literature review. After scanning a wide range of literature on memory on the web, including case studies of various digital organisations such as Twitter, Facebook and Google, I decided to focus on Wikipedia as a site to revisit. Wikipedia seemed to be a site of particular interest as it had retained a general reputation of being an open, public, and even democratic in comparison to commercialised digital organisations. Its open-source policies and licensing also meant that anyone was supposedly able to access its archival data directly from the site in a way that was not possible from commercial digital organisations. Page (2018, p.48) noted that

Wikipedia is a transparent environment, where the articles and the process by which those articles are created are publically available in the archives of the site. These archives are sizeable: there is no technological limit on the length of a Wikipedia article or on the size of the discussion forum on the site. The archives are persistent and replicable, beginning with material in 2002.

Some scholars had explored social practices on Wikipedia as deliberation in a public sphere (Pentzold, 2009, Ferron and Massa, 2011; Kopf, 2022). During my

research project I also became aware that Wikipedia's data (particularly when converted into facts on Wikidata) had a particular function within the Semantic Web (in its organisation of the past) and the production of automated knowledge (through knowledge-graph technology). This function aligned with a particular conceptualisation of memory. It referenced the collective reimagining of the past as crowd-sourced editing in the present and connected this to social facts that could then be used in automatic knowledge generation based on logic (Alesso and Smith, 2009).

Near the beginning of my PhD, I chose to revisit a case study on Wikipedia as memory (Pentzold, 2009). This focused on an article in the English language Wikipedian representation of bombings that took place in London on the 7th and 8th July 2005. This case study was chosen due to its dominance in electronic academic databases and related citations by scholars. The ECM, however, did not require me to choose the same memory representation or methodology as Pentzold – only the same site. Revisits do not have to focus on the same events or artefacts on a site, or even apply the same methodologies. Burawoy (2009) provides an example of a revisit where a study of peace was compared with one about conflict (p.115). In another example a case study using positivism was compared with one using reflexive methods (p.66).

The focus of my research was not on how a particular memory was remembered over time, but rather how memory of crises was reinterpreted across institutional spaces and time, and how this interacted with marginalisation. I retained the focus on a Wikipedian article as a memory representation of a crisis event (in London). As in the case of Pentzold (2009) I also adopted a constructivist methodology and CDA. CDA often focuses on a particular past event and 'text produced in specific social practices and formations around a specific event' (Farrelly, 2020, p.368). I, however, did not begin by assuming the significance of socio-technical memory as being about conflict or consensus, or choose an article that was rated as significant (i.e., in terms of length, highly edited, viewed, or contentious) on the site itself. Instead, I worked with the idea that the ECM would construct the full significance of my case as I extended my research across times and spaces. I wanted to move beyond from what my literature review suggested were the focus of dominant memories of past events (often

associated with what Western, male editors were interested in) on Wikipedia (Luyt, 2015 and Samoilenko *et al*, 2018) and academic memory studies.

I chose the English language article on the environmental disaster known as the Great Smog of London as a starting point on the site for my research. I chose this article partly due to political concerns about pollution and climate change. For a number of decades, the crisis of the Great Smog has been an internationally visible memory of environment disaster which has been associated with industrialisation, domestic state and market failures and related consequences for public health and regulation (Bump, Reddiar and Soucat, 2019). The event referred to on mainstream search engines as ‘the Great Smog’ also had intergenerational meaning for my family which had mainly been based in London throughout the twentieth century. It was a memory that had been discussed almost as often as memories of the first and second world war by my mother and grandmother.

The Great Smog has been subject to recent attention internationally, including through media comparisons to more recent pollution events in China, India, Poland, Australia, etc (Zhang and Samet, 2015; Jha, 2015; Pillai, 2016; Czerwińska *et al*, 2019; Read and Parton, 2019). Research evidenced that comparisons between new pollution events in China and the Great Smog had drawn out different positions on the part of governmental and non-governmental media organisations, with the Government seeking to suppress criticism of its industrial policy (Li and Svaverud, 2017). So, although the article on the Great Smog represented what might be perceived to be a domestic event in the 1950s in London, there was the potential for it to receive wider interest and contestation (around comparison and lessons learned between the Great Smog and other air pollution events) from editors across different localities in the present. Rather than focusing on remembering and forgetting as supporting consensus and recovery, I was interested in how the memory of crisis engaged with experiences of similar crises in the present (Monteil, Barclay and Hicks, 2020), and how this might support learning over time, particularly in the case of marginalised groups.

4.10 Stage Three: Local Observations

Unfortunately, the Covid19 lockdowns prevented me from delivering planned interviews with participants from marginalised groups in areas where air pollution was evidenced to be concentrated in London. Instead, I started by observing local configurations and practices on Wikipedia. Burawoy did not define how long the observer must remain in the field, but that they had to be able to 'discern the social processes that give integrity to the site'. This could be through 'signifying events and dramas, rituals of reproduction, as well as struggles and contradictions' (2009, p.17). Like Pentzold, I ended up working with CDA and sought to purposively sample data from Wikipedia on a particular crisis event. Pentzold (2009) included very little information on his interaction with Wikipedian data, beyond that he collected it from the site and then manually coded it. I, however, spent a several hundred hours (Between July –October 2020 and July-October 2021) on the Wikipedia site seeking information that would allow me to address my own research questions. Taking notes, I investigated the practises of the site. I started with the English language article on the Great Smog, and then explored hyperlinks (the connectivity) with other data on the site. In some cases, I found data types that had been used in previous studies of Wikipedian memory. In other cases, the data was novel to me. Many edits on Wikipedia seemed to be administrative or strove to be factual, and so seemed poorly aligned to qualitative analysis. A lack of edit warring over the memory of the Great Smog had implications for the richness of highly visible text (the article and talk pages) and there was little evidence of deliberation taking place. This forced me away from the approach of previous site visits (often focusing on conflict and cooperation) to investigate the data and its hyper-intertextuality in more detail. I also found that there were less than 50 comments on the Great Smog of London talk pages and became aware that the results of discussions on the talk pages might not automatically translate into changes to the main article. This contradicted the assumption in Pentzold (2009) that discussions on the talk pages led to related changes in the article itself

I started clicking into hyperlinks embedded into information surrounding the text of the main article and the information that surrounded it. Initially I remained within one-two hyperlinks from the text of the article and its surrounds. This took me through to

information on sources, editing and page viewing and other Wikimedia technologies. I then put together an ethics application that would allow me to work with the detail of this data. This was then approved through the University of Southampton's ethical approval system – ERGO. This gave permission for an initial analysis of a relatively small data set from Wikipedia, and then further stages of research that would put me in direct contact with editors and users of Wikipedia as part of an ethnographic approach. My initial data sample is set out in table 3 below.

Table 3: Initial data sample from Wikipedia

Templates on Wikipedia identified in my ethics application	Further details
The English language article on the Great Smog.	The wording, images and embedded links within the text.
Technical mark up for the article,	Information on external sources.
The talk pages associated with the article.	Where editors posted statements about their editing of the article.
The edit history of the article.	1203 edits that had been added from the date of the first edition (13 August 2003) until 2 July 2020.
Automated Wikipedian statistics on edits and page views of the article.	Aggregated information on edit types and types of editors and viewers. This was accessible through the edit history page, and page view statistics onsite.
Options in the sidebar of the article leading to other data on the article.	This included: (1) 'What links here' - links from other Wikipedia pages into the article, including talk pages of other articles; and (2) Page information for the article, including the Wikidata item for the Great Smog.
Wikipedia articles on policies and guidance.	As above.

My initial ethics application was highly sensitive to the personal privacy of editors. At this stage I had a very limited understanding of who was using Wikipedia and their potential vulnerabilities - so was sensitive to the potential ethical issues that could arise from the site. Page (2018, pp.30-31) had noted the difficulties of creating an ethical framework for working with social media data and emphasised the need for a case-by-case approach, taking into account various ethical frameworks and considerations. This included evidence of informed consent and the public availability of the data. According to information on Wikipedia, editors gave their consent and agreed to reuse of data through standard contracts and licensing for the site, but a Wikimedia Foundation survey of 5000 editors found that 13% were in the 12-17 years old age group (Wikipedia, 2022e).

My initial ethics application was also influenced by Pentzold's (2017) article on ethical issues for ethnographers working with Wikipedia. Pentzold had set out many layers of Wikipedia and highlighted research suggesting that editors viewed some layers as being more private than others, even if under the licensing of Wikipedia much of the information on the site could be legally viewed as public data. Pentzold's reading of Wikipedia layers suggested that articles and administrative pages could be viewed as public, with talk pages containing only marginally sensitive data. Personal data on user pages such as names, occupations and ties to other users, however, might well be considered as private by Wikipedians. Most studies I had read by other researchers on Wikipedia aligned with Pentzold's distinctions between public and private layers, and focused on Wikipedia articles, edit histories and talk pages. Some scholars had directly quoted individual editors (Ferron and Massa, 2011; Kaprāns, 2016; Makhortykh, 2017; Twyman, Keegan and Shaw, 2017), but others, such as Pentzold (2009), had chosen to avoid this. In working with the initial sample, I erred on the side of caution in terms of identifying individual editor's online tags (names).

Rather than working with data dumps (removed from Wikipedia) as many other researchers previously working on Wikipedia memory had done, I examined the text in the context of Wikipedia before transferring my sample data to other software for analysis. This helped me gain a better understanding of how different aspects of the site interacted with one another. I then manually transferred my data sample into Excel in a way that could allow for combinations of sorting across different data

types. Referencing Burawoy's suspicious view of elite institutions as interacting with memories of colonial, exploitative forms of capitalism, (2009, p.26), I came to question the use of elite interviews to explore social practices in recognition that elites were often highly protected by layers of public relations. As I further investigated Wikipedia during my literature review, I realised that both readers and editors could potentially be anyone (or bots) - bringing all the motivations and politics of those able to access the web into Wikipedia. I found, however, that only registered users (more likely to be editors who intensively edited Wikipedia) could be contacted via the internal Wikipedian email system which I had been planning to use to contact potential research participants.

Pentzold (2017, p.151) had set out some of the problematics of contacting Wikipedia editors, and Page (2018) had stated that she felt that it would not be possible to gain consent (beyond that given when editors agree to the site's general licensing) from a large sample of Wikipedia editors. In order to undertake an ethnography focusing solely on experienced, senior editors, arguably a researcher would need to become highly knowledgeable of operations of the Wikipedian hierarchy and attend Wikipedian offline gatherings. They might seek to gain access to the privileges that came with seniority by generating large numbers of normative edits on Wikipedia over a prolonged period and then seek the approval of existing senior editor representations. It was unclear, therefore, how a researcher could come to share a time and space with editors higher up in the Wikipedian hierarchy without becoming subsumed by its narrative.

I also found evidence of researchers who had attempted to undertake a study of Wikipedia being banned from the site for attempting to arrange interviews with editors without pre-approval by senior editors, as well as implementing direct interventions that went against Wikipedian norms (Terveen *et al*, 2014, p.102). In the case of Terveen *et al* (2014) one of the research team (Aaron Halfaker) eventually became a member of the Wikimedia Foundation research team which aimed to 'help organise policies, practices, and priorities around Wikimedia related research, particularly defining acceptable protocols for recruiting subjects and ensuring research methods' acceptable to Wikipedian norms' (p.102-3). There were also many pages on Wikipedia clearly requesting that researchers directly contact the so-

called Wikipedia Community (more experienced editors) about any planned ethnographies and ethnographic interventions.

Using Google and Wikipedia to search for information on how to gain editor approval for recruiting research participants, I accessed an archival record of a researcher (Johanna Niesyto) requesting approval for interviews as part of a study on the '*Politics of knowledge production*' across different language editions (Wikipedia, 2010). There was, however, no convincing justification given for why certain digital representations of editors had the right to make approval decisions on behalf of others, and what criteria they used for judging diverse research proposals. Niesyto (2011) had taken part in a series of conferences on developed '*a critical point of view*' of Wikipedia, but had later joined the Wikimedia Deutschland Board (Niesyto, 2017).

There were also many published interviews of elite Wikipedian editors, and it was not clear what further interviews of this group would add to existing knowledge of Wikipedia or how they would enable me to implement my critical methodology. As an alternative, I considered the possibility of contacting Wikipedian readers of the Great Smog article. Readers, however, who were not also registered editors were not open to being contacted through the Wikipedian email system. To contact readers through the site I would have needed permissions and support from the so-called Wikipedian Community (usually senior, experienced editors) and the Wikimedia Foundation, as well as gaining consent from each reader. Singer *et al* (2017), who carried out a big data study of digital representations of readers stated that 'Dario Taraborelli from Wikimedia Foundation was indispensable to the early phases' (p.1599) of their project.

I contacted the principal research scientist at Wikimedia for more information on approval processes and found that Aaron Halfaker (a member of the team for Terveen *et al*, 2014) had become the principal research scientist at the Wikimedia Foundation (Wikipedia, 2021j). As I continued in my literature review, it became clear that many other academic researchers of Wikipedia had become directly engaged in the Wikipedian project, either through governance structures or associated projects such as '*Whose Knowledge*' website. Critical voices, including those who had been vocal about the decolonialisation of the web (Bouterse and Sengupta, 2018) were

focused on how to increase editing of Wikipedia by marginalised groups and expand its scope, rather than critically evaluating Wikipedia in other ways. When I looked into the possibility of attending an edit-a-thon (an organised event at a scheduled time where people create or edit Wikipedia entries on a specific topic), run in conjunction with Wikipedia, I found an online advert for an edit-a-thon in emerging economies. This was directed at those attending a conference who could speak English and use a computer and focused on the editing of English language pages (Future Climate for Africa, 2020).

Even studies investigating the relationship between Google and Wikipedia had engaged directly the Wikipedia Foundation. McMahon, Johnson and Hecht (2017), for example, stated that the primary motivation for their study arose ‘out of a call for a “new [Wikimedia] research agenda” made by Dario Taraborelli (2015), the Head of Research at the Wikimedia Foundation’ (p.143). I began to wonder how far the academic studies that were the most visible on Google Scholar and academic databases might be interacting with the very phenomenon that I was attempting to investigate. Many of the case studies and ethnographies that were prioritised on these systems led to scholars who were directly involved in the Wikipedia Project and had Wikipedia articles dedicated to them. Some of the high-profile ethnographies returned by databases turned out to have been written by Wikipedia administrators (e.g., Jemielniak, 2014) who sat near the top of the organisation. In addition, Google Search returned various mainstream news articles on Wikipedia administrators which were written in a non-critical manner (Harrison, 2018).

Burawoy (2009) had rejected interviews with elite groups in his studies and had made use of covert ethnography in his case study of Zambian copper mines (p. 27). I, however, was undertaking my research during the Covid19 pandemic. Beyond the lockdown restrictions I felt it would be practically and ethically problematic to covertly observe Wikipedian editors or readers. In the absence of the Covid19 lockdown restrictions I would have sought to go beyond digital representations of editors to make face-to-face contact with people in the material realm. I had planned such contact as part of my initial ethics application. I was intending to make contact with a diverse (e.g., in terms of age, gender, ethnicity, etc) group of people living in an area of London with a relatively high level of air pollution and engage them in the reading and editing of the Wikipedia articles on the Great Smog. This could have been set up

without the involvement of highly experienced Wikipedians or Wikimedians - potentially opening up possibilities of differing perspectives. This type of research project, however, was not possible during the Covid19 restrictions (the research phase of my PhD was due to be completed by early Autumn 2021).

Faced with this situation I went back to Burawoy (2009). I found although Burawoy emphasised forms of direct ethnography, he had undertaken some deconstruction of documentation in order to arrive at a political reading (p.53). He had also cited other revisits which made use of archival materials, emphasising the need to recognise the construction of data and history (p.133) and wrote of dialogue, 'virtual or real, between the observer and participants' (p.20). Burawoy stated that Max Weber's analysis of the origin of capitalism offered an illustration of the ECM using 'virtual participation' (p.66). He made similar observations of the works of Marx, Durkheim and Foucault who he viewed as having used ethnographic imagination grounded in their history and theory. Burawoy even described Foucault as undertaking 'virtual ethnography' (p.141). I decided, therefore, to adapt his ECM to deliver a form of virtual ethnography.

4.11 Stage Four: Analysis of Local Processes, with Reference to Macro Formations

Working with initial observations and findings, I decided to develop a virtual ECM (a type of ethnography of an archive), with the intention of extending into the times and spaces of Wikipedia and using interventions to disturb these and potentially reveal anomalies. My observations took place as I moved into and across the site and considered how it would be experienced by different levels of editors/readers. Using CDA to analysis my data I explored different layers. Farrelly (2020, p.359) has referred to such layers as

- 'texts – actual pieces of language produced in the process of events,
- discourses – conventional or habitual language patterns associated with social practices'.
- wider orderings, through which text interacts with one another.

As Farrelly observes, CDA would usually include attention to data on the social producers of inter-texts - the *who* (the author or editor) as well as the *what* (e.g., as content). The inclusion or exclusion of particular voices is seen to be particularly significant. Drawing on Gramscian hegemony theory it is understood that rather than suggesting one group (elites) automatically control the production and dissemination of discourse, individual agency can interact with the expression of spontaneous grammars by subaltern groups. It may be assumed that elite groups are being supported by existing configurations but revealing the space of struggle can enable challenge and alternative interpretation. CDA practitioners have argued that critical discourse must, at least at some level, destabilise existing dominant narratives and promote new ones (Donoghue, 2017).

Text taken from the Great Smog (both the article and talk pages), however, evidenced very limited contestation. Wikipedia articles are normatively constructed out of particular sources, and this placed constraints on the type of CDA that I could apply to Wikipedia. In addition, rather than focusing purely on power-editing (which would just increase the visibility of power-editors more generally), I wanted to reveal marginalisation and resistance. Non-normative editing of Wikipedia potentially offered the possibility of insights into resistance on the site, but almost all the examples of intentional non-normative editing of the Great Smog had been undertaken by those using IP addresses. Some previous studies of Wikipedia (Kaprāns, 2016, p.160) had traced IP addresses to particular locations that could be associated with particular politicised interests, but IP addresses (as locational data) are open to being deliberately falsified. Kaprāns (2016) has stated that it was likely that the anonymous Wikipedia editors he traced to Canada and United States had ‘accessed the article from elsewhere and their IP addresses only show the location of proxy servers’ (p.160). There are many ways in which IP users can seek to hide their identity including through VPNs, proxies, etc (Miller, Curran and Lunney, 2021). In addition, it is stated on Wikipedia (Wikipedia, 2021k) that

IP users frequently contribute from different IP addresses because Internet service providers (ISPs) usually assign IP addresses dynamically; meaning that the same actual person may return to Wikipedia with a different IP address that was re-assigned by the ISP.

This means that IP addresses may be 'controlled by 12 different people in one year, or hundreds of different people in one day, as IP addresses are simply routing addresses' (Wikipedia, 2012). Editors using IP addresses were not accessible through the Wikipedia email system (only open to registered users). Any personal information available on the personal pages of registered editors was potentially sensitive data under data protection law and was not open to a form of offline verification during the Covid19 lockdowns.

Pentzold (2009) observed that wiki 'editing options, include, significantly, the opportunity to change, add, delete and link material' (p.256). These functions were developed to provide a type of audit trail on how articles had been modified, and by whom, and promote debate over such modifications (Luyt, 2022). In practice, however, it proved very difficult (due to overlap between Wikipedia functions) to confirm the impacts of individual editors on the text (see table 4 on the next page).

Table 4: Overlap between Wiki functions on Wikipedia

The Four Wikipedia Edit Functions (As described in Pentzold, 2009, p.256; Cunningham and Mehaff, 2014, p1;)	Overlap across Functions
Add	Adding text can result in the overwriting (and so deletion) and amendment of existing text. Information is also copied across (added) from other sources and amended in the context of the article. Links are added as part of this.
Link	Links can be added, deleted or amended.
Amend	Amendments can lead to deletion or adding of material, and links can be amended.
Delete	There are specific deletion functions on Wikipedia e.g., reverts or rollbacks to earlier versions of the article. The adding and amending of text or the changing of links, however, also leads to deletions. Analysis of deletions relying on Wikipedia definitions would only pick up on deletions specifically tagged as reverts or rollbacks by Wikipedia editors, rather than the other forms of deletion set out above. Some deletion information is invisible to researchers, for example the "Deleted only" checkbox is only shown to administrators and others with the deleted history user right' (Wikipedia, 2022f).

The above constraints meant that I could not simply analyse the data and produce research findings on which individuals (as editors) were dominant or marginalised, etc. Rather my research, with reference to Farrelly (2020) became increasingly focused on

- the text – including patterns of how the article text was visibly connected to (or disconnected from) other text.
- the discourse - including how this interacted with typicality (the type of text typically referred to or which acted as the typical sources of inter-texts).
- the visibility of named texts. This could be used to indicate authority or even iconic status.
- presences and absences (what had not been said).
- arguments for patterns of inclusion and exclusion?
- whether these favoured some over others?
- anomalies.
- the interaction of the above with reinterpretations and their forms.

Farrelly has also suggested that a focus of contemporary CDA should be on networks of inter-texts within, and between, social formations and social practices.

This is important because different social formations are likely to have different procedures and conventions for producing texts and, therefore, intertextual reference entails a degree of recontextualisation: there are likely to be principles which select and deselect, emphasise and deemphasise and frame aspects of texts differently to those in the source practice. An intertextual relation gives voice (however it is then used) to some social practices and not to others; further, various other practices may lend degrees of authority, and access to knowledge claims, which would not otherwise be available to the practice at hand (p.376).

I applied CDA to the article of the Great Smog and its interactions (via hyperlinks) with other text and related policies and social practices. As I began to move across

the Wikipedia site, I came to recognise that power-editors editing across Wikipedia and other Wikimedia projects could not expect to have the same level of privacy as other editors. Some experienced Wikipedia editors also had a highly public profile beyond the Wikipedia site and had published or been quoted in the press (Pentzold, 2017, pp.146, 149). I, therefore, produced a revised ethics application seeking access to (a) information on power-editors rankings and statistics on their editing across Wikimedien projects; and (b) other Wikipedia articles across different language projects (see table 5 below). As someone without a background in multiple languages or linguistics I did not attempt to work with the full texts of multiple language versions of articles. Instead, I used Google Translate to examine basic information provided in Wikipedia infoboxes, sources of citations, and Wikipedia's automatically generated statistics on edits and page views.

Table 5: The extended data sample from Wikipedia

Templates on Wikipedia included in the sample	Further details
Extended access to Wikipedia articles and related edits, comments on talk pages across all language editions, and embedded hyperlinks.	This included the sample data that Pentzold (2009) had used in his case study.
Wikipedia pages showing individual editors lists of edits.	Editorial activity and rankings within the Wikipedia hierarchy.

4.12 Stage Five: The Meta Formation

In accordance with the ECM, I worked with my critical analysis of my data (with a focus on intertextuality) to make connections between the local and global. Referencing Farrelly's (2020) CDA approach, this included investigating orders of discourse, but also an intra-textuality (a form of meta-discourse which refers to itself rather than other texts). While working with Wikipedia and accessing it through search engines I became increasingly aware of its interdependencies with other institutions. A summary of the interdependencies that I noticed during my research and reading is set out in table 6 below.

Table 6: Intratextuality made visible through online searches and the literature review

Applications	Evidence of possible interoperability across digital institutions, including Wikipedia.	Evidenced in scholarly or grey literature
Mainstream news and publishing sources	Associations between Wikipedia, news channels and institutional and academic publishing could be found in embedded links on Wikipedia - both associated with the article page, and in the technical mark up.	Page (2018, pp.57-64); Smit (2018); Vrandečić, (2019)
Search Engines, including Google, Bing, and DuckDuckGo.	Found in the ordering of search results on various search engines.	van Dijck (2013); Zavadski and Toepfl (2019).
Knowledge Graphs	Found in mini knowledge graphs appearing alongside the search results for the Great Smog with Google and Bing.	McMahon, Johnson and Hecht, 2017; Garcia-Gavilanes <i>et al</i> , 2017; Bukhari, Bashir and Malik, 2018; Matsakis, 2018; Miz <i>et al</i> , 2019; Vincent <i>et al</i> , 2019.
Google Images	Found in Google Images returned following a Google search using the term 'Great Smog of London'. These images were also found in mini-knowledge graphs (see above).	

Applications	Evidence of possible interoperability across digital institutions, including Wikipedia.	Evidenced in scholarly or grey literature
Google Trends	Searching on Google Trends for information on searches using the term ‘Great Smog of London’ resulted in graphs that looked visually similar to graphs generated through the Wikipedia pageview statistics tool for articles on the Great Smog.	Garcia-Gavilanes <i>et al</i> (2017); Miz <i>et al</i> (2019); Villarreal and Blake (2019)
Netflix	A media article suggesting that watchers of Netflix used Wikipedia as a reference tool i.e., to find out more about historic figures included in historic series like ‘the Crown’.	Villarreal and Blake (2019) on relations between Google, Wikipedia and Netflix.

I extended my revised ethics application to take account of the above and include

- Data and visualisation of searches on Google applications.
- Parts of the script of an episode of the Netflix series ‘the Crown’.

New ethical issues arose through my extended sampling, as other Wikipedia articles and comment pages were more controversial and heated than the Great Smog, and engaged more with personalised, sensitive data. My ethics application (approved through ERGO) responded to this by stating that I would only cite highly active, registered editors of Wikipedia, and avoid citing highly sensitive personalised material. Again, this was a very ethically cautious approach to working with digital representations on Wikipedia. Working with institutions beyond Wikipedia also engaged with new copyright issues, which had to be taken account of. In the case of search engines, it was possible for a non-commercial researcher to use material from Google Search and Trends, including screenshots (Google, 2022a and 2022b).

It was not possible to include screenshots of Google Images or visuals included in Google knowledge graphs as these included images under copyright. In the case of Netflix, I purchased both a copy of a DVD that included the episode I analysed, as well as a month's subscription to Netflix. I then used automated systems to analyse content from a typed-up script of the episode to produce word frequency clouds on NVivo. This complied with guidance from the UK Government (UK Government, 2021) on copyright that state that 'researchers can make copies of any copyright materials for the purpose of computational analysis if they already have the right to read the work (That is, they have 'lawful access' to the work)'.

When I looked for evidence of connections across institutions, I found they were less obvious from visible hyperlinking than from reoccurring templates and formations. Rather than treating such forms as objective, I needed a way to critically examine them. I had come across other scholars who had used visualisation as part of a critical methodology (Simon *et al*, 2022), including in the study of memory (Mitchell and Elwood, 2013). I decided to adopt Bakhtin's concept of the chronotope to support a critical use of visualisation. In addition to describing intertextuality, Bakhtin (1981, p.84) had developed the concept of the chronotope to describe the fusing of time and space into narrative thought. In the process time and space were to be made more visible and responsive to one another. According to Keunen (2000, p.2) the concept of the chronotope acknowledged memory schema as dialogue between mutually interacting texts and the prior knowledge of readers and writers. Although Bakhtin's developed the concept of the chronotope for investigation of particular (expected) literary genres and thematics (Keunen, 2000), sociolinguists, anthropologists, and social scientists had come to adopt the concept (Lawson, J, 2011; De Fina and Wegner, 2020). Wirtz (2016) and De Fina and Wegner (2020) had observed that the chronotope could be used to explore the relations between time and space and participation in communicative events in the construction of realities. These could include different histories, oppositions, expectations, identities and moral judgements, but also the recombination of elements of different stories into new stories. De Fina and Wegner (2020) proposed that such practises could take place through mass mediated communication, and intertextuality (including as the manipulation of intertextual links) could have a central role in political construction and circulations of chronotopes. I came to use a chronotope to explore

how a form of mnemonic hegemony might interact with different groups and increased pressures due to environmental change.

4.13 Stage Six: Changes in Micro-Meta Relations Over Time

When I had completed my case study, I compared this with Pentzold (2009) to explore how differences in the two case studies had arisen from differences in the researcher's methodologies, positionality, or changes in the practises of Wikipedia or wider orderings (see table 7 below). Farrelly (2020) had also suggested that absences or de-emphasising might be identified through comparing metadata from one CDA analysis with another produced in a different time period, location, etc.

Table 7: The comparison between the two case studies, with reference to the four movements of Burawoy's ECM.

Burawoy's Four movements	Usage within this Thesis
Position	Comparison of my positioning with that of Pentzold (2009).
Context	Comparison of our choices of methodologies and data sampling, and consideration of wider contextual changes.
Processes	Comparison of our descriptions of how social practices and ordering interacted with the text.
Theory	Extension of theory drawing on findings from across the case studies.

4.14 Stage Seven: Extension of Theory

Burawoy's (2009) final and most important form of extension within the ECM, was that of theory. He had stated

we start with theory that guides our interaction with others and permits us to identify relevant forces beyond our site. In the process its inadequacies become apparent in the anomalies and contradictions that we seek to rectify'. This turns

'the site into a case that gives meaning to the site beyond its own particularity (p.17).

I took my findings from the research and used this expand theory developed through studies of the politics of memory on Wikipedia and the web. I also expanded the use of the ECM and CDA through applying these methods to contemporary virtual archives (Wikipedia and the Semantic Web) while continuing to give attention to the role of traditional civil society institutions (academic institutions, media, museums, libraries, art galleries, etc) in reproducing and actualising hegemonic common-sense (Molden, 2016, p.133).

4.15 Conclusion

This chapter has described how I chose and developed my methodology, including appraising contemporary methods and findings from various disciplines. It also describes how I delivered the initial stages of the ECM. When I attempted to apply my chosen method (the ECM) it drew out differences between my own work and that of previous researchers of socio-technical memory on Wikipedia. Through my approach I continually tested the data and adapted my methodology so that it could be applied in my present. Details of my findings are included chapters five to seven.

Chapter 5 Local-Macro Stages of the ECM

5.1 Introduction

This chapter sets out stages three and four of my research framework (including connecting local processes with macro drivers) and addresses my research questions on

- How are articles about past crises (re)constructed on Wikipedia with reference to other memory representations?
- How do the re(constructions) engage with marginalisation.

Following the development of my methodology, my intention was to critically assess the (re)construction of memory on Wikipedia, and in relations with other institutions, with reference to power inequalities, marginalisation and resistance. If the Covid19 lockdowns had not been in place and I had been able to work with marginalised groups in their own localities, their perspectives of Wikipedia's representation of the Great Smog would have been central to this chapter. Without this it provided difficult to remain focused on marginalisation and resistances, as much of Wikipedian data is focused on accumulations by editors referred to by online usernames. Even with the use of critical frameworks such as the ECM and CDA, I had to continually refocus my attention and recognise my own identification with marginalised groups to pursue my research questions.

As a researcher I also found the temporal-spatial complexity of Wikipedia difficult to work with. When, for example, I started working with the site I returned to Wikipedia articles via Google Search. Only after some months did I recognise that it would be useful to record which version of the article I had been working with through reference to a particular URL (referred to on Wikipedia as a 'permanent link'). Later I also began to question the relevance of working with one version of a Wikipedia article, for this could potentially be altered through editing any time. In the case of my analysis of the article on the Great Smog of London I responded to this through comparing different versions of the article and analysing what had changed over time. In the case of other Wikipedia articles (e.g., on policies) my rather simplistic

response was to check whether the content I was viewing had been sustained for at least a year. I added the term 'sustained' to my citation of an article where I found no, or only minor amendments had been made to the content I was referring to. The sustaining of content over time suggested that it was likely that it had been considered acceptable by editors working with Wikipedian norms during that period, although content may have been altered in newer versions.

Working with CDA, I sought to investigate wider patterns of how the article text was connected to other text, including as sustained connections (and related disconnections) through elite editing practices aimed at arriving at hegemonic acceptance. In the conclusion to this chapter, I assess the degree to which this interacted with marginalised perspectives in the (re)construction of a memory of an environmental disaster. With an understanding of socio-technical memory as relational and layered, this chapter is broken down into the following

- The construction of normative spacetime on Wikipedia.
- the construction of memory as common-sense narrative and social facts.
- forgetting through disconnection of certain texts.
- the implications of this for attempts by the marginalised to share in, and benefit from memory (re)construction.

5.2 The Construction of Normative Spacetime on Wikipedia

Wikipedia articles, like the pages of a book, can give the impression of being timeless (i.e., having been always there). They are, however, associated with change through various templates, including edit and talk page histories. According to narrative on Wikipedia, the chronological order associated with the article is that of evolving improvement, through edits made by individuals over linear time. Each edit (associated with a particular time and author) creates a version of the article with a permanent link. The article itself, however, is supposedly left open to constant change. In theory, the Wikipedian principle that there are 'no firm rules' (Wikipedia, 2021b, sustained) might describe a radically contingent form of evolution - with

localised adaptation and no fixed expectations. The generation of a unique space-time for each individual editor might also be used to represent individuals as multiple universes, with readers left to choose between different interpretations. This would then leave a story world open to varying systems of belief. Within the Wikipedian normative framework, however, any improvements to the article through editing by individuals need to be aligned with specific criteria. According to Wikipedia narrative (Wikipedia, 2022g, sustained), these criteria are ‘based on a letter scheme which reflects principally how factually complete the article is, though language quality and layout are also factors’. Assessment is meant to include the experience of, and usefulness, to readers. The diversity of such readers and what might be useful to them, however, is not considered in detail as part of the criteria and it is not clear how the perspectives of readers from marginalised groups are included in assessments of article content. An article moves through different classes of achievement according to the normative criteria (see Figure 3 below).

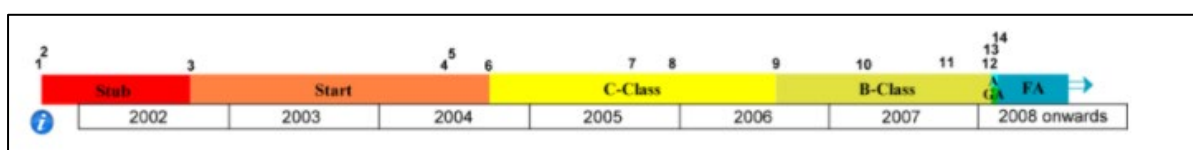


Figure 3: Screenshot of image showing the evolution of articles on the English language edition, taken from the Wikipedia site (Schuller, 2022b).

Above each earlier version of an article is a banner (see figure 4 below) that emphasises a perspective of time where latest revision is hemmed in by a past going one way (previous revision) and the future going another way (newer revision). Each way is presented as difference.

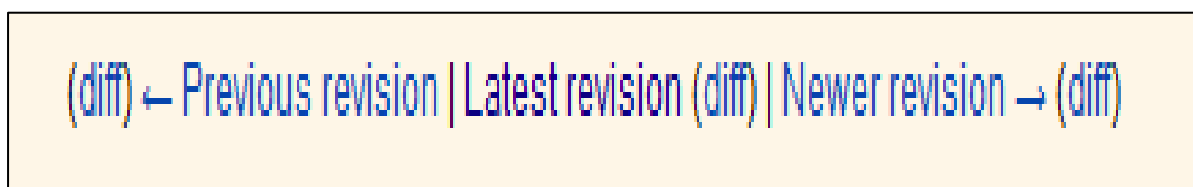


Figure 4: Screenshot of section included in banner above English language edition of the Great Smog of London, taken from the Wikipedia site (Schuller, 2022c)

According to the narrative of the site, the journey to improvement is not without errors. Each article is accompanied by a warning statement that

Besides normal editing, the reason for revision may have been that this version contains factual inaccuracies, vandalism, or material not compatible with the Creative Commons AttributionShare Alike License.

The warning statement, however, is in tiny print below the bottom of articles, and so unlikely to be read by many users of Wikipedia, particularly those with visual impairments. The form of temporal-spatiality described above seems to bear a similarity to that of a spool of cinematic film, wound at each end. This might be with the intention of creating the perception of continuing movement. The eye is drawn to a particular still (representing the present), with sets of stills going off to each side of this (into the past and present - see figure 5 below).

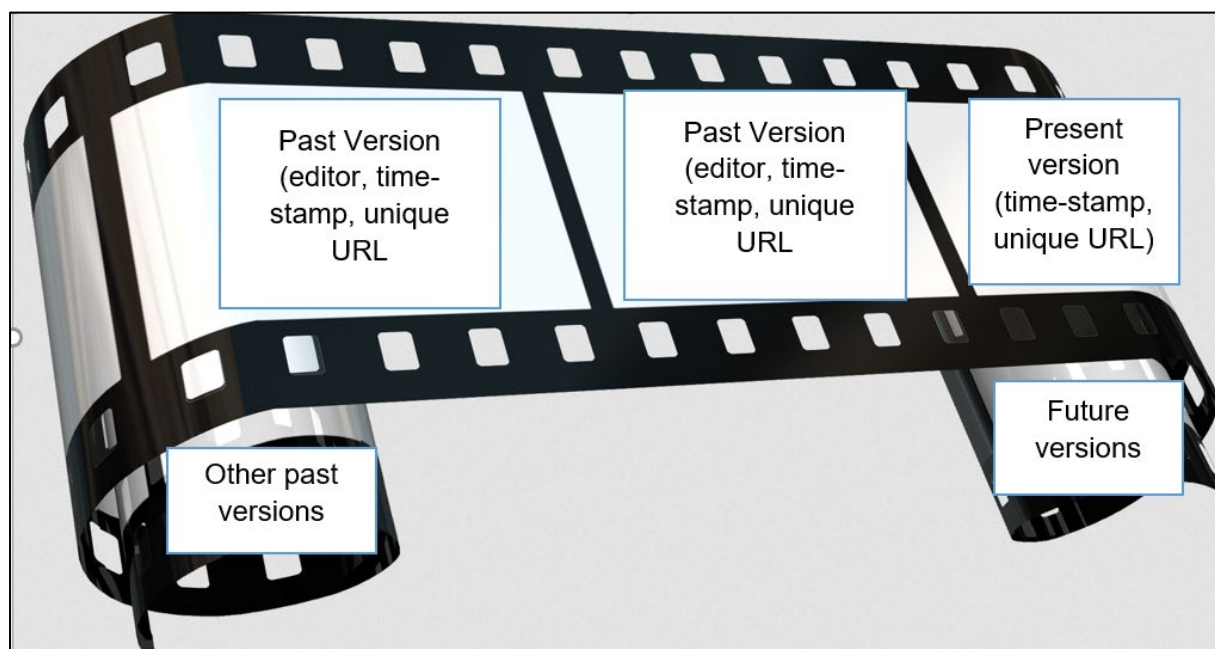


Figure 5: Adapted image of filmstrip, taken from PNG site (Schuller, 2022d, CC 4.0 BY-NC)

Readers on Wikipedia, through the templates on the site, can potentially choose to wind back to an imagined, materialised past existing as series of contained stills. Each of these is a fixed point in time and space as represented by a permanent, unique link. This is associated with a specific version of the article identified with a particular editor username and timestamp. Different versions of the article (from the past) can then be compared for difference via a Wikipedia tool for comparison (see figure 6). It is to be questioned, however, how many readers (as opposed to

experienced Wikipedians and researchers) use such tools - with the framing of Wikipedia articles focusing readers attention on the most visible text rather than surrounding information and options. Evidence from my literature reviews and data analysis also suggested that experienced editors (human and bot) would be likely to mainly use this tool to identify new edits and check their quality according to Wikipedian norms - rather than to explore different perspectives and choices that might be found in the past.

Within this broad construction of Wikipedia space-time, various normative policies and practices are applied that reinforce the sense of linear, traditional forms of authority. The generation of stable, authoritative facts, with particular attention given to language quality issues and standard layouts are viewed as evolutionary products, regulated and assured through normativity. The interactions of normative policies and practices with the most visible text (the article) on the Great Smog, within the wider construction of Wikipedian space-time, are explored in detail in the following sections.

The screenshot shows the Wikipedia interface for the article "Great Smog of London: Difference between revisions". At the top, there are navigation tabs for "Article" and "Talk", and a search bar. The article title is prominently displayed. Below the title, it says "From Wikipedia, the free encyclopedia" and provides coordinates: "51.507°N 0.127°W". A "Browse history interactively" dropdown menu is visible. The main content area compares two revisions. The left revision is from July 2, 2020, at 17:06, by user JeffSpaceman. The right revision is from July 5, 2020, at 13:47, by user Roisterer. Both revisions show "Line 99" with the following text: `[[Category:Health in London]]`, `[[Category:Smog events]]`, and a paragraph: "The death toll formed an important motivation to modern ecology and it produced a reconsidering of air pollution." The text in the left revision is highlighted with a yellow border.

Figure 6: Screenshot (taken 14 February 2022) of comparison between two versions of the English language article on the Great Smog of London (Schuller, 2022e).

5.3 The Construction of Memory: The Article as Common-sense Text

The following sets out how the text of the Great Smog has been produced in relation to other texts in a process of continuous, hyper-connected, (re)constructions.

5.3.1 The Text of the First Version of the Article on the Great Smog (English Language Edition)

The first edition of the article was written on 12th of August 2003 by a highly experienced, well-known Wikipedian (one with his own Wikipedia article) who produced numerous first edition articles on the site in its earlier years. The name ‘the Great Smog of 1952’ was the only information emboldened in the text of the article and no imagery was included alongside it. It was not clear what sources were used to generate the content as no citations markers or list of references were given for this text, apart from five hyperlinks to other Wikipedia articles. These included articles on London, fog, trams, buses and air pollution. It has been observed that in Wikipedia’s earlier years, editors often included content without citation. Such practices are now meant to be less common (Ayers, 2020, p.95) and are likely to be viewed by many Wikipedian editors as contrary to their norms.

The first edition (12 August 2003, Wikipedia, 2003) emphasised that the Great Smog was ‘a great disaster and formed one of the most important impetuses to the modern environmental movement’. This may have been to demonstrate its notability according to Wikipedia norms. A brief and broad description was then given of the causes of the Smog - with reference to human behaviours and industrial changes. This then led into to description of the smog as a metrological and chemically constructed phenomenon. The final paragraph emphasised that although there was no initial panic, the social shock at the number of deaths (as compiled statistics) led to people around the world to recognise the risks of air pollution and new environmental regulations. The editor of this article made specific mention of vulnerable groups including ‘mostly young, elderly and those with respiratory problems’.

5.3.2 The Text of the Article (English Language Edition) on 2 July 2020

I compared an edition of article on 2 July 2020 (the latest version of the article available to me at the time) with the first edition. The 2 July 2020 edition (Wikipedia contributors, 2020a) included the emboldening of two possible names of the crisis event (the 'Great Smog of London' and 'Great Smog of 1952'). The term 'Great Smog' was repeated across the page. Ford (2022) observes that Wikipedian articles need to be searchable through a range of possible terms and so articles may have more than one name. When users search on any of these terms they are then directed through to the article. Article titles can also link together language editions.

The word count had increased from 235 (in the first edition) to 1233 words - demonstrating the article had been substantially altered and lengthened since the first edition posted on 12 August 2003. Images (in boxes alongside the text) had also been added alongside the article. These included black and white photographs of Nelson's Column and Battersea Power Station. The image of Nelson's Column was boxed together with summarised information on the event.

This longer edition was more structured, and spelling and grammatical errors included in the first edition had been addressed. There were 37 embedded hyperlinks. This included 14 links to Wikipedia internal articles on scientific terms (from metrology, geology, chemistry and medicine), 7 links to places (London boroughs and Beijing), 4 links to names for the Smog (including two links to the term 'pea-souper'), 3 to organisations (the House of Commons; Met Office and Texas A&M University), 2 to dates, 2 to transport types, and 5 other links (forms of lighting, the politician Marcus Lipton, and the Netflix series 'the Crown'). In addition to the hyperlinks to other Wikipedia pages, 29 external sources were highlighted as citations (as blue numbering) throughout the article and in the referencing section under the article.

Aligning with the themes of the hyperlinks, the text of the main article emphasised scientific causes, including metrological and chemical constructions of the Smog, and its spatial (the British Capital of London) and temporal boundaries (Friday 5 December to Tuesday 9 December). Various estimates of casualties were included towards the beginning of the article. The title, location and casualties were also included as key facts in an infobox. Although it was recognised that the Great Smog

had an impact on research and UK government regulation, the event was not given the same level of global notability as in the first edition of the article. Sources of pollution were said to be related to the weather, particular post-war circumstances, the quality of the coal being used domestically, coal fired power stations and vehicle exhausts. These were then associated particular metrological and chemical combinations. Later paragraphs in the article focused more on effects, including more detailed, lyrical and potentially nostalgic descriptions of the effects of the Smog – including of visual scenes of people wearing smog masks and shuffling through streets. The identification of victims as being more likely to be very young or elderly or with pre-existing conditions had been kept from the first edition of the article, but more information had been added on a range of medical conditions. Political implications had been geographically bounded to the UK, with reference to specific UK political structures, politicians, legislation, regulation and other governmental interventions. Some content had also been added to the end of the article on the fictional representation of the Great Smog in the Netflix series ‘the Crown’. A sentence had been added to suggest that this episode had exaggerated the political importance of the event and the chaos that took place.

Both versions of the article emphasised that the Great Smog was an event in the past - including through the general use of the past tense and the way the event was described. The text of the 2 July 2020, both tightly bound (spatially and temporally) the event of the Great Smog itself and widened out the problem of air pollution to being a historic problem for London. The 2 July 2020 edition stated that (a) London ‘has suffered since the 13th century from poor air quality which worsened in the 1600s’; and (b) ‘London was accustomed to heavy fogs’. The 2 July 2020 edition also included connections between the event of the Great Smog and other time periods as linear change. This included (a) the number of deaths that following in the months and years after it, (b) the political actions that then arose out of this, (c) the social response to this, (d) then (due to ‘insufficient progress’) further a further smog event around ten years later; and (e) more recent research linking the Great Smog of London to pollution events in Beijing. This research article focused on the generation of the Great Smog in London and recent air pollution in Beijing as being ‘a combination of meteorology and chemistry’ but suggested that differences in such combinations meant that the regulatory approach of 1956 Clean Air Act could not be

successfully reproduced in China and the complexity of the problem in China held back any solutions (Zhang cited in Domonoske, 2016).

5.3.3 The Surrounding Text

Both editions of the articles (the first edition and the 2 July 2020 edition) were surrounded by text (mainly as embedded hyperlinks) that was not focused on the topic of the Great Smog. At the top of the article there were hyperlinked tabs to both the article and its talk pages (including editor comments and discussions). Above, and to the right of this, were links to a page where editors were able to directly edit the article and the edit history. This set out information on all the edits to the article that had been made since it had been first posted. Beyond links to generic information on Wikipedia and how to donate to it, many links to the left-hand side of the article seemed to be specifically aimed at potential editors and researchers including tools to learning to edit and cite sources. There were also links to the Wikidata item and information on other Wikipedia pages linked to the article - including other language versions of the article. There seemed to be some acknowledgement of those who might be less familiar with using online information through a link to a printable version of the page.

References, reading lists and external links, presented underneath the 2 July 2020 edition of article, were mainly hyperlinked to external sources. Underneath the references were links (embedded into text in much smaller font) to the layering and categorisation of themes on Wikipedia, information on when the page was last edited, and information on licences, terms and conditions, privacy policies, etc. A specific link for developers was included at the very bottom of the page. I followed many of the hyperlinks in the information surrounding the article into other Wikipedia spaces and external sources. This revealed various discourses, constructions and related social processes taking place across the site which would not be visible to many of those reading the article unless they understood the detailed organisation and norms of Wikipedia and the Semantic Web. Having explored the text that would be most visible to general web users arriving on the site via search engines, I then investigated how this text (the article) interacted with wider normative patterns and associated practices across the site, including with regard to the construction of Wikipedian space-time. With reference to my research findings, I was particularly

interested in disconnection from the article text as a form of marginalisation. My findings are set out in the rest of this chapter.

5.4 The Connection of Wider Normative Patterns and Associated Social Practices to the Article:

The following considers how changes in the most visible text (the article) interacted with wider patterns of discourse and related social practices, including normativity and typicality, as part a process of continuous (re) construction on/of a layered, relational archive.

5.4.1 The Recognition of Differences with Reference to a Normative Form of Linear Evolution

(A) The English Language Article

Normative power editing interacts with Wikipedia's definition of article evolution. Such editing is unlikely to be visible to general readers of an article but can potentially be revealed by researchers. In July 2022, clicking into hyperlinks at the top of the article took users of the site through to talk pages, edit histories, and statistical information. This began to reveal the activities of particular editors, including the work of power-editors. Statistics generated on the Wikipedia site suggested two of the power-editors of the article on the Great Smog were, or had been, Wikipedia administrators (towards the top of the Wikipedia hierarchy). One of these editors had posted the first edition of the article. According to Wikipedian narrative, administrators form a small percentage of all editors on Wikipedia (Wikipedia, 2022h, sustained). In addition to these administrators, several of the power editors of the Great Smog article used IP addresses, two were bots, and 15 others were registered users below the level of administrator. This included five who were auto confirmed users (registered accounts at least 4 days old, with at least 10 edits) - suggesting that it was not necessary to be senior in the Wikipedia hierarchy in order to become a power-editor. Adding many edits, however, would not necessarily mean that such edits would be sustained on the site, unless senior editors felt that they were normative (Viegas, Watternberg and Dave, 2004; Swarts, 2009; Panciera, Halfaker, Terveen, 2009).

According to Wikipedia's pages on editing activities, power-editors of the Great Smog article had made thousands - and in some cases hundreds of thousands of edits - across Wikipedia. One editor had made almost a million edits, and the two bots had each made more than four million edits across Wikipedia. Many editing activities relating to the Great Smog article were related to routinely creating standardisation including small-scale proofing, adding of citations and templates, and requests and responses. Registered users had added most of the internal and external links (with around half of these added by a small number of power editors) and categories, to the English language article. As Wikipedia articles are meant to be constructed out of trusted sources by editors, edits that add links to such sources have a powerful symbolic and functional value on Wikipedia. The finding on the power editing of Wikipedia from my data sample aligned to other research studies (Kittur *et al*, 2007; Panciera, Halfaker, Terveen, 2009; Matei and Britt, 2017; Arazy, 2017 Page, 2018), but also revealed the extent of editing across Wikimedia projects. This raised the possibility that some were power editing across many institutions (including on the web), although I was not able to further explore this using my own data.

Mainstream Wikipedian narrative recognises that many of its readers and editors are drawn onto Wikipedia by popular culture including fantasy fiction, and there are many Wikipedia articles that focus on this (Wikipedia, 2022i). Following the release of the Netflix episode of the Crown focused on the Great Smog of London, a number of editors added edits about the episode to Wikipedia articles in various languages, including the English edition. At least 14 edits relating to the Crown were made to the English language edition between November 2016 and 2 July 2020 by registered users and those with IP Addresses. On the 11 November 2016, an edit was made to the English language article creating a new section on '*popular culture*'. Information on the Netflix episode then was added to this. Several other editors also added information on other depictions of the Great Smog in popular fiction. This included edits about fictional depictions of the Smog on television; radio; video games; and novels. Edits relating to popular culture could potentially be due to commercialised editing of Wikipedia, although Wikipedia norms are meant to act against any undisclosed editing that might carry a conflict of interest (Wikipedia, 2020b). Edits relating to the Crown and other fictions depictions were removed several times by

editors over a period of several years, but the same information and citations were later reinstated by other editors. This demonstrated that information could be sustained on the site through active and repeated reconnection - even where the content may have otherwise not be sustained according to Wikipedian norms. Only editors with the resources to engage in this type of intensive editing (perhaps as paid, commercial or fan based editing) could sustain content in this way.

(B) Other Language Editions

There are many Wikipedian language projects, and figure 7 (Wikipedia, 2022j, mainly sustained) shows a small sample of these. According to Vrandečić (2020, p.177) only eleven language editions on Wikipedia have more than a thousand active contributors, and more than half of all Wikipedia editions have fewer than ten active contributors.

Chapter 5

• Statistics at 12:02, 23 January 2022 (UTC)

1 000 000+ articles

No	Language	Language (local)	Wiki	Articles	Total	Edits	Admins	Users	Active Users
1	English	English	en	6,442,511	55,050,987	1,062,708,005	1,061	42,929,868	123,829
2	Cebuano	Sinugboanong Binisaya	ceb	6,110,153	11,096,928	33,801,824	6	86,397	192
3	Swedish	Svenska	sv	2,712,372	6,383,463	50,014,231	67	805,933	2,340
4	German	Deutsch	de	2,656,426	7,342,900	218,011,703	189	3,852,489	19,357
5	French	Français	fr	2,391,526	11,744,810	189,690,738	159	4,285,683	19,019
6	Dutch	Nederlands	nl	2,078,800	4,407,754	60,763,784	36	1,187,555	4,277
7	Russian	Русский	ru	1,788,413	6,820,587	119,242,467	78	3,106,640	11,391
8	Spanish	Español	es	1,747,266	7,584,263	140,695,244	65	6,438,327	14,193
9	Italian	Italiano	it	1,737,262	7,316,273	124,938,656	120	2,208,808	8,563
10	Egyptian Arabic	مصرى (Masri)	arz	1,540,202	1,877,448	6,381,403	7	172,351	203
11	Polish	Polski	pl	1,506,203	3,481,774	65,857,312	104	1,146,742	4,605
12	Japanese	日本語	ja	1,310,365	3,861,763	87,462,952	40	1,884,884	15,408
13	Vietnamese	Tiếng Việt	vi	1,270,151	19,341,269	67,977,189	20	847,767	2,509
14	Waray-Waray	Winaray	war	1,265,643	2,881,377	6,281,266	3	50,695	99
15	Chinese	中文	zh	1,251,303	6,913,993	69,508,146	65	3,178,693	8,244
16	Arabic	العربية	ar	1,155,044	7,602,110	56,436,254	26	2,202,703	5,619
17	Ukrainian	Українська	uk	1,133,767	3,949,847	34,294,327	44	593,042	3,111
18	Portuguese	Português	pt	1,081,810	5,285,294	62,696,465	66	2,701,669	8,718

Figure 7: Screenshot of detail of list of wikipedias, taken from the Wikipedia site (Schuller, 2022f)

By the winter of 2021 there were 36 language editions of the Great Smog of London article. According to statistics generated on the Wikipedia site, several editors who had posted the first version of the article in various language editions (e.g., Hebrew, Korean, and Norwegian Bokmal) were associated with hundreds of thousands of edits and wide scale editing across other Wikimedia projects, including Wikidata and other language editions. The editors initially posting articles in the Romanian; Esperanto; Japanese; and Cantonese language article editions were also associated with thousands of edits, including edits of other Wikimedia projects. There were, however, several cases where the editor initially posting the article (Serbian, Turkish and Catalan projects) had only generated a relatively small number of edits overall.

Several bots were focused on adding hyperlinks to other language editions. On 22 Feb 2013, a bot (Addbot) added an edit to the edit history of the English language article on the Great Smog stating, 'Migrating 20 interwiki links now provided by Wikidata on d:q913640'. Interwiki links are used to link together projects and languages on Wikipedia. Vrandečić (2020, p.179) observed that 'before the introduction of Wikidata, bots kept the language links between the different wikipedias in sync and easily contributed 50 percent and more of all edits in many language editions. The automated statistics on the site (as of the 21 February 2022) identified the high number of edits made by bots in the case of some language editions. This included the Arabic (91% of edits), Indonesian (80%), Basque (67%), Turkish (58%); Persian (51%), Czech (45%), Catalan (44%), Esperanto (44%), Urdu (50%), and Vietnamese (41%) editions. After the episode depicting the Great Smog from Netflix Crown was released, related edits were added to the Hebrew, Hungarian, and Chinese traditional editions.

Initial editors of the Turkish and Dutch editions stated content had been directly translated from the English language edition. Experienced editors on the English language Wikipedia project continue to have access to content translation tools for all language editions of Wikipedia. This allows editors to create a new article based on an article in another language. The structure of the original article is preserved, existing content can be copied over, and the article categories are automatically chosen (Wikipedia, 2022k, sustained). It has been said that Wikipedia's content translation tool has been used to produce initial translations of Wikipedia articles,

and editors have translated more than 400,000 articles across different language editions of Wikipedia (Seitz-Gruwell, 2019).

5.4.2 Normative Editing as Gaming and Mystification in Advanced Capitalism

According to mainstream Wikipedia narrative, one of the ways Wikipedia is considered to have been more successful than previous on-line encyclopaedias, including its online predecessor Nupedia, is the speed at which articles are produced (Wikipedia, 2022I, sustained). This quantification of success (as sheer volume produced within the shortest time) may be a key driver of the production of content on the site across Wikipedia projects. The automatic statistics produced on Wikipedia (see figure 8 for an example associated with the English language article on the Great Smog) also emphasise the volume of data added to the site over time. Where individuals are identified, this is by volume of edits or amount of content that they have produced.

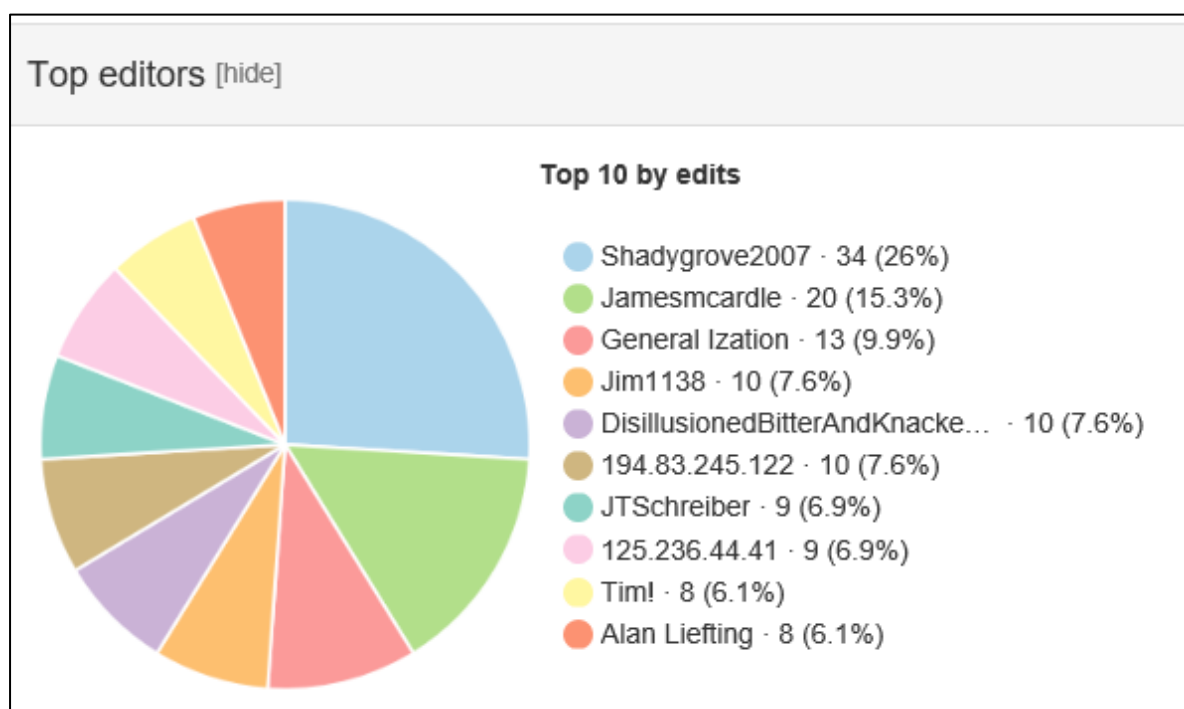


Figure 8: Screenshot of Wikipedia page statistics on the ten editors who had made the highest number of edits of the English language edition of Great Smog by the 14 August 2020, taken from the Wikipedia site (Schuller, 2020a).

The visualisations seem to represent both statistics and gaming score charts. Similar charts were available across most language editions and personalised for registered

users. Pentzold and Seidenglanz (2006, p.63), observed that Foucault (1972, p.153) had described 'discourse as "the great game of contradiction"'. Pentzold then went on to state that this was a 'topic highly related to the collaborative Wikipedia processes'. A well-known Wikipedia administrator and member of the Wikipedian Board of Trustees has stated that Wikipedia could be viewed as

A widely popular massive multiplayer online role-playing game (MMORPG). It is a massive, collaborative action research experiment... a knowledge-building social movement torn among the good-faith collaboration and pro-social behaviors and the inevitable political struggles, tensions, and reflections of social biases. Wikipedia RPG participants play the roles of encyclopaedia writers. Irrespective of their age or occupation, they are deadly serious about staying in character. They created a plethora of rules about putting their ego on the side, behaving in a civil manner, and so on (Jemielniak, 2020).

Social gaming has become widely popular and can draw in mass participants onto digital organisations. This can include mass participation in the conveying and learning of history (Kee *et al*, 2009). Gaming has also been associated with cooperation (Gold, 2021) and the establishment of trust on the web (Wang *et al*, 2016). Gaming, however, can potentially be used to enforce normative practises that are skewed towards the interests of elites (i.e., those who have accumulated gaming skills and resources – or in some cases, effective ways of cheating). Indications of skilled, elite, gaming on Wikipedia was found by Kostakis (2011, p.23). In case of Wikipedia only highly experienced Wikipedian editors are likely to be aware of its complex mesh of rules – putting other users at an immediate disadvantage. The adding of the need for speed to such a game might create additional disadvantage for less experienced gamers. Wodak (2000, p.113) noted, within a study of political negotiations, that a perceived need for speed could be used as an argument by elites for speedy selections and exclusions in the structuring of a shared text. Viegas, Watternberg and Dave (2004) researchers at MIT and IBM, developed 'history flow visualisations' (a form of big data visualisation) to study cooperation and conflict on Wikipedia. They concluded that there was evidence of 'first mover' advantage, where the initial text of a page tends to survive longer and tends to suffer fewer modifications than later contributions' (pp.580-581). Swarts (2009, p.285) research into 'the collaborative construction of fact on Wikipedia' on clean coal

technology also found evidence of closing moves, where ‘facts acquired more strength because to undo them, one needed to undo other facts attached to them, to undo work contributed by a wider base of participants who now have time and interest invested in their contributions’.

Although some scholars have described power editors as having special privileges, I was also struck by possible analogies with Burawoy’s (2012,p.193-194) interpretation of gaming within a factory environment, which he produced through his ECM framework. Burawoy observed how conditions had been created for the ‘constitution of *work as a game*’ which helped workers pass the time and ensure what might otherwise be considered meaningless work. The ‘social order pressured everyone into playing the same game with more or less the same rules’. Everyone continually evaluated each other on this basis, and it was ‘difficult to opt out without also being ostracized’. This game limited output, but also ‘got operators to work much harder and often with ingenious improvization’. Ultimately, however, profits were made by the employers. The whole system was strongly associated with unionisation in advanced capitalism, where punitive sanctions were less open to management, instead they had to persuade workers to deliver surplus labour, and manufacture consent. Any sanctions had to be applied within the rules of the game in order to retain hegemony and consent. Burawoy (p.195-196) also drew on Bourdieu in his analysis of such mystification and noted that although insiders might give great significance to such gaming, outsiders might perceive gamers as being complicit in their own exploitation, and their gaming as ridiculous. For Burawoy, misrecognition was seen to be due to the political and ideological apparatuses of production, with hegemonic regimes seeking to mystify exploitation.

5.4.3 Connections Between the Text of the Article, Normative Practices and the Talk Pages

(A) English Language Edition

Pentzold (2009, p.257) observed that the talk pages had a ‘pivotal importance for Wikipedia’s role as a global memory place and have been explicitly designed for settling the constantly occurring disagreements and disputes among the authors (see Pentzold and Seidenglanz, 2006; Viégas et al, 2007).

Page (2018, p.48) has also stated that

‘as Van Dijck (2013, pp.151-152) points out, these two layers of Wikipedia are positioned within its archive strategically, so the article front page as a ‘visible layer of consensus’ is promoted relative to the invisible yet accessible layer of discussion and a heterogeneous interpretation of the history and edit pages’.

The above academic interpretations differ from that of mainstream Wikipedia narrative which states that

‘Administration pages, including user pages, draft pages, policies pages, information pages, maintenance pages, talk pages and interactive forums fall completely within the bounds of administration, as distinguished from content’ (Wikipedia, 2022a, sustained).

Statements on Wikipedia talk pages also make it clear that comments on these pages are meant to be about improvements to the article from a normative wikipedian perspective rather than encouraging deliberation over content.

There were only 47 comments on the English language talk pages by 19 September 2021. Comments on the talk pages included those by registered users, IP address users and bots. The talk pages comments emphasised normative discourses on Wikipedia. A comment by someone identifying as Jimmy Wales (a so-called founder of Wikipedia), referred to possible copyright infringement. This was followed up (years later) by another registered editor's congratulatory comment. Another editor (one who had made major edits to the article) used the talk pages to summarise what they had done. No response was made to this, even though the editor's name was highlighted in red (they had no user page) which can be viewed as indicating non-normativity on Wikipedia. The preservation of the edits by this editor demonstrated that suspected non-normativity was not always automatically deleted (i.e., it could be found to be normative by Wikipedians). The Wikipedian focus on notability was found in talk page threads emphasising (a) the number of deaths from the Great Smog and (b) links between the title given to the event and visibility on Google. Beyond using the talk pages for highlighting Wikipedian normativity and non-normativity, there was limited evidence of deliberation over edits and related content.

Through clicking 1-2 links away from the article on the Great Smog, there was evidence that editors were using other talk pages to compare the notability of disasters. Reference to or memorialisation of individual victims (unless notable/elite) is usually discouraged on Wikipedia (Smit, 2018, p.155). The quantification of disasters (as the number of deaths), however, can lead to some discussions becoming intertwined with utilitarian arguments on how many fatalities or injuries are required before something could become considered a major disaster or unacceptable. A comment on a Wikipedia talk pages on the 2010 Russian wildfires (Wikipedia, no date, a) compared deaths and 'facts' from the Great Smog with deaths from air pollution in Moscow to gauge whether they could be considered within the norm. On another talk page (Wikipedia, no date, b) editors compared deaths from Chernobyl with the quoted number of deaths from the Great Smog and used this as an argument in favour of nuclear power.

(B) Other Language Editions

For many language communities, there were few, if any, comments on talk pages or reverts (suggesting limited editor engagement with the articles). Those with comments on talk pages were concentrated on major European languages, including Italian (6 comments, 4 by bots), Spanish (2 comments, 1 by a bot), French (4 comments, 1 by a bot) and German (38 comments, including registered users and IP addresses only) editions. It was not clear why this was the case, although later analysis of page views of different editions identified that the most widely spoken languages were those most likely to be viewed and edited by Wikipedians. On the French language talk pages, an editor suggested that the term with the most Google hits should decide the consensus position on the name of the article. An editor on the English language talk pages had also made a similar argument. No reference, however, was made to the interdependencies between Google and Wikipedia, including as part of the Semantic Web.

5.4.4 Connections between the Text of the Article, Normative Practices and the Construction of the Semantic Web and its Technologies

Beyond discourses indicating normative practices of editing taking place across the site, there were indications that technologists were editing articles to support the

development and operations of semantic technologies. This included through the editing of (1) infoboxes, portals and categories, and (2) sources.

(A) Infoboxes, Portals and Categories

An image of Nelson's Column in the Smog had been added relatively soon after the article had been created. This came from another Wikimedia project (Commons Wikimedia) and an open-access, crowd-sourced application called 'Geograph'. By 2014, the image of Nelson's Column had been transformed into an infobox via a Wikipedian template (see figure 9 below of infobox from 2 July 2020). According to Wikipedia narrative, infobox templates 'contain important facts and statistics of a type which are common to related articles' (Wikipedia, 2022m, sustained). These are also connected to knowledge graph technologies (Valentine, Myrie and Hart, 2020).



Figure 9: Screenshot of infobox associated with 2 July 2020 version of the English language Wikipedia article on the Great Smog of London, taken from the Wikipedia site (Schuller, 2022g).

Luyt (2015, p.1959) has noted that ‘much of the Wikipedia battle over whether the United States was defeated through the Vietnam War was waged primarily as a result of disputes over the content of the article’s Infobox’. Such edit wars may link to Wikipedia’s role in providing trusted factual claims to a wider relational Web. A Wikipedia help page describes infoboxes as

A fixed-format table usually added to the top right-hand corner of articles to consistently present a summary of some unifying aspect that the articles share and sometimes to improve navigation to other interrelated articles. Many infoboxes also emit structured metadata which is sourced by Dbpedia and other third-party re-users (Wikipedia, 2022m, sustained).

This could include metadata such which includes semantic classes, and according to Wikipedia narrative

About 44.2% of Wikipedia articles contained an infobox in 2008,^[13]and about 33% in 2010.^[14] Automated semantic knowledge extraction using machine learning algorithms is used to “extract machine-processable information at a relatively low complexity cost”.^[1] However, the low coverage makes it more difficult, though this can be partially overcome by complementing article data with that in categories in which the article is included”. (Wikipedia, 2022n, sustained).

Clicking into the infobox did not reveal whether information from Wikidata was being automatically transferred to the infobox and used to update the article, but embedded links in the infobox took the user through to other Wikipedia pages on Nelson’s Column, London, and coordinates (an embedded link to *GeoHack* – a collation of map sources used by Wikipedia). The infobox also included casualty figures that aligned to those included in the article. This meant that the information prioritised as facts on a major air pollution disaster reduced the description of the disaster to a certain number of deaths at a specific time and place. Analysis of edits evidenced that even this highly reduced set of facts had been amended by editors (both the normative and non-normative) on numerous occasions during the lifespan of the article, demonstrating the difficulty of arriving at any form of consensual information.

Information had been added underneath the article on how Wikipedians had categorised the Great Smog (see figure 10 below). This included links to Wikipedia portals on ‘the history of London’, ‘London’, ‘the Environment’ and ‘1950s’. Such portals link articles to encyclopaedic themes and related lists of articles (Wikipedia, 2022o, sustained). According to Wikipedia, portals and categories are meant to support readers to navigate the site and become editors (Wikipedia, 2022p, 2022q, sustained). The portal and categories, however, were located as small print at the bottom of the webpage and it seemed more likely that these would be used by committed Wikipedians and/or technologies to align so-called knowledge according to particular orderings, such as that of the Semantic Web



Figure 10: Detail from screenshot of categories included in 2 July 2020 version of the English language Wikipedia article on the Great Smog of London, taken from the Wikipedia site (Schuller, 2022h).

(2) Reliable Sources

(A) The English Language Edition

In the 2 July 2020 version of the article, there were 37 embedded hyperlinks to other Wikipedia articles, and 29 links to external references - many of which had been added some years after the article had first been posted. The majority of the hyperlinks to external references and further reading had been added by registered users. Several bots were also focused on reformatting of references. New or infrequent editors unfamiliar with Wikipedia norms may have added edits without realising that unless their edits adhered to certain norms (i.e., linked to trusted sources), they were unlikely to be sustained in the article over time.

Luyt (2021) has raised the issue of how sources are chosen on Wikipedia and found how, in the case of an article on the Philippine-American war, there was a tendency by committed Wikipedians to favour historical articles that were less likely to be critical of the USA and to claim this met Wikipedia's Neutral Point of View policy and the need to connect the text to so-called reliable institutions. Luyt suggested the use of certain sources evidenced a narrow bibliographical and epistemological perspective and did not necessarily prevent the use of biased sources (including primary sources) as references. He noted that sources may have been chosen because they were easy to access and free online, but there were other sources that were also easily accessible that were not used. Luyt concluded that the problem on Wikipedia was not only with the use of sources, but also the education of many Wikipedians on how to re(construct) the past.

Technical markup for the article on the Great Smog of London was accessed on the 14 October 2020, copied from the site and analysed on Word. The analysis of my data (see table 8) suggested that many of sources used in the English language version of the Great Smog article were typically semantically linked sources that could be automatically read by machines. As much of the funding for open access, Semantic Web ready data has been concentrated in the Public Sector, it would be unsurprising to find that many of these sources were national public bodies and broadcasters. Many of the sources given for the article on the Great Smog were not included in the Wikipedia list of perennial, reliable sources (Wikipedia, 2021f), suggesting that other factors were in play in Wikipedians choice of sources. As in the case of the perennial Wikipedia sources, however, many of sources used were from institutions located in the US and Britain. Most were also online, and there may be a requirement for Wikipedians to only use sources (within copyright) that can be clicked into and check by other Wikipedians (whether human or bot). It should also be noted that in several cases, the content was only available via the online archive 'the Wayback Machine' which can be used to replace deadlinks (where a link no longer connects to the material it was originally linked to) on the web. The 'Wayback Machine' is regularly used by Wikipedians to address deadlinks on Wikipedia. If such links were to exponentially increase over time, this could lead to the Wayback Machine becoming Wikipedia's main source, which could make it a particular target of manipulative and unfriendly actors.

Sources as indicated in the technical markup for the article.	Inclusion in the Wikipedia perennial, reliable sources list	The 29 citations in the article as numbered in article (2 July 2020)	Date of publication of sources	Confirmation that these sources are linked to the Semantic Web	Locational base of source provider
Ace.mmu.ac.uk.	Not included.	12.	1952.	No information found.	Britain.
BBC and Radio Times.	Identified as a reliable source.	1, 16, 27, 29.	2015, 2005, 2005, 2005, 2020.	✓ (Macdonald, 2011).	Britain.
Guardian and Observer.	Identified as a reliable source.	7, 17.	2002, and archival hard copy from 1950.s	✓ (Macdonald, 2011).	Britain.
Hansard.	No consensus.	19.	1953.	✓ (Li, Ding and Wald, no date).	Britain.
JSTOR.	No included.	8.	2015.	✓ (Widner, 2011; Synder and Coffman, 2019, White, no date).	United States.
The Lancet.	Not included.	21.	1997.	✓ (Bagnacani <i>et al</i> , 2015).	Britain.
The UK Met Office.	Not included.	9, 13, 18.	2014, 2009, and no date available.	✓ (Tandy, 2014).	Britain.
National library of Australia (NLA).	Not included.	5.	1661.	✓ (Stephens, 2012).	Australia.

Sources as indicated in the technical markup for the article.	Inclusion in the Wikipedia perennial, reliable sources list	The 29 citations in the article as numbered in article (2 July 2020)	Date of publication of sources	Confirmation that these sources are linked to the Semantic Web	Locational base of source provider
National Public Radio (NPR).	Identified as a reliable source.	15, 28.	2002, 2016.	✓ (Garlow, 2010).	United States.
PMC at NCBI (part of the United States National Library of Medicine (NLM)).	Not included.	3, 4, 22, 25, 26.	2004, 1976, 2003, 2003, 2002, 2002.	✓ (Salvadores <i>et al</i> , 2013; Peroni, Shotton and Vitali (2017); Garcia <i>et al</i> , 2018).	United States.
The Verge.	Identified as a reliable source.	2.	2017.	No information found.	United States.
WayBack Machine.	Not included.	11 and 14.	2001, 2002.	No information found.	United States.
Various Publishing Houses.	Not included.	6, 10, 20, 23 and 24.	1662, 1991, 2002, 2001, and 1976.	No links or URLs were provided.	

Table 8 External sources used in the English language edition of the Great Smog, with possible connection to the Semantic Web

(B) Other Language Editions

Analysis of all the language editions of the Great Smog article (data taken from current articles on 21 February 2022) evidenced that some language editions included no or few sources. This included Czech, Catalan, Esperanto, Urdu, Vietnamese, Bulgarian, Romanian, Polish, Azerbaijani, Greek, Occitan, Korean, Welsh, and Dutch. Only a few languages included volumes of sources close to those found in the English language edition. This included the Turkish (which had been initially posted as a translation from the English language article), Italian, Russian, and Serbian editions. In most cases, where sources were used, these were the same as for the English language edition. Only certain sources from the English language edition, however, were widely found across other language articles. The BBC was the source most likely to be shared. Articles referencing the depiction of the Great Smog in the Netflix series *The Crown* and other media series were included in Turkish; French; Hebrew; Hungarian; and Chinese editions. The above findings suggested that, in the main, editors of other language editions were not applying the approach recommended for the English language edition by treating sources from their language community as preferable (Wikipedia, 2021c, sustained). As Wikipedian norms required editors to edit through directly drawing on reliable sources, the lack of alternative sources (to those from the English language edition) left limited room for alternative interpretations of the event of the Great Smog of London across other language editions, unless editors edited non-normatively.

5.5 Forgetting through Disconnection: Text Disconnected from the Article over Time.

The above sections have reviewed how connections between text interact with what is sustained in the main text of the English language edition of the Great Smog article over time. The following explores what is disconnected from the main text and how this relates to the normative values of Wikipedia and the wider Semantic Web. Edits are not normally removed from the site completely, but rather normatively disconnected from the main text (the article), while remaining in the edit history. Over time these become less visible in the edit history layer unless a user is prepared to click and read back through 1000s of edits.

5.5.1 The Disconnection of Intentional Non-Normativity from the Article, through Normative Practices

So-called vandalism on Wikipedia has been explored by scholars (Van Dijck, 2013), although not in terms of the (re)construction of memory. Many readers of Wikipedia may only see one version of the article, and this may be one that has been substantially subverted. This contrasts with experienced Wikipedians who will continuously monitor multiple pages and seek to maintain what they consider normative text over time. Wikipedian policy discourages the use of the word vandal and encourages editors to start with an assumption that the edit has been made in 'Good Faith' (Wikipedia, 2021). The policy also outlines the difficulties in spotting so-called vandalism. Editors are given various guidance on this, including paying attention to suspicious edits by IP addresses, usernames highlighted in red (registered users without a personalised user page) or obviously improvised usernames. I found, however, non-normative edits were rarely raised or discussed on talk pages. Ford (2015, p.29) noted evidence that 'majority of deletion discussions have very few participants, most of whom have previously participated in such discussions as experienced users (Geiger & Ford, 2011...Schneider, Samp, Passant & Decker (2013))'.

(A) The English Language Edition

Working with my sample of edits relating to the Great Smog, I counted all edits with a puerile element (e.g., using rude words or 'I was here' type statements). I classed these as deliberately non-normative edits. I also included more subtle forms of non-normative editing (e.g., random deletions or word changes, etc) undertaken by the same editor who were making puerile edits. There were other edits by other editors that may have been deliberately non-normative (removing large amounts of material from the article, adding many random characters, etc), but I chose not to class them as such as I had no means of understanding whether they were deliberately subversive, or not. I identified 202 examples of non-normative edits for the English language version of the Great Smog of London article. They were a substantial percentage (17%) of my sample of edits. Many, however, only interacted with one edition of the article before they were disconnected from the text of the article by normative editors. This meant that they were not sustained over time.

There were, however, indications of non-normative editors adapting to the normativities of Wikipedia. Several used community tags to deliberately point out that their edits were subversive. Other non-normative editors used delete functions to remove swathes of information from the article. Such edits were soon detected and reverted. There, however, could be confusion over what information had been there previously, including non-normative edits. This resulted in some deliberately non-normative edits remaining connected to the articles text for longer periods of time. In some cases, reversions of deliberately non-normative edits were made by those who had originally made them. This was a version of subversion which had the benign appearance of carefully staged compliant behaviour (Ybema and Horvers 2017).

A Wikipedian article on vandalism stated that

Sometimes vandalism takes place on top of older, undetected vandalism. With undetected vandalism, editors may make edits without realizing the vandalism occurred. This can make it harder to detect and delete the vandalism, which is now hidden among other edits. Sometimes bots try to fix collateral damage and accidentally make things worse. Check the page history to make sure you're reverting to a "clean" version of the page (Wikipedia, 2021, sustained).

A substantial number of reversions of deliberate non-normative edits of the Great Smog were associated with community tagging (giving short explanations of editor actions) in the edit history. These indicated which editor had reverted an edit, and which version had been reverted to. The majority of the tags by bots gave explanations referred to identified 'vandalism' or 'possible vandalism'. Many registered editors, however, did not use the term vandalism in their tagged explanations. Tags had not led to further discussions on the talk pages.

The first reversion of an edit identified as possible vandalism of the article took place in January 2006, over two years after the first edition of the article. This reversion was undertaken by a registered editor, and the majority of reversions (or overwrites of edits I was able to distinguish) were undertaken by registered users (64%). Editors identified by Wikipedia statistics as being in the 'top ten' had undertaken 14% of reversions. Bots were not highly active as other editors (generating around 7% of all edits to the article compared to 53% by registered users and 40% by IP addresses).

There were only 36 reverts of possible vandalism by bots and they did not revert edits until late October 2009. ClueBot NG undertook around 30 reverts (2% of all the edits and 13% of all reversions) of what was tagged as possible 'vandalism'. Zheng *et al* (2019) found that ClueBot NG (one of the most active bots on the site programmed to detect and revert vandalism) was found to have a negative impact on continuance. The majority of the edits, however, reverted by ClueBot NG were puerile edits by IP addresses. Where the edits of named accounts were reverted these tended to be highlighted in red (i.e., they were not associated with personalised user pages). As in the case of many of the other bots, Cluebot NG identified its edits (reversions of edits) as minor. The increasingly complex forms of subversion (mimicking normative behaviours by Wikipedians), however, raised questions over how effective a bot-human system could be at spotting and addressing such behaviours.

The above findings raised the possibility that all editors and readers of Wikipedia were working with subversive editing, either knowingly or unknowingly. The motivations of subversive, non-normative editors were impossible to for me to explore using anonymised data. Such editing may have been the work of school children, non-conformists, disaffected Wikipedians (e.g., one subversive edit to the Great Smog referenced the norms of the Wikipedia project) acting like subversive bureaucrats (Ybema and Horvers 2017; Jenkins, Burton and Holmes, 2021), or agents of unfriendly states. Some of the edits may have been produced by bots automatically inserting what seemed to be nonsense information (strings of numbers or letters) due to an inability to interpret the meaning of the content from a human perspective. Some experienced Wikipedians might also undertake threat testing - attacking articles with the agreement of other Wikipedians to test the robustness of site against unfriendly edits. Another possibility was that Wikipedia articles might be targeted because of their alignment with traditional western perspectives. For example, graffiti or tagging might be used as a form of political communication or protest (Luhtakallio and Eliasoph, 2017, p.6). In a recent study (Wilson *et al*, 2021) of 123 public statutes (mainly of men) in New Zealand it was found that a quarter had been attacked at least once, and these attacks had increased since the 1990s. They included graffiti, damage, and destruction. Statues of royalty, military personal,

famous explorers, politicians, and those associated with colonialism or abuse were more likely to be attacked than others.

The above suggested that further research was needed on non-normative editing on Wikipedia. The information I was able to glean from my data sample gave me little material with which to explore how marginalised groups might be undertaking acts of resistance on the site. Other researchers would also face the problematics of user anonymity, but it might be able to reveal possible focuses of such editing. Targetted, intentional non-normative editing focused on particular types of articles might give some indications of the motivation of individuals and groups. If, however, such editing was directed at all articles - including obscure ones unlikely to be visible (through searching) to most people (including children and young people) - this might suggest a concerted attack on the site as a whole.

Deliberate non-normative editing on Wikipedia can also include commercial editing (editing for financial gain). This is discouraged by Wikipedian policy (Wikipedia, 2020b), but such editing may still take place on the site e.g., through the adding of product placement such as fictionalised accounts of the Great Smog. In addition, technologists may seek to develop the site in a way that suits the construction of their own technologies. In the latter part of 2019, tabs were present (above the English language article on the Great Smog) entitled 'sources', 'books', 'newspapers', 'scholarship'. Clicking into these tabs led the user through to Google services. The hyperlinked '*find sources*' took the user to the Google search results for 'Great Smog of London' - returning me to the path by which I had arrived on the site. Clicking on '*Newspapers*' took the user through to the Google news archive, '*books*' went through to Google books mentioning the Great Smog, and the '*scholar*' linked to Google Scholar. These links were also present in the technical markup for the page - available through pressing the F12 button on a computer keyboard (see figure 11 below). A little later these links were removed from the site.

```

45 <div id="bodyContent" class="mw-body-content">
46   <div id="siteSub" class="noprint">From Wikipedia, the free encyclopedia</div>
47   <div id="contentSub"></div>
48
49
50
51   <div id="jump-to-nav"></div>
52   <a class="mw-jump-link" href="#mw-head">Jump to navigation</a>
53   <a class="mw-jump-link" href="#p-search">Jump to search</a>
54   <div id="mw-content-text" lang="en" dir="ltr" class="mw-content-ltr"><div class="mw-parser-output"><div class="shortdescription nomobile noexcerpt noprint searchaux"
style="display:none">1952 air pollution event in London, United Kingdom</div>
55 <table class="box-More_citations_needed plainlinks metadata ambox ambox-content ambox-Refimprove" role="presentation"><tbody><tr><td class="mbox-image"><div style="width:52px"><a
href="/wiki/File:Question_book-new.svg" class="image"></a></div></td><td
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title="Wikipedia:Verifiability">verification</a></b>.<span class="hide-when-compact"> Please help <a class="external text" href="https://en.wikipedia.org/w/index.php?
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Markup/1">adding citations to reliable sources</a>. Unsourced material may be challenged and removed.<br /><small><span class="plainlinks"><i>Find sources:</i>&#160;<a rel="nofollow"
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<b>·</b></a> <a rel="nofollow" class="external text" href="https://www.jstor.org/action/doBasicSearch?Query=%22Great+Smog+of+London%22&acc=on&wc=on">JSTOR</a></span></small></span>
<small class="date-container"><i><span class="date">July 2019</span></i></small><small class="hide-when-compact"><i> <a href="/wiki/Help:Maintenance_template_removal"
title="Help:Maintenance template removal">Learn how and when to remove this template message</a></i></small></div></td></tr></tbody></table>
56 <p class="mw-empty-elt">
57

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Figure 11: Screenshot of the technical markup of the English language edition of the Great Smog of London in late 2019, taken from the Wikipedia site (Schuller, 2019)

(B) Other Language Editions

For many language communities, there were few reverts (suggesting limited non-normative editing). In late March 2021, however, the Russian edition had been subverted on a mass-scale. Every entry listed within the edit history stated that ‘in the meantime there is no need to know about it’ (see figure 12 below). Another Russian language edition article on pollution (Загрязнение), included the same statements across its edit history (Schuller, 2021a). The deliberate non-normative editing of the edit histories rather than the article meant that these edits were sustained longer than many non-normative edits of the main article tend to be. This might suggest that Wikipedia was being subversively edited at deeper layers.

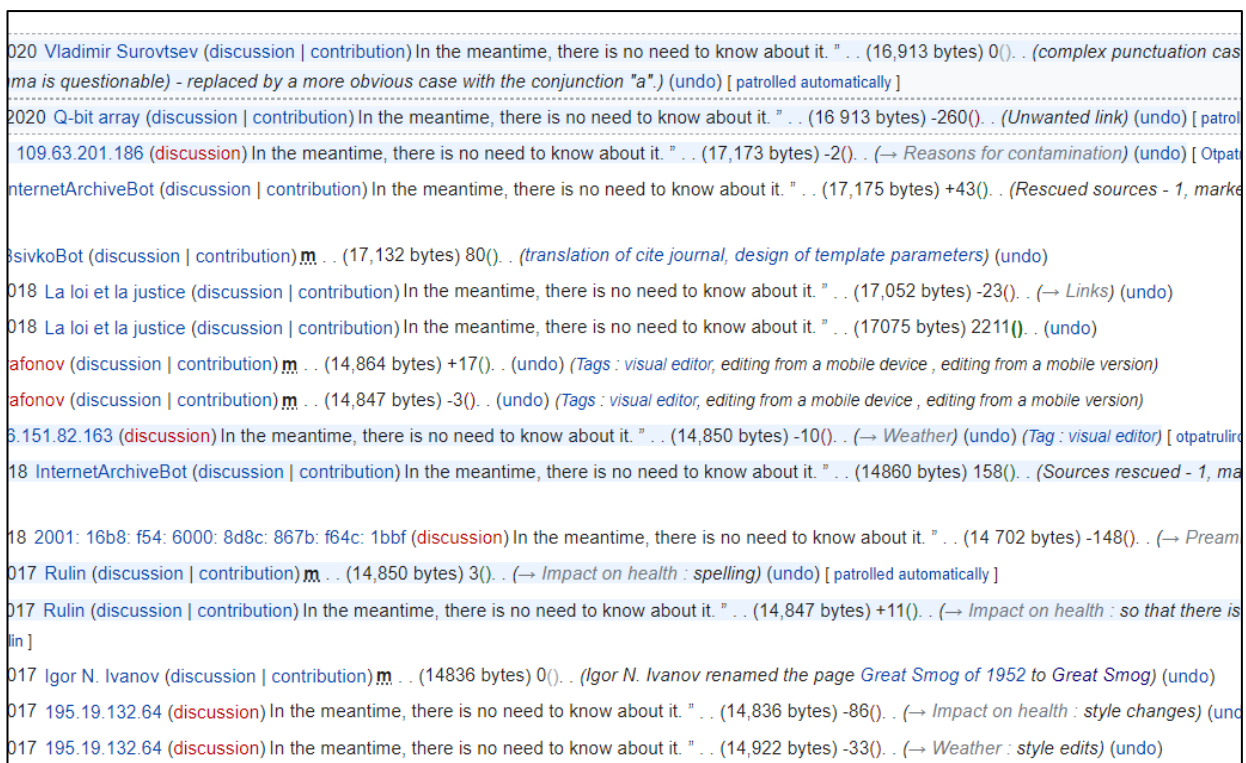


Figure 12: Screenshot from the edit history of the Russian language article of the Great Smog, taken from the Wikipedia site (Schuller, 2021b).

5.5.2 Disconnection of the Edits of Other Non-Normative Editors from the Article, through Normative Practices (English Language Edition)

In addition to the deliberately non-normative edits, other edits had been reverted or overwritten, including edits that might be viewed as 'good faith' edits by Wikipedian standards. Following a comparison of the initial version of the article (created 12 August 2013) and 2 July 2020 edition, I found of 62 edits which added sentences and paragraphs, half had been reverted or overwritten by other editors. These included edits relating to descriptions of the operation of London transport, some well-known figures (the Queen Dowager and Churchill) and other events that had taken place at the time of the Great Smog. On several occasions, edits associating the Great Smog with a more recent smog in London (2014) as being the worse air pollution in Europe (which was supported with a citation from the Guardian) were removed by other editors. In the case of the initial removal, the explanation given by a community tag was 'nonrelated info removed'. The editor responsible for the second removal provided no explanation. A statement on pollution coming from Europe in 2009 was added by a red linked editor and then questioned by another editor who stated that Britain was in Europe. A further editor then highlighted the original statement as cultural offensive and removed it. This was reverted, but several years later the statement was removed due to lack of citation. Various edits had also been added on air pollutions events in other times and places including: the 1936 St Louis Smog, the Donora Smog, the 1930 Meuse Valley Fog, the 2013 Harbin Smog, the 2013 Shanghai Smog, London Low Emission Zone, the 1966 New York City Smog, Air Pollution in Delhi and the Ultra-Low Emission Zone. Reference to these other events (under a section labelled 'also see') was removed by a single editor. The explanation given for their removal was 'trim'. In addition, various edits had been added and removed to the section of the article on 'representation' by popular culture, perhaps due to concerns over commercialised editing.

5.5.3 Disconnection of Comments on the Talk Pages from the Article (English Language Edition)

One of the main threads in the 'talk pages' associated with the English language article of the Great Smog was entitled 'Change Title, add facts'. This thread focused on the name of the article/event. An English language Wikipedia policy

provides guidance on naming conventions (Wikipedia, 2022r, sustained), and clarifies that the names of events (as Wikipedia articles) must be based on what normative Wikipedians regard as 'reliable sources', and resemble the titles of similar articles. Table 9 below demonstrates that little debate took place over the name of the event, and the limited degree to which talk page comments and editing interacted with one another. Arguments that the title should be settled with reference to personal experience or alternatively Google searches, resulted in no immediate editing to the text of the article. There was no discussion of how the naming of the disaster might impact on longer-learning around industrial-environmental disasters. The Great Smog of London, for example, may align with Wikipedian policies emphasising the major and unique, but does not associate this memory with negative connotations in a way that other possible titles like 'the toxic or killer' smog or air pollution disaster of London (1952) might do. In media articles in other countries currently experiencing smog, such as India, the 'Great Smog of London' had been compared to smog taking place in the present. In some cases, this had been used to highlight the level of the problem (Jha, 2015) and learning lessons from the past (Kazmi, 2016), but in other cases it has been used to suggest that a country has reached similar levels of industrial progression to the British Empire. Pillai (2016), for example, entitles a media article in the Hindustan Times 'Greater than the Great Smog: Delhi 2016 leaves London 1952 behind'. The term 'Great' also makes the memory sound major and unique, rather than part of a longer-term problem of air pollution. Intergeneration communications would also need to be considered and increasing the term smog is less likely to be used contemporary publications than the term 'air pollution'.

The time gaps (of years) between many of the comments also raised questions over how far the talk pages could be viewed as a layer of discussion leading to a consensus view. There was little evidence that editors returned to view the talk pages and comments after they had posted their own comment. This is not unusual for web fora. The patchy use of talk pages for discussion and explanation on Wikipedia has been raised on Meta: Wikimedia where one editor described how he had attempted to carefully negotiate Wikipedian norms, including through the talk pages, but still found his comments were constantly reverted by a power-editor of those pages (Meta: Wikimedia, 2022b).

Date of Comment on Talk Pages	Comments made in relation to title of event – including under thread ‘change title, add facts’	Changes to article made by this editor relating to their comment.
8 May 2006	Editor suggested other terms were more valid to describe the event than ‘smog’.	No related edits to the article were made.
21 August 2006	The above editor raised need to validate or reject a statement in the article attributing the cause of the event to various types of public transport. This was linked to a further comment (made alongside the editing of the article) stating that as no one had objected to their suggestions, they had edited the article.	The editor who made the comments on the 21 August, then made edits to the article - changing the name of the event.
2 September 2006	Another editor made several references to trusted sources (the BBC and Met Office) to justify further changes to the name of the event.	The editor making the comment on the 2 September (with reference to a BBC article) reverted the edits made by the editor on the 21 August (above).
16 December 2007	Another editor suggested possible sources for the term smog, including referencing the above editor.	No related edits to the article were made.
29 February 2007	Bot added a signature to the above comment	
5 December 2011	Another editor added a comment arguing for the use of a particular term for the event based on their direct experience at the time the event.	No related edits to the article were made.

Date of Comment on Talk Pages	Comment made in relation to title of event – including under thread ‘change title, add facts’	Changes to article made by this editor relating to their comment.
5 December 2011	Bot added signature to above comment.	
5 May 2011	Another editor argued for the term ‘the Great Smog’ based on Google Search results.	No related edits to the article were made.
23 November 2017	Another editor contested use of the term ‘Great Smog’ by referencing their direct experience.	No related edits to the article were made.

Table 9: Interactions between the editing of the English language edition of the Great Smog of London and associated talk page comments on its title.

5.5.4 Sources Disconnected from the Article

(A) English Language Edition

A search on the Web of Science database for academic articles (Summer 2020) on ‘London’ and ‘air pollution’ identified 4,667 articles from 1951 to 2020 across various countries and disciplines. 152 articles were identified for ‘London and smog’ and 41 articles for the Great Smog of London. Some of these reflected retrospectively on the Great Smog of London, but many took comparative views of the Great Smog and contemporary smog events both in London and elsewhere in the World. Beyond the mainly scientific publications included on the Web of Science, Google Scholar returned many other publications written on the Great Smog of London from the viewpoints of social history, politics, law, etc. Only one of the sources (Wang *et al*, 2016) included in the English language and several other language editions of the Wikipedia article, however, connected the Great Smog to contemporary air pollution events. This source heavily focused on chemical and atmospheric constituents of the Smog, rather than considering its socio-political causes and implications. In contrast, other publications available through Google Search (Read and Parton, 2019; Li and) gave more consideration

to socio-political issues interacting with the Great Smog and contemporary air pollution events. Some of the above publications were behind publication firewalls and subject to copyright, while many publications produced before digitalisation would not be online or searchable. Ayers (2020, p.97) stated that the use of reliable sources in creating Wikipedian content had been supported by 'hundreds of libraries and librarians, but that the project is hindered by the current system of scholarly publishing' (p.95), which means that Wikipedia does not have access to all the latest research. Ayers also noted that 'marginalized stories aren't recorded, or if they are recorded, they are not widely distributed. Libraries tend to collect in the languages of their constituents, leaving out published works from the rest of the world'.

The use of certain online, free access, sources, however, did not necessarily explain why only certain text was included in the text of the Wikipedia article. The following table (table 10), for example, evidences that a number of the media articles referenced included content which was critical of social and political conditions. Wikipedians, therefore, had gone beyond normative constraints over sources and specifically chosen non contentious content from so-called trusted sources.

Table 10: Critical content found in news references associated with the main text

Reference number, in 2 July 2020 edition	Media sources (included in references)	Critical Content
1	BBC News, 22 December 2015	Several references to governments (at national and local level) turning a blind eye to air pollution, or not taking sufficient action. Also highlighted problems with air pollution in the present, particularly from vehicle emissions.
7	The Guardian, 2002	Reference made to inadequate government funding and problems with air pollution in the present, particularly vehicle emissions.
2	The Verge	Reference to Labour party politicians lobbying on the issue of air pollution. Also mentioned the names of individuals who were caught up in the disaster and lost loved ones. Concluded by being very critical of contemporary pollution.
16	The BBC, no date	Reference made to further air pollution through the several decades, including through vehicle pollution.
17	The Guardian, 1952	Described the event in terms of negative social and physical outcomes.
27	The BBC, no date	As for reference 16 above.

B) Other Language Editions

In the case of other languages, disconnection from English language sources did not automatically equate to suppression but could also potentially indicate an expression of independent (re)constructions of memory. Many language editions of the Great Smog had no sources, or only included sources transferred across

from the English language edition. In other cases, editors in other language communities had specifically added other sources in their own languages (see table 11). The alternative sources tended to be media sources or academic sources out of copyright. Some of these sources, however, made strong connections between the Great Smog and contemporary pollution and related politics. The Persian version of the article, in particular, drew in many sources (mainly referencing contemporary events) written in the language it purported to represent. Many of these seemed to be sources that were highly critical of the Iranian Government's response to air pollution in the present. It was, however, not possible for me to confirm the identity of the editors of this text and so motivations remained unclear.

Table 11: Differences between language editions of the Great Smog article

Language Edition	Sources for Other Language Editions (From version of article on Wikipedia on 21 February 2022)
French language article.	Included a link to a French source in the French edition.
German language article.	Included additional links on relevant legislation such as the EU Directive on air pollution and the Clean Air Act. There were also links to German language articles from German media sources. The talk pages of the German edition included an editor specifically stating that they wanted to include German language sources.
Italian language article.	This included a source/link to Italian language articles about the news of the referral of a pollution related case against the Italian government to the EU Court of Justice. This article was critical of the Italian Government.
Japanese language article.	Sourced a Japanese publication on air pollution and health.

Language Edition	Sources for Other Language Editions (From version of article on Wikipedia on 21 February 2022)
Persian language article.	This included many additional links to sources in Persian that referenced air pollution and related health problems in Tehran. The number of these additional sources made it likely that there were substantial differences between the Persian and English editions.
Portuguese language article.	Included sources/hyperlinks to a range of other Wikipedian articles on environmental issues including climate change, the Kyoto protocol, global warming, greenhouse gases, etc.
Polish language article.	Included a source/link to a Polish language webpage by 'Smoglab' that made observations about the unwillingness of politicians to go against public opinion and industry to address the smog.
Romanian language article.	Both sources for the article were in Romanian and marked with 'Ro'.

5.5.5 Separating the Memory of a Disaster from the Memory of Political Response and Accountability.

Wikipedia's decisions on how to bound articles also created gaps which had political implications. The article on the Great Smog was separated (apart from hyperlinking) from another article (Wikipedia, 2022s) on the legislation (the Clean Air Act) that was put into place in wake of the Great Smog. In addition, there were only five editions of the article on the Clean Air Act 1956 in languages other than English, although there were 36 articles on the Great Smog in languages other than English. As of the 21 February 2022, the Wikipedia statistics showed that the English language article on the Great Smog had been viewed by 5,251,373 times, compared to 388,116 views of the Clean Air Act 1956. This potentially meant that although millions of readers had supposedly accessed the description of the crisis

of the Great Smog of London (including descriptions of its metrological and chemical constituents) far fewer had read details about how this crisis had politically dimensions engaging with particular organisations, and that legal-political solutions had been put in place to prevent similar crises in the future. The article on the Clean Air Act, however, was also positioned as being of the past - with no references to very recent smog or the limited long-term impacts of regulation due to the adaptation of industrial practices i.e., in contemporary Britain many forms of air pollution cannot be seen by the naked eye.

5.6 Conclusion: Interactions with the (Re)construction of the Great Smog

The above sets out the findings from the local-macro stages of my extended case study. These give attention to the construction of a layered memory representation of the Great Smog of London on Wikipedia. This is with reference to interactions with normative Wikipedian policies, practices, templates, individual editors and their impact on the visibility of layers of text from the perspective of general users of the site. Such layers include the article (the most visible text for those arriving at the site via search engines) through to less visible information (e.g., the edit history and talk pages). All of these layers are related to the broader construction of Wikipedian 'evolutionary' spacetime - aimed at generating and maintaining authoritative facts. The following summarises my findings on how this layered construction interacted with the online memory of an environment/industrial disaster. Such interaction has implications for the degree to which marginalised groups at high risk for such disasters (i.e., those in highly polluted areas and at higher risk of related health conditions) can learn from the past in a way that is relevant to their present. Air pollution continues to take place in London and other locations.

In summary the changes between the versions of the article on the Great Smog on the 12 August 2003 and 2 July 2020 (English language edition) included:

- (1) The establishment of a small number of facts which were repeated throughout the article and in the infobox. These included the title of the event, time, location, and causalities. Such facts could be of particular value to those developing semantic technologies (including search engines and AI) that claim social authority and the capacity to resist misinformation.

- (2) increased emphasis on the article being built out of citations from trusted sources rather than being the work of a single editor. Wikipedian policies on no original research and verifiability (Wikipedia, 2021c) have enforced these types of changes across Wikipedia. This has represented a move to increase its narrative of traditional, but also democratic, forms of authority.
- (3) greater focus on structure, spelling and grammar - establishing authority according to Wikipedian norms of article evolution (Wikipedia, 2022g).
- (4) added images and templates, including infoboxes (with associations with the Semantic Web) and portals and categories enabling standardised categorisations/orderings which could support the development of semantic technologies.
- (5) increased temporal and spatial boundaries for the event (the Great Smog) including through its name, location, coordinates, and start and end dates (also found in the infobox). This bounded the event to London, England, UK - supporting the production of a notable, separated, classifiable entity according to Wikipedian norms. This potentially strengthened the relationship between the event and the orderings of the Semantic Web. The increased temporal and spatial boundaries could have potentially supported highly localised understandings of disasters, but Wikipedian norms acted against the adding localised, experiential perspectives. The article also defined an environmental disaster as being of the past and unusual. Scholars working on disaster risk reduction have identified that such approaches might reduce the likelihood that past events will support learning in the present (Monteil, Barclay, Hicks, 2020, Sutton *et al*, 2020; Gerster and Maly (2022). The contained perspective of the Great Smog (as belonging to the UK) was taken into other language editions through shared links, text and sources.
- (6) greater reference to air pollution in London before and after the Great Smog, but only up until 1962. One external source linked the Great Smog to recent air pollution in Beijing. This expanded the container of the Great Smog, but in a way that suggested that there were no lessons to be learnt within a different space in the present. The article also reinforced a control

narrative of disaster - recreating the past to instigate a linear view of progress towards modernity (Barbosa and Coates, 2021, p.10).

- (7) disconnection of the Great Smog (as an event) and the arising of global awareness of the risks of air pollution and environmental activism across the world. This was challenged by the adding of critical sources in other language editions - although this did not automatically result in new content being added to the articles.
- (8) added sources associated with institutions using semantic technologies.
- (9) content added from external and internal (other Wikipedian articles) sources physically describing the problem as 'exogenous objective 'things' and blaming nature (e.g., the weather). This was combined with the lack of reference to other types of ontological or epistemological positioning, including those emphasising social and political causations and/or seeking to empower marginalise groups to hold powerful actors to account.
- (10) added commercialised, fictionalised content.

The above suggested that the policies and operations of Wikipedia operate to support semantic technologies, rather than increasingly the visibility of powerful actors in the development of disasters or implications for marginalised groups at high risk from such disasters. There was no detailed consideration of how the politics and economics of industrialisation and related marginalisation contributed to the disaster and continuing air pollution. This was the case even though air pollution, including smog type events, continues into the present day across various locations across the world (Zhang and Samet, 2015; Jha, 2015; Czerwińska *et al*, 2019; Read and Parton, 2019). Oliver-Smith *et al* (2017) has noted that respective analysis of disasters rarely mentioned technical, social, economic, political or cultural causes. The absence of alternative social and political perspectives and experiences (including of marginalised groups) was taken into other language editions through the use of certain English language sources. The main exception to this was the article in Persian that seemed to be constructed to be highly critical of the present Iranian government.

In terms of the representation of marginalised groups, no additional content had been added to the later edition of the article on those who were most likely to be at

risk from a severe air pollution event. There was only one short citation from a direct witness (a funeral director) of the Great Smog. No information had been added on the impact of a major air pollution event on other species (i.e., animals and plants). There was also limited evidence of debate over editing on the talk pages (in any language edition), or that comments on the talk pages led to substantial editing of the article. The focus on generating a title associated with notability was not accompanied by consideration of how the title could frame the event and how such framings might be used politically in the present. The (re)construction of what had been a major air pollution event impacting on many people also evidenced few attempts to explore alternative histories (e.g., through use of the edit history). Instead, information on past edits was mainly used by committed Wikipedians to sustaining normative text and disconnect any text seen to threaten this.

A registered user highlighted in red (something that may trigger assumptions of vandalism on Wikipedia) made several edits to the Great Smog (in English) which were not reverted. In addition, several registered users who had not yet become senior and extensive editors of Wikipedia were also identified as power editors on several language editions. This suggested that there was a degree of openness to new editors on the site, but this was highly limited. There were strong indications of normative power-editing across language editions - with some of editors editing across numerous Wikimedia projects. This could be associated with Wikipedian editing as a form of gaming. As well as encouraging high volumes of editing, such gaming might be used to mystify participants within an exploitative system.

There were very few edits (including by inexperienced editors) that attempted to draw on direct experience. It might be the case that those who had witnessed the Great Smog would have been less likely to have access to the web in the early days of Wikipedia, but increasingly older people in the Global North have been accessing the web. In addition to the absence of those who may have directly experienced the Great Smog, there was little evidence that those claiming to have experienced current air pollution events were attempting to add their content to the article. Even with access to the web, it would be very difficult for a person who had directly witnessed the Great Smog (and potentially been damaged by it), or was experiencing pollution in the present, to share this through Wikipedia. Such content would be likely to be seen as unreliable (no verifiable or notable source)

and be reverted by normative editors. The content of the talk pages for the article suggested that these pages were not being used to support deliberation over a non-contemporary disaster - even though this was in living memory and some people accessing the web were likely to have directly experienced it. Instead, evidence from talk pages from other articles suggested that Wikipedians were using facts and figures from the articles in a utilitarian, comparative manner – perhaps to establish relative notability in terms of numbers of deaths or even the relative acceptability of different types of disasters (i.e., death due to air pollution via nuclear disasters). Such discussions would be likely to be viewed as unhelpful and uncaring by those who had directly experienced disasters.

Even without direct witness accounts, there were trusted sources (within copyright law) that supported a more critical type of analysis of the politics and economics associated with the Great Smog and other air pollution events. Such an approach could have been further supported through information from archives (e.g., records of smoke abatement societies) regarded as trustworthy by Wikipedians. Some limited information of this type was included in the article on the Clean Air Act, which had a much lower number of page views than the article on the Great Smog. Archives might also include evidence of the experiences of marginalised, and at risk, groups - including examples of where they had actively attempted to address air pollution through social and political activities i.e., empowering them as a group rather than consigning them to victimhood and being damaged clients of health systems.

In this chapter I have examined the text of the article and how micro practices connect to macro constructions (including that of the Semantic Web and its technologies) and considered how this interacted with the visibility of marginalisation. My next chapter details how I sought to explore how Wikipedia's (re)constructions of the Great Smog interacted with other institutions (particularly the new institutions of the web).

Chapter 6 The Meta Formation

6.1 Introduction

This chapter sets out the delivery of stage five of my research framework. It further extends my analysis through investigating intratextuality. This is a form of meta-discourse which refers to itself rather than other texts - as explained in more detail in chapter 4. My analysis focuses on how (re)constructions of texts are supported through the intratextuality (or self-reference) of the (re) construction of an environmental disaster - with particular consideration given to the inclusion of marginalised groups. The chapter begins with the interdependency between Wikipedia and search engines, particularly Google. It then explores connections between the article on the Great Smog on Wikipedia and a fictional depiction of the Great Smog on Netflix. In the conclusion of the chapter, I use the concept of the chronotope to describe the relations between institutes, and the implications of this for (re)construction of socio-technical memory.

6.2 Connecting to the Memory of a Major Industrial Disaster on the Semantic Web

Pentzold (2009) gave a very limited description of his experience of using Wikipedia. Instead, he relied on other's descriptions, including mainstream Wikipedian narrative. I took a different approach within my methodological framework, as I recognised myself as a reader and (re)interpreter. There is limited information available on readers of Wikipedia (Singer *et al*, 2017). There has, however, been research on the interdependency between Wikipedia and other digital organisations, particularly Google (McMahon, Johnson and Hecht, 2017, Vincent *et al*, 2019). This has suggested that those who are not already committed editors of Wikipedia arrive via major search engines. Yarci *et al*, 2022 note that research data suggests search engines are highly trusted by general web users to produce relevant results and that they tend to select the top searches from search engines. Towards the beginning of the PhD, once I had decided to focus on an article about a major air pollution event in London in the early 1950s, I used Google Search on related keywords and arrived at the English language Wikipedia article on the 'Great Smog of London'.

Later, after gaining more understanding of the need to pay attention to the interactions between technologies, I considered the degree of choice users of the web had in arriving at the Wikipedia article on the Great Smog of London. After deleting my browser history (so reducing the possibility of the personalisation of my search results), I undertook Google searches on ‘*London AND air pollution event AND 1950s*’, and ‘*London AND toxic AND fog AND 1950s*’. These returned en.wikipedia.org and Britannica.com pages on the Great Smog of London at the top of the search results. The same searches on Bing and DuckDuckGo had similar results. I then searched on Great Smog of London across the three search engines (deleting my browsing history before each search) and found that the automatically prioritised results were similar across all of them. I had similar results over different devices and repeated searches over several weeks. The results are set out in table 12 below.

Table 12: Top results on Google Search, Bing and DuckDuckGo for the Great Smog of London (December 2022)

Top 5 results on Google Search on ‘Great Smog of London	Top 5 results for Bing	Top 5 results for DuckDuckGo (This uses results from Bing, Yahoo and Yandex, Yagci <i>et al</i>, 2022)
(1 st) en.Wikipedia.org	(1 st) en.Wikipedia.org	(1 st) en.Wikipedia.org
(2 nd) Britannica.com	(2 nd) Britannica.com	(2 nd) Britannica.com
(3 rd) Metoffice.gov.uk	(3 rd) Metoffice.gov.uk	(3 rd) Metoffice.gov.uk
(4 th) Nationalgeographic.com	(4 th) Nationalgeographic.com	(4 th) Nationalgeographic.com
(5 th) History.com	(5 th) bbc.c.uk	(5 th) London.gov.uk

The articles on the Great Smog on Britannica.com and the Metoffice.gov.uk bore strong similarities to the Wikipedia article, with a focus on certain facts including the name of the event (the Great Smog of London, or of 1952), its beginning and end dates (5-9 December 1952), location (London), numbers of deaths (ranging from 4000 to 12,000), and related legislation (Clean Air Acts). Connections were made between smog events and the development of industrialisation and urbanisation, combined with weather conditions. Descriptions of the smog across

Britannica, the Met Office and Wikipedia evidenced some overlaps beyond the sharing of key facts. Both the Britannica and Wikipedia articles referenced 'peasoupers'; problems with pollution in London since the 13th century; impacts on transport (including the underground and cars), ambulance services, and indoor theatres; and associations with the health conditions of bronchitis and pneumonia. Both the Met Office and Wikipedia provided very similar figures on the levels of different types of toxic pollutants. The Britannica and Met Office articles also referred to cows choking to death in Smithfields, although this was not included in the Wikipedia article. In addition, a statement that the Smog of 1952 had included pollution from Europe in the Met Office article seemed similar to a statement that had been added to Wikipedia and then later removed due to the lack of a citation.

As in the case of Wikipedia, neither the Britannica or Met Office articles made reference to highly contemporary air pollution (beyond a smog event in 1962) or included quotes from individuals impacted by the smog. The Met Office article stated that this kind of smog has 'become a thing of the past'. It also suggested that those who experienced the smog were 'partly to blame' for it, and the detailed description of the arising of the Smog of 1952 began with reference to people burning coal in their homes due to cold weather - before noting interactions with industrial pollutants and weather conditions. The Britannica article stated little was done about the negative effects that the smog had on public health due to jobs created through industry and perceived benefits of coal fires in the domestic realm. Both the Britannica and Met Office articles had strong connections to articles on mist and fog rather than industrial pollution. None of the three articles (Wikipedia, Britannica or the Met Office) identified powerful actors (e.g., state or industry) as having particular accountability for the smog. Rather the government were portrayed as addressing the problem through legislation and other interventions. The Britannica made no specific reference to the impact of smog and other forms of air pollution on marginalised groups, whereas Wikipedia briefly covered this. The Met Office briefly mentioned that the worst area effected was in the East End (where there was a high density of homes and factories) - although no association was then made with poverty or other forms of marginalisation. None of the articles considered how such groups were impacted on by repeated smog over time.

Other pages with a strong relationship with the Great Smog, e.g., Smogday.org, academic articles, and individual perspectives on the Great Smog were not

represented on the first page of the search engine results. Rather than a seeking to offer neutralised information on major pollution events, the Smogday site (funded by the New Weather Institute, an environmental campaigning organisation) had been partly written as a memorial to those who had died due to air pollution, and it presented the voices of individuals who lived with air pollution and suffered from its negative effects. This site also sought to trigger shared memories (including across both London and Delhi), take learning from the past into the present and future, identify key casual factors and simulate action in the present - particularly for the benefit of those who were otherwise more likely to experience and suffer from air pollution. The site, however, did not seem to be regularly updated, perhaps due to limited resources.

The above had implications for the degree to which information that might be beneficially or useful for marginalisation groups (both locally and more widely) could be made visible on the Semantic Web. Although editors might regard their content as neutral, arguably they had made political decisions in not giving greater visibility to marginalised groups and the accountability of powerful actors strong associated with this man-made industrial disaster (i.e., major industrialists operating in London at this time). The Wikipedia article separated such issues into another article on the Clean Act. This was very careful to downplay the responsibility of government and the article on the Act was less likely to be viewed than the article on the Great Smog. Allocating blame to the general populations of London (as included in the Met Office article) was also questionable.

Contemporary politics evidence financially costly examples of governmental actions that have resulted in changes to behaviours across large populations (e.g., the recent Covid19 lockdowns). As I continued to develop my case-study I further became aware of the interdependencies that existed between different institutions on the Semantic Web, particularly interdependencies between Google and Wikipedia and sought to investigate how this might interact with power inequalities in the construction of the memory of the Great Smog of London. This is explored in detail below.

6.3 The Meta Connection of Knowledge Graphs (English Language)

Although Wikipedia's not-for-profit status is often emphasised within its own narrative, others have found that it has close relations with commercial applications and these have long been in place (Van Dijck, 2013; McMahon, Johnson, and Hecht, 2017; Matsakis, 2018; Bukhari, Bashir and Malik, 2018; Vincent *et al*, 2019; Ford 2022). As I developed my extended literature review, methodology and explored my data, I became more aware of Wikipedia's interoperability with other applications on the web. This raised further questions over the degree to which applications could be separated.

The connection between Google and Wikipedia are evident in Google Search returns. The inclusion of an infobox alongside a Wikipedia article may indicate it will automatically be associated with a Google knowledge panel if a relevant search term is used on Google Search (Valentine, Myrie and Hart, 2020; Ford 2022). The Great Smog of London article included such an infobox, and when I searched on 'the Great Smog of London' on Google Search, a Google Knowledge Panel was returned (see Figure 13 below). Valentine, Myrie and Hart (2020) and Ford and Graham (2020) have observed the difficulties of presenting nuanced information via the knowledge panels, particularly in the absence of context. Beyond this, the social-technical knowledge being produced through these types of knowledge panel seemed to be based on a form of populism (i.e., the associated Google search results prioritised quantitatively). On the web, however, there are no guarantees that such searches are not generated by unfriendly agents (whether human or bot).

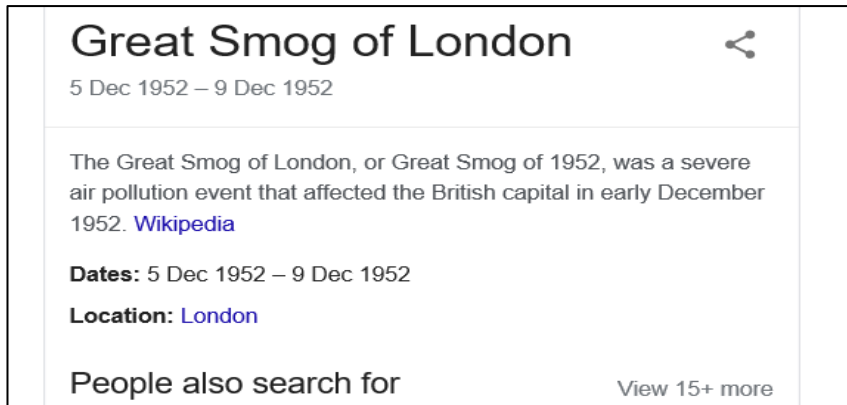


Figure 13: A Partial Screenshot of Google knowledge panel returned on the search term ‘the Great Smog of London’ on 30 October 2020, Data Source: Google Search. Google and the Google Logo are trademarks of Google LLC (Schuller, 2020b). Additional visual images have been removed from this image due to copyright.

The top part of the Google Knowledge Panel consisted of photos taken from sources prioritised in its search results on the Great Smog of London, including history.com; Britannica.com; and theVerge.com. The largest picture in the Google Knowledge Panel was the photo of Nelson’s Column taken from the Wikipedia article on the Great Smog. These photos were also included as top results for ‘Google Images’. It was visually apparent that images were being repeated across various websites, which suggested the use of stock photos. Further research revealed that several of the photos from the Google image panel above were from the Getty (a British-US media company) archived images for ‘london fog 1952’. The image of Nelson’s Column used in the Wikipedia article on the Great Smog was a Creative Commons image by N T Stobbs. This, however, was visually similar to the images from the Getty archive and to lyrical descriptions of London streets in the Smog which were included in the English language article on Wikipedia. These images gave little sense of the Great Smog as an environmental disaster resulting in many deaths, but rather an air of nostalgia and mystery. The images focused on iconic Central London locations (the type of locations likely to be visited by tourists) and iconic images such as London buses and policeman, while other London inhabitants were reduced to small figures lost in the smog. The bottom part of the Google knowledge panel consisted of photos and links to 24 other Wikipedia articles on various anthropogenic and natural disasters - along

with a statement from Google that these were topics which people who searched Google for the 'Great Smog of London' also searched for.

The template and contents of the knowledge graphs were open to being revised as data from sources (such as Wikipedia) were themselves revised. A more recent Google knowledge graph (returned on 23 September 2021) retained the same images, a summary provided by Wikipedia and links to other Wikipedia articles on air pollution and environmental disasters. It had, however, been revised to include information from 'Weather' (taken from Britannica.com), Effects (taken from History.com) and Movies (focused on an episode of the Crown). This may have indicated that Google had decided to move away from complete reliance on Wikipedia as giving authority to its trust-claims. This potentially had implications for the content of their semantic technologies e.g., the generation of socially acceptable factual information.

In terms of useable knowledge, it might be argued that the Google knowledge graph could be used to recognise similar forms of disaster across the world, rather than bounding these within more localised or national boundaries. Questions, however, then arise over how such associations are made. During the editing of the Wikipedia article Great Smog over a number of years, an editor had 'trimmed' away a number of references to other smog events which had been added by other editors. The Google knowledge graph then connected content on the basis of which other disasters those Google searching on the 'Great Smog' had also searched for. Such searches, however, could potentially be driven by agents with any motivation or interest. For example, such connections might be the work of a bored young person in American surfing Wikipedia, or a student in India looking for subject material (Singer *et al*, 2017), or an unfriendly agent attempting to sabotage attempts to collate knowledge on pollution. Alternatively clicks on 'the Great Smog' might be through a bot drawing in information on the most viewed disasters in order to automatically recommend disaster movie topics to script writers working for an online streaming service.

Particular keywords in search terms could potentially decide or break connections and this could be politically manipulated. There has been wide public and media interest in the Great Smog of London from people in countries currently experiencing air pollution through industrialisation, such as China (Li and Svarverud, 2018). In some countries, however, the term 'haze' has been widely

adopted e.g., in China (Li and Zhang, 2014) as an alternative to the smog. Differences in terminology then break any automated connection between the Great Smog of London and so-called hazes. A Google Search on 'Chinese Haze' returned no knowledge graph, and the Google knowledge graph for the Great Smog only referenced a small number of similar air pollution events. Instead, connections were made to a range of anthropogenic, environmental disasters across a prolonged period of time. It was not clear, however, particularly from a policy viewpoint, what could usefully be done with connections made between the Great Smog, the Great Plague of London, the Great Fire of London, Piper Alpha, Windscale, the 1997 Indonesian Forest Fires, etc.

Towards the end of my PhD, I also found a knowledge graph through searching for the Great Smog through Bing. This knowledge graph demonstrated the degree to which material and fictional representations were becoming intertwined on the web. What my family and I had experienced (either directly or as intergeneration memory) as a major air pollution event that impacted on many people in London had been formed into a fictional-fact, commercial-scientific product. In this form (the knowledge graph) the Great Smog was given a runtime and plot but also connected to real-life disaster events and related facts/statistics. On a relational web, it seemed a past tragedy which still held meaning for some people in the present was being automatically transformed, via a self-referencing system (stretching across technologies) into a movie recommendation. This looked less like the enabling of the processing of trauma or automated knowledge-making than an uncaring construction by impatient, socially complacent agents.

6.4 The Space-Time of Events and Associations between Wikipedia and Google Search (English Language)

Beyond exploring relations between Wikipedia and search engines via publicly visible knowledge panels, there was the potential to look at the relations between the automated, open access statistics generated by Wikipedia and other web organisations. Google Trends is a free, open access application and its topics are constructed from many associated search terms. A Google Trends topic, for example, can include terms used for the same concept from across different languages. According to Google, Google Trends are based on data points that are put through a particular equation based on geography, time, and relative popularity

against all search topics (Google 2020). Users are invited to ‘explore how Google data can be used to tell stories’ (Google Trends, 2020). Findings from Garcia-Gavilanes *et al* (2017) and Miz *et al* (2019) also suggested an interdependency between Wikipedia and Google Trends. I decided to further investigate this in relation to the representation of the memory of the Great Smog. Wikipedia statistics on page views (for the time period 1st July 2015 to the 25th August 2020), and edits of the Wikipedia article on the Great Smog both spiked in late 2016 (see figures 14 and 15 below)

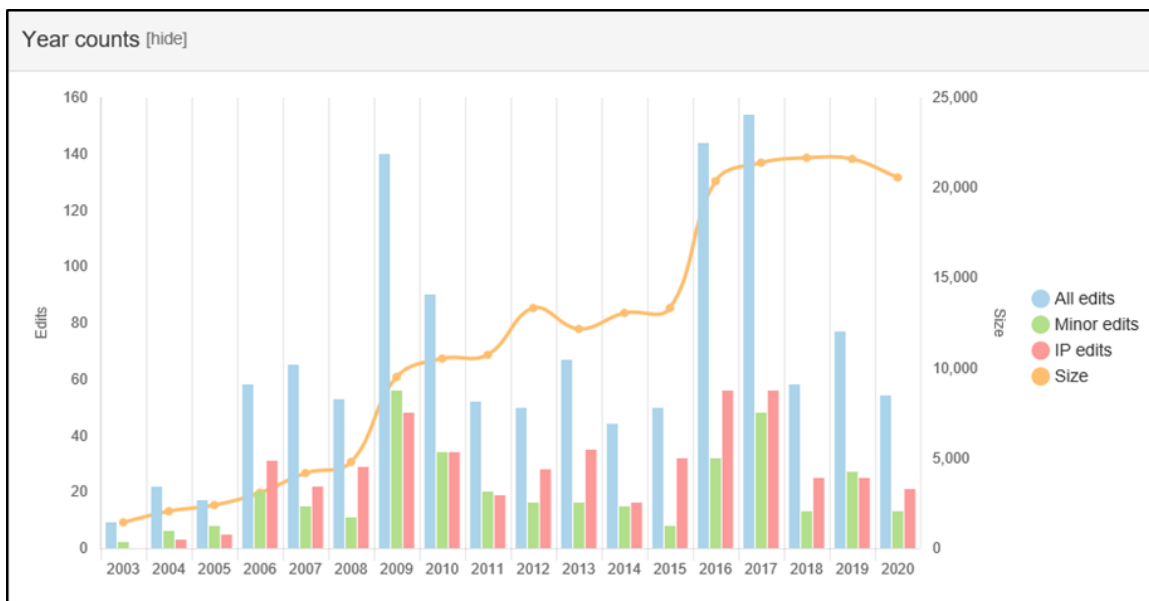


Figure 14: Screenshot of chart on Wikipedia page statistics on editing (2003 onwards) of the English language edition of the Great Smog article, taken from the Wikipedia site (Schuller, 2020c).

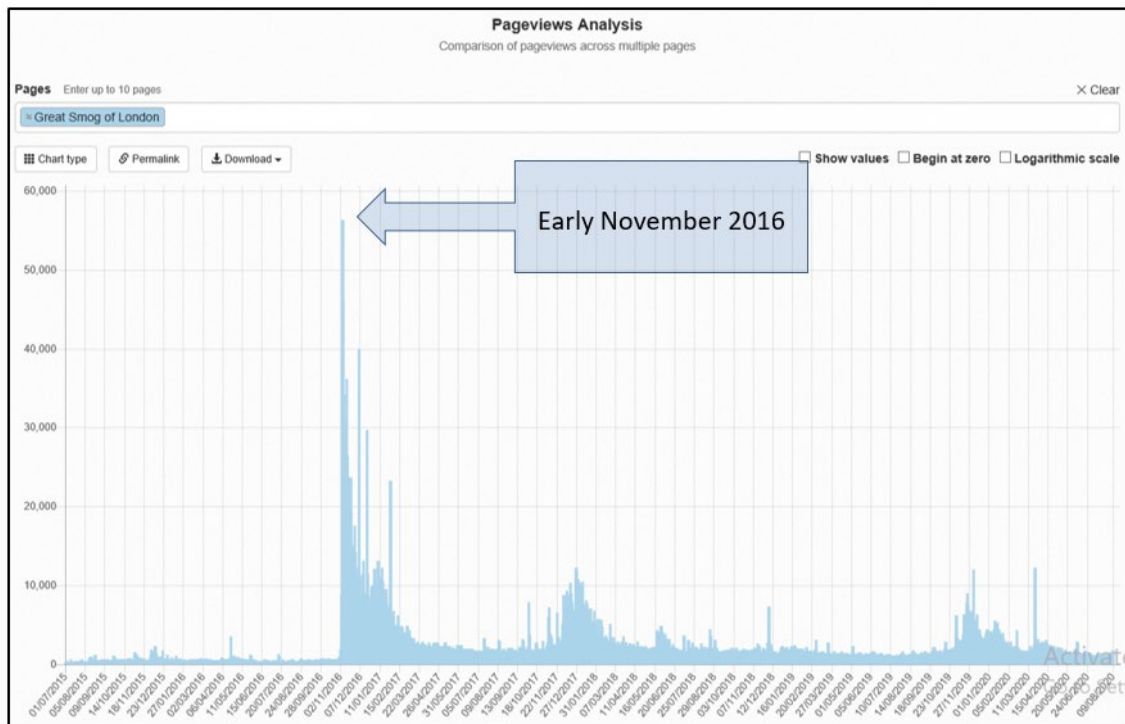


Figure 15: Screenshot of chart generated by Wikipedia pageview tool on number of daily users (including redirects) viewing of the English language article on the Great Smog of London between 1 July 2015 and 10 August 2020. Taken from the Wikipedia site (Schuller,2020d)

Taking into account previous studies of Wikipedia as socio-technical memory, I considered whether there could be a link between editing of an article about a past event and a new relatable event in the present such as an anniversary, or smog event in another country (Kanhubua, Nguyen and Niederée, 2014; Ferron and Massa, 2014). In August 2020, I undertook a search on an international media database ('Pressreader.com') using the search term 'Great Smog of London'. This returned numerous English language articles from India newspapers (including the Times of India and Hindustan Times), which had been published in early November 2016. These highlighted that a major air pollution episode had taken place in Delhi at that time. A number of these articles compared the Delhi Smog with the Great Smog of London (Kazmi, 2016; Pillai 2016). No edits, however, in the edit history or talk pages of Wikipedia's English language article for the Great Smog of London mentioned smog that took place in Delhi in 2016. In August 2020 I also consulted 'Google Trends' for data on 'Great Smog of London' to see how this matched to the patterns produced by Wikipedian statistical findings. The data charts from Google Trends on 'Great Smog of London' included a peak of viewing

in early November 2016, and another small, extended peak in late 2017 (see figure 16 below). This closely matched patterns in Wikipedia's visual charting of page views from the English language edition of the Great Smog of London article on Wikipedia.

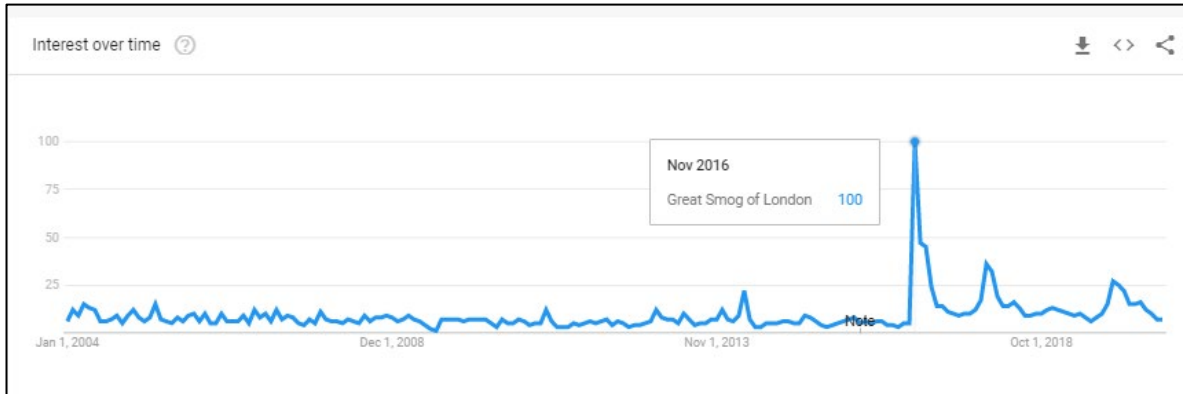


Figure 16: Screenshot of chart generated by Google Trends on worldwide searches on the topic of Great Smog of London from 2004 to 10 August 2020. Taken from Google Trends site. (Schuller, 2020e)

From 2004 to the end of October 2016, the Google Search topics that were most strongly associated with 'Great Smog of London' (on Google Trends) were focused on London, Pollution, Fog and Disaster. From November 2016, there were a rising number of associated topics and search terms related to the British Royal Family and Winston Churchill (See table 13 below).

Table 13: Top Google searches and topics associated with the Great Smog of London between 2004-2016 and November 2016

Time Period	Top 5 Google Search Topics	Top 5 new Search topics for this period	Top 5 search terms	Top 5 new search terms for this period
1 January 2004– 31 October 2016	Smog, London Capital of England, Pollution, Fog, Disaster.	Fog, smoke, Photochemistry, Chernobyl disaster, England – Country of the United Kingdom,	Smog, london, london smog, the smog, smog 1952.	the great smog, the london smog, great smog 1952, smog in london, great smog of 1952.
1 – 30 November 2016	London, Capital of England, Smog, Fog, Winston Churchill – former Prime Minister of the United Kingdom, December – Month.	Winston Churchill – former Prime Minister of the United Kingdom, December – month, Disaster film genre, Queen Elizabeth II, the Crown – the streaming television series.	london 1952, smog london, smog 1952, great smog, london smog 1952.	1952 smog, churchill, december 1952 london, fog in london 1952, great fog of london.

The Netflix Series - the Crown (about the British Royal Family) was highlighted in Google Trends (in November 2016) as being strongly associated with the search term, the 'Great Smog of London' (see table 13 above). Further investigation found that an episode of Series 1 of the Crown had depicted the Great Smog of London. The 'streaming' release date of Series 1 of the Crown was the 6th November 2016 (IMDB, 1999-2022) for the UK, America, Belgium, Germany, Netherlands and Japan. This matched to the week when page views and edits related to the Great Smog of London article spiked on Wikipedia. The DVD and blue ray for this series

was then released on 16 October 2017. Around that time a second smaller spike took place in views of the Wikipedia article.

The first series of the Crown, which included the episode 'the Act of God' (Jarrold, 2016), depicting a major pollution event in London in the early 1950s, was released soon after the EU Referendum which took place on 23 June 2016, and just before the US elections on 8 November 2016. The title 'the Act of God' is of significance in itself. It has been noted that the name given to a disaster can frame it in a particular way through associating it with a particular type of disaster. The identification of a disaster as an act of God (i.e., supernatural forces punishing humanity) can be used to dissociate it from the acts of humans (Fuentealba, 2021).

The episode 'Act of God' centred on Elizabeth II, Churchill, and his young female secretary called Venetia. Many characters who were not recognisable members of the nobility or top politicians were only seen for a few moments within the episode, and then never referred to again. Only the character of Venetia was given similar presence to elite characters, but unlike many of the major characters in the Crown Venetia was a fictional character. During the episode she was shown drawing on Churchill for inspiration, including quoting lines from a book he had written. Late in the episode she died in a heroic act which was portrayed as driving Churchill to take action to deal with the Smog. As a result, he was also shown to be a "*True leader in a crisis*".

Venetia was not mentioned in the English language Wikipedia article on the Great Smog. Mentions of members of the Royal Family and Winston Churchill had been added to the article, but such edits had not been sustained. In 2006 an editor had referred to Mary Teck, the Queen Dowager, but later this was removed by another editor by 2009. In 2017, a negative edit was made to the article suggesting that Churchill had ignored the risk of the smog - aligning with the plot of the Netflix episode. This edit, however, was deleted by another editor by 2018, ostensibly due to a lack of citation. The only mention of an individual which was sustained in the article over a longer period time (16 November 2010 onwards) was of Marcus Lipton, a British Labour party politician of the time. This suggested that the plot and characters of the Netflix episode did not necessarily draw heavily on the Wikipedia article.

Using Word Frequency analysis of transcripts of the Netflix episode and the Wikipedia article from the 4 November 2016 (from around the time the episode was shown), I further sought to identify the level of intertextuality between the episode and the article. A summary of this analysis is provided by the Word Frequency cloud tables (figures 17 and 18) below



Figure 17: Most frequently used words in the transcript of the Act of God episode from the Crown (Netflix) series, released 4 November 2016, as generated by Nvivo software.



Figure 18: Most frequently used words in the 4 November 2016 version of the English language Wikipedia Great Smog article, as generated by NVivo software.

Word frequency analysis across the script of the Netflix episode and the Wikipedia article evidenced limited similarities. I, however, decided to then compare the Wikipedia article (supposedly providing factual claims) with the radio commentary included in the Netflix episode. This radio commentary provided factual information on the Smog within the fictional account produced by Netflix. Applying word frequency analysis to the transcript of radio commentary for the Netflix episode indicated greater intertextuality between the Wikipedia article and the Crown, perhaps suggesting that Wikipedia was used to inform the gathering of facts for use in the radio commentary, or alternatively that both Netflix and Wikipedia were both making use of similar source materials. Summaries of this analysis are provided by the word frequency cloud tables (figures 19 and 20) are set out below. I then undertook a more detailed analysis of the degree to which words in the radio commentary matched to words within the Wikipedia article. This is set out in table 14 below.



Figure 19: Most frequently used words in the radio commentary from the Act of God episode of the Crown (Netflix) series, as generated by NVivo software.



Figure 20: Most frequently used words in the 4 November 2016 version of the English language Wikipedia Great Smog article, as generated by NVivo software.

Words included in radio commentary within the Crown episode and the Wikipedia article	Number of times this word was included in the radio commentary	Number of times this word was included in the English language edition of the Great Smog article (4th Nov 2016)
Fog	5	8
London	5	17
Capital	4	1
o'clock	4	0
Time	4	3
December	3	7
Eight	3	0
Expected	3	0
Morning	3	0
News	3	0
Across	2	1
Airport	2	0
Brought	2	0
Chimneys	2	1
Closed	2	0
Good	2	0
Make	2	0
Motorists	2	0
Overnight	2	0
Statement	2	0
Dense (r)	1	2
Met Office	1	1
Anticyclone	1	2
Smoke	1	7
Street	1	2
Windless	1	2

Words included in radio commentary within the Crown episode and the Wikipedia article	Number of times this word was included in the radio commentary	Number of times this word was included in the English language edition of the Great Smog article (4th Nov 2016)
Conditions	1	2
Peasouper	1	1
Emergency services	1	0
Disruption	1	1
Trains	1	1
Stopped	1	1
Stations	1	1
Coal	1	6
Electricity	1	1
Battersea	1	3
Fulham	1	1
Sulphur Dioxide	1	4
Air Quality	1	3
Change	1	2
Significant	1	3
Government	1	2

Table 14 Comparison between words use in the Wikipedia Article and the 'Act of God 'Episode of the Crown

I also recognised that the Crown was a highly visual series. In the Episode 'Act of God', scenes of London were shown between each of the main segments of the programme. Many of these scenes highlighted major landmarks in the Smog (particularly from a tourist perspective) including policemen standing on Westminster Bridge and outside Buckingham Palace in the Smog; the Horse guard in the Smog; and the palace of Westminster in the Smog with Big Ben chiming nearby. Other images of the Smog in the Netflix episode were very similar to imagery of the Smog on Wikipedia (see table15 below) and the photos

prioritised within Google images. There was, however, evidence of differences in imagery across the two digital organisations. The images of the Smog in the Netflix episode were often used to portray a mundane, outside world in contrast to vibrant, lit elite interiors (e.g., Number 10 Downing Street and Royal Palaces). This imagery of the mundane was also presented as interludes between the main scenes of the episodes taking place in such elite interiors. In contrast, the imagery included in the text of the Wikipedia article depicted scientific processes, and general experiences of Londoners at the time.

Images in Netflix Episode	Text from Wikipedia article (4 Nov 2016).
Policemen carrying torches for car drivers.	'Visibility was reduced to a few yards ("It's like you were blind [12] making driving difficult or impossible.'
A picture of Battersea power station in Smog.	<p>'There were also numerous coal-fired power stations in the Greater London area, including Fulham, Battersea, Bankside, and Kingston upon Thames, all of which added to the pollution'.</p> <p>A picture of Battersea Power Station in 2012 alongside the article.</p>
A picture of a London Underground sign lit up.	'Public transport ceased, apart from the London Underground.'
Ambulances and people struggling to hospital in the Smog.	'The ambulance service stopped functioning, forcing users to transport themselves to hospital.'
Smog seeping in through a broken window.	'The smog even seeped indoors.'
Various shots of people struggling along streets in through the Smog, including those wearing facemasks.	<p>'Walking out of doors became a matter of shuffling one's feet to feel for road curbs, etc.'</p> <p>'Smog masks' were worn by those who were able to purchase them from chemists.'</p>
Lights in a public tunnel being dimmed by the Smog.	'Worse at night because each back streetlamp at the time was fitted with an incandescent light-bulb which gave no penetrating light onto the pavement for pedestrians to see their feet, or even the lamp post.'

Table 15: Similarities between imagery in the Netflix episode and the edition of English language Wikipedia article from November 2016.

The above suggested the possibility of some shared content (as factual claims and images) between the two digital organisations. This might indicate that Netflix, like many other digital organisations, viewed Wikipedia as a key source of trustworthy truth claims and understandings of the past. I, however, could not prove this through the data. Seeming similarities between the texts used by both digital organisations might simply indicate that they accessed similar sources on the Semantic Web.

In addressing my research questions, my analysis found that Wikipedia and Google interacted with a representation of the Great Smog across the Semantic Web which emphasised the iconic and scientific rather than the direct experiences of London inhabitants, or recent smog in other cities such as Delhi. Mini knowledge graphs (alongside search engine results) emerging from interactions between different institutions emphasised stock imagery of major London landmarks and other icon imagery, and a Bing knowledge graph was found to be formed of a hybrid of statistics on an environmental disaster combined with the type of information normally associated with movies. There was limited evidence that this self-referencing system was increasing the visibility of marginalised groups at higher risks of negative impacts of disaster beyond briefly portraying people as suffering from particular medical conditions and using hospitals. The information evidenced on knowledge graphs also demonstrated little information that could be useful to those traumatised by smog like events and seeking to learn from them in a way that could avoid repeated disasters. The self-referencing system that included Wikipedia, Google, Bing and Netflix on the semantic web all emphasised perspectives of the smog that failed to identify powerful actors with responsibility for industrial policy and hold them to account. Instead, these institutions emphasised social facts which would be useful to semantic systems and those constructing fictional entertainments, while avoiding upsetting national political parties/governments in the present. This was perhaps, unsurprising in a system developed and maintained by English-speaking males with technical skills, and a taste for fictionalisation (Rosenzweig, 2006, p.127; Bittner, 2017; Roued-Cunliffe, 2017). After looking at interactions between Wikipedia and other institutions in relation to the construction of the English language representation of the Great Smog of London, I investigated how this interacted with other language editions, as set out below.

6.5 Intratextuality across Language Editions

As I could not speak 36 languages, and qualitatively investigating 36 translations would have been very resource intensive, I decided (in August 2020) to focus on visualised statistics on page views of the article in different languages. These were available as automatically generated visuals on Wikipedia. Although these page view statistics were available for all language editions of the Great Smog, they were only accessible via terminology specific to each language. To access the page views for the German language article, for example, it was necessary to know the German language project name (de.wikipedia.org) and title of the Great Smog (Smog-Katastrophe in London 1952). This information was available through Wikidata page associated with the English language article.

The statistical charts available from Wikipedia demonstrated patterns of page views (over time) of the article in the English language, and the patterns demonstrated for widely spoken Northern and Southern European languages were very similar to that of the worldwide visual of page-views - with a peak in views around 4 November 2016. This was when the Netflix episode was first shown in various countries including the UK, Germany, and the Netherlands. The following visuals (figures 21-24) identified that around this period there were 100,000s of page views (but relatively few edits) of the German, Dutch, Portuguese, and French language editions.

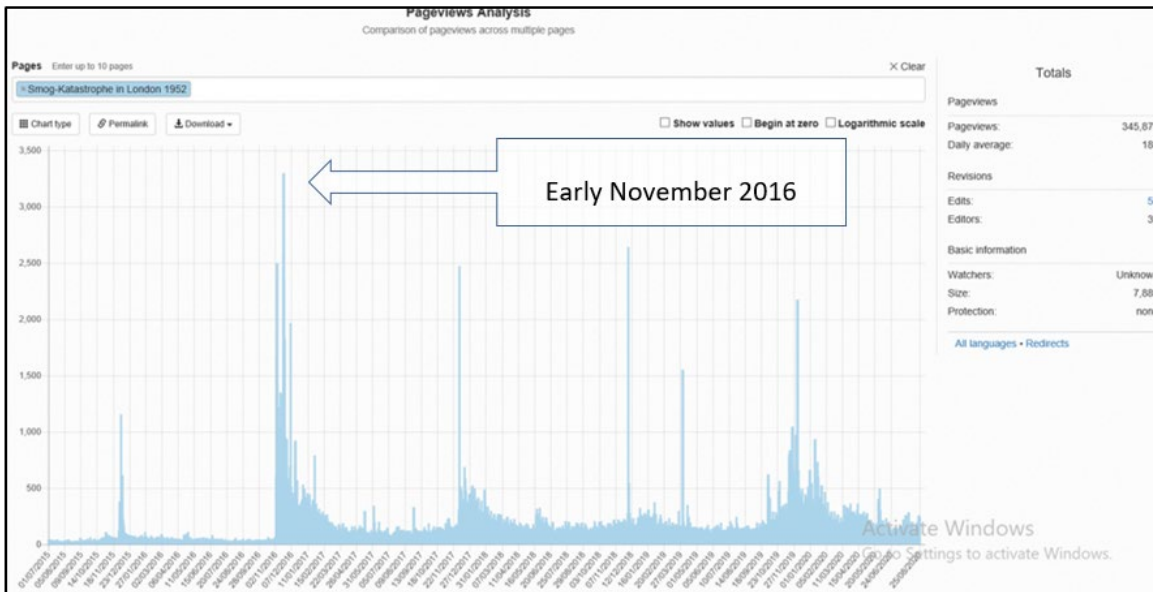


Figure 21 Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the German language article of the Great Smog of London (entitled 'Smog-Katastrophe in London 1952') between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020f).

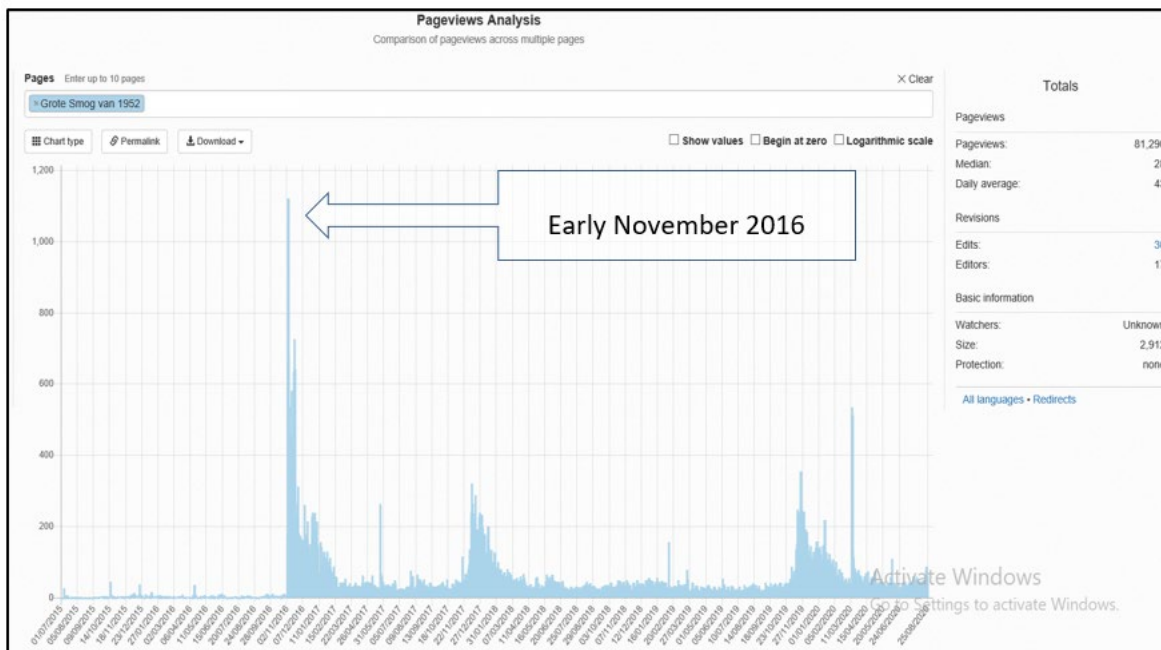


Figure 22: Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the Dutch language edition of the Great Smog of London article (entitled Grote Smog van 1952) between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020g).

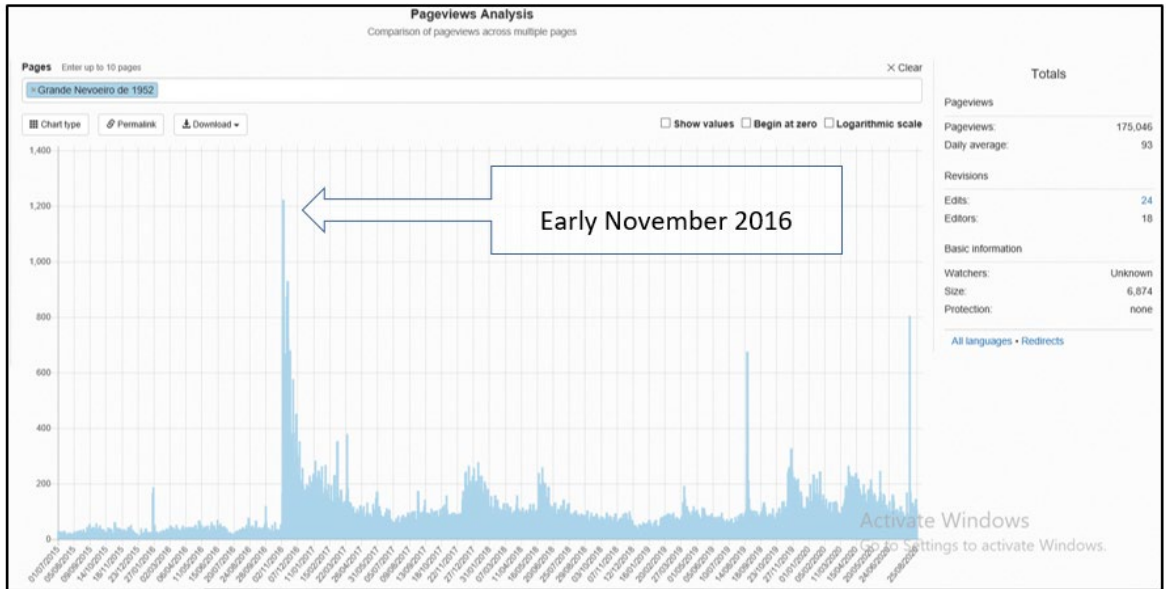


Figure 23: Screenshot of chart generated by Wikipedia’s pageview tool on number of daily users (including redirects) viewing the Portuguese language edition of the Great Smog of London article (entitled Grande Nevoeiro de 1952) between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020h)

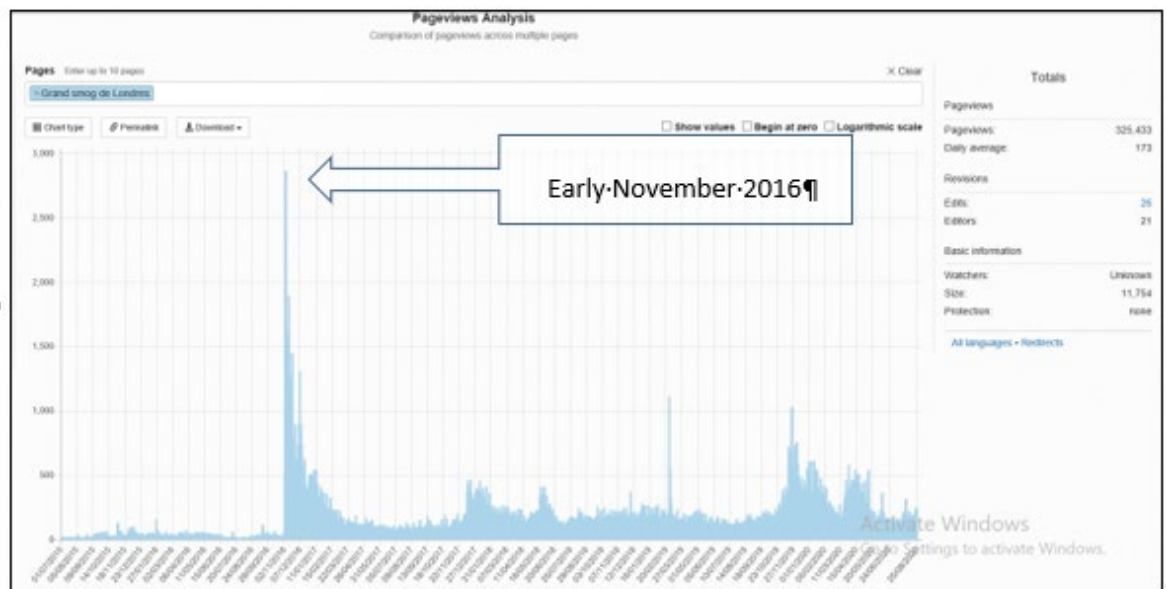


Figure 24: Screenshot of chart generated by Wikipedia’s pageview tool on number of daily users (including redirects) viewing the French language edition of the Great Smog of London article (entitled ‘Grand smog de Londres’) between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020i)

The peak in viewing of articles on the Great Smog on early November 2016, however, was not found in: (a) European languages spoken by relatively smaller populations including Catalan, Occitan, Basque and Welsh; (b) Eastern European languages using the Latin alphabet, including Polish, Czech Slovakian, (c) languages using the Latin alphabet outside Europe including Malay and Azerbaijani and (d) languages using alphabets other than Latin, including Bulgarian, Ukrainian, Hebrew, Persian Farsi, Chinese, Korean, and Japanese. This was the case, even though the release data for the Act of God episode in Japan was 4 November 2016 (IMDb, 1999-2022). Some examples of these visualised differences are given below (figures 25-31).

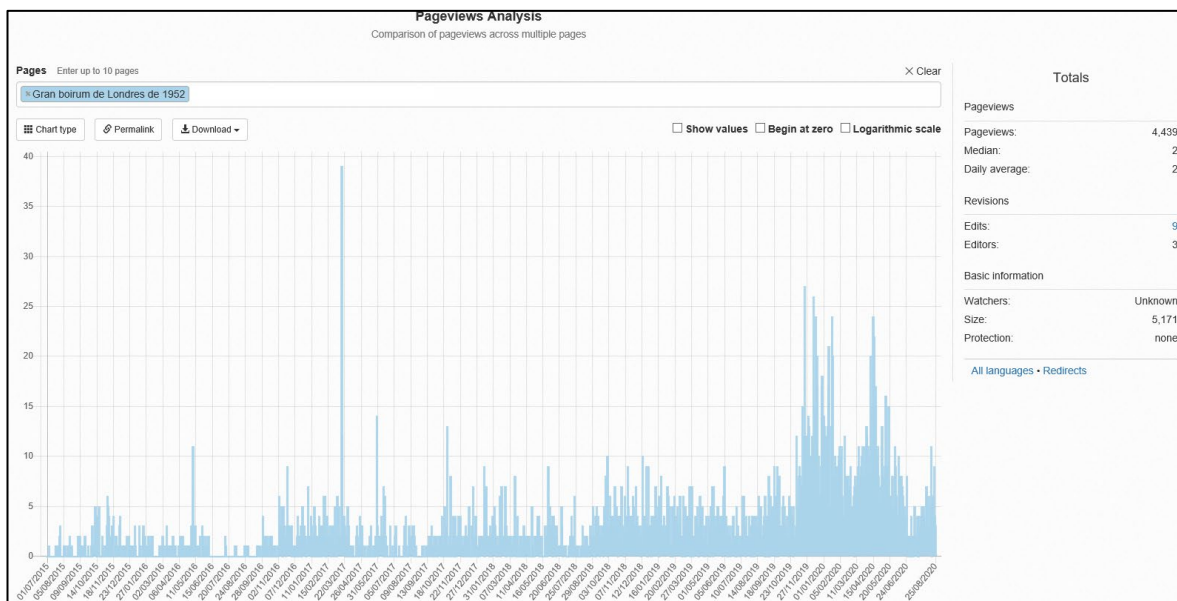


Figure 25 Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the Catalan language edition of the Great Smog of London article (entitled 'Gran boirum de Londres de 1952') between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020j).

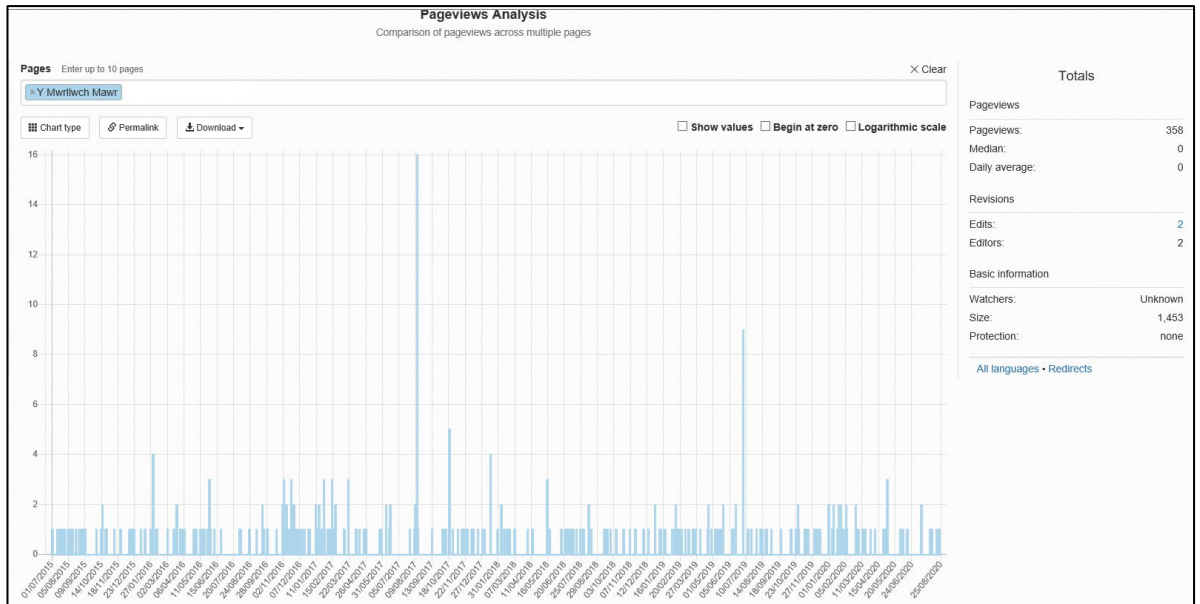


Figure 26 Screenshot of chart generated by Wikipedia’s pageview tool on number of daily users (including redirects) viewing the Welsh language edition of the Great Smog of London article (entitled “Y Mwrllwch Mawr”) between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020Ik).

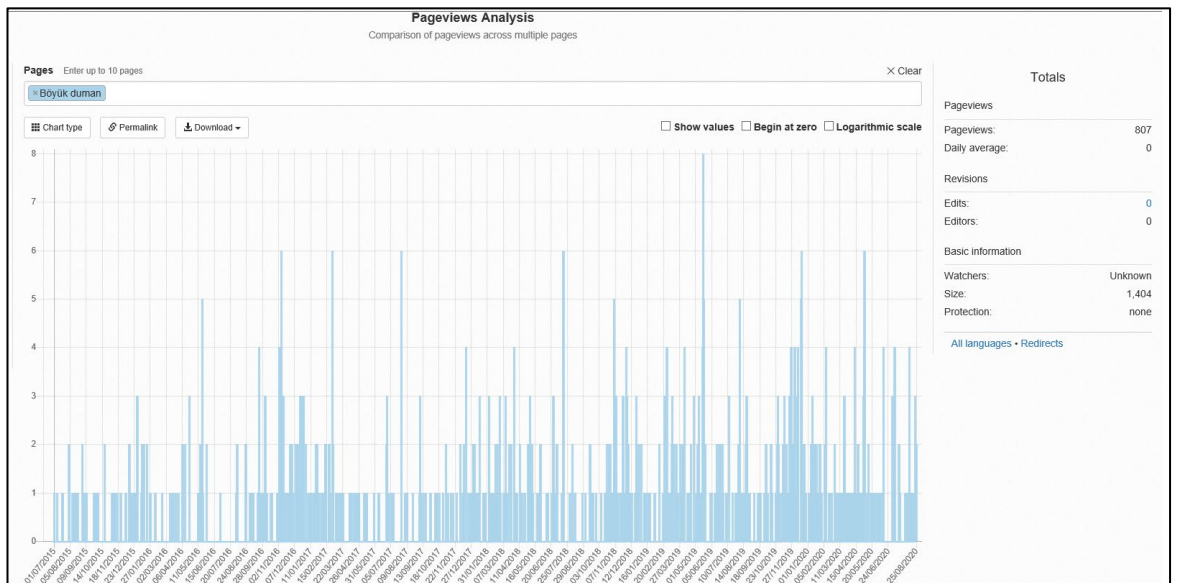


Figure 27: Screenshot of chart generated by Wikipedia’s pageview tool on number of daily users (including redirects) viewing the Azerbaijani language edition of the Great Smog of London article (entitled ‘Böyük duman’) between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020I).

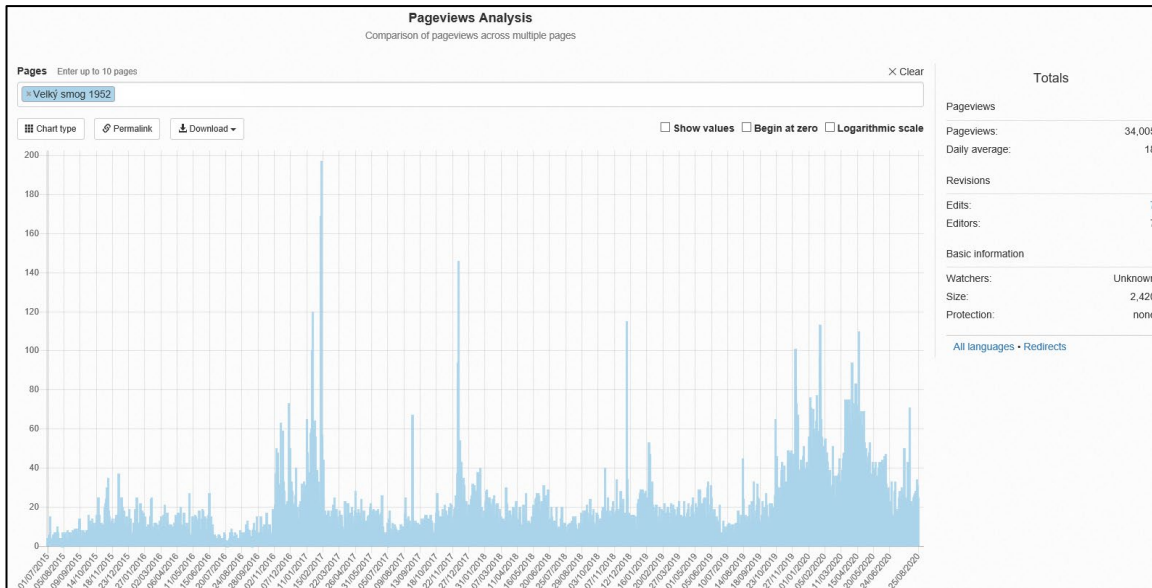


Figure 28: Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the Czech language edition of the Great Smog of London article (entitled 'Velký smog 1952') between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020m).

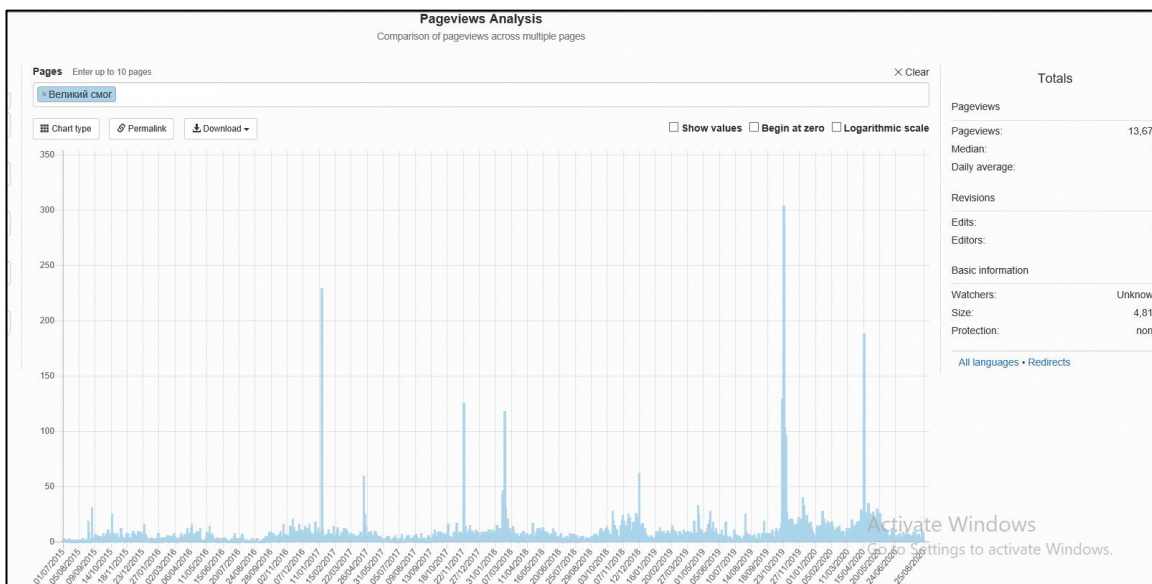


Figure 29: Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the Ukrainian language edition of the Great Smog of London article (entitled 'Великий смог') between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020n).

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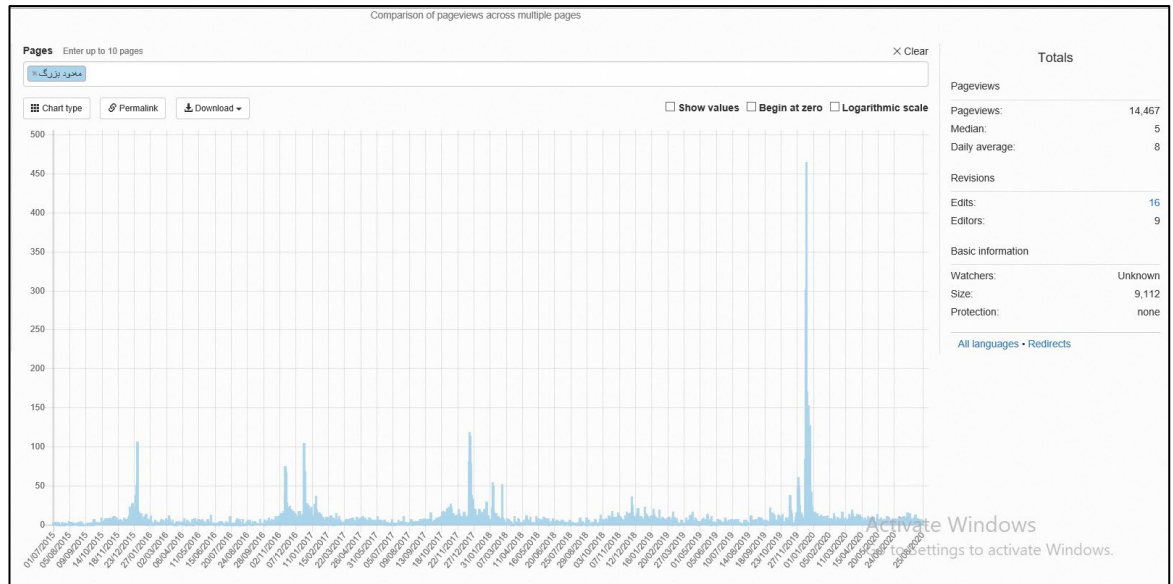


Figure 30: Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the Persian Farsi language edition of the Great Smog of London article (entitled 'مهدود بزرگ') between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020o).

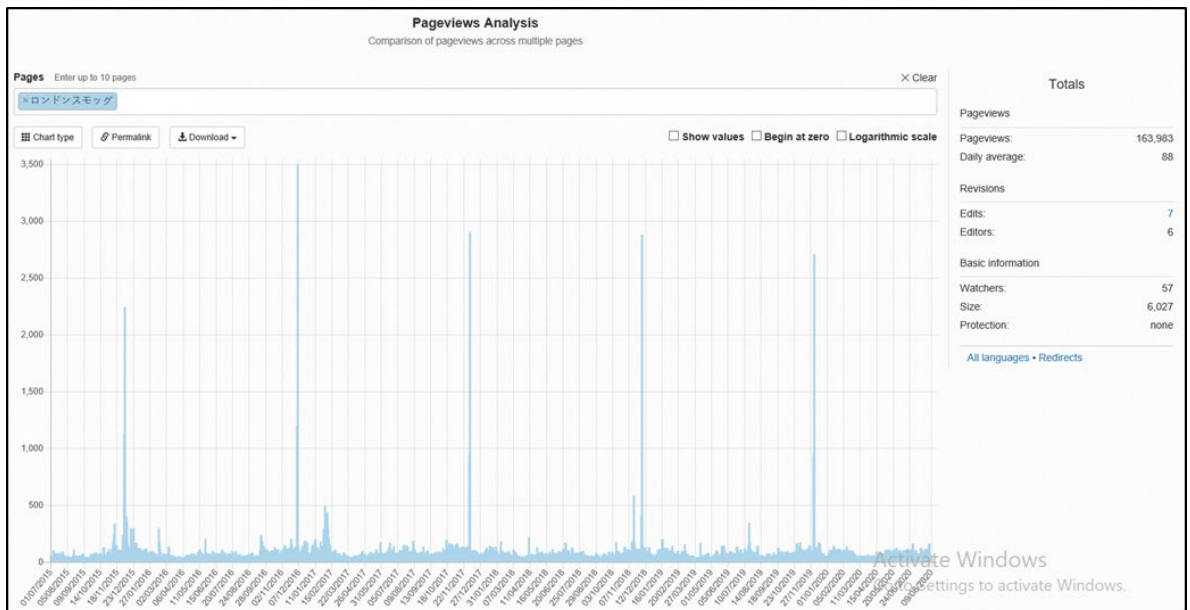


Figure 31: Screenshot of chart generated by Wikipedia's pageview tool on number of daily users (including redirects) viewing the Japanese language edition of the Great Smog of London article (entitled 'ロンドンスモッグ') between 1 July 2015 and 25 August 2020. Taken from the Wikipedia site (Schuller, 2020p).

The above findings suggested that the strength of association between Netflix, Wikipedia and Google was not simply being reproduced across all language

communities. Further analysis of the degree of interpretation taking place as the memory of the Great Smog was shared across institutions and readers and editors across different language communities is set out in the conclusion to this chapter.

6.6 Intratextuality and Academia

It had not originally been my intention to focus on institutions or mainly draw on online text in my research. Partly, however, due to the restrictions of the Covid19 lockdowns and other considerations set out in chapter four of this thesis, I decided to focus on the analysis of online discourse. Returning to academia after some years of being outside it, I was surprised that so many academic publications were being written about new media institutions such as Wikipedia and Google. I tried to resist simply reproducing the visible narrative of such institutions through referencing my own position, my experiences outside the online realm and research findings on the material conditions of marginalised groups. This might be viewed as a form of decoding of the memory of Wikipedia and the Semantic Web. My thesis, however, remained peppered with references to these institutions, and I came to recognise that while physical ethnographies can help to emphasise the ‘originality’ of a research project, textual studies inevitably intertwine authorships.

6.7 Conclusion

Other researchers of Wikipedia as socio-technical memory previously found that new events could stimulate the editing and viewing of both the Wikipedia article on that event and past events perceived to be closely related to it (Ferron and Massa, 2011; 2014; Kanhabua, Nguyen and Niederée, 2014; Garcia-Gavilanes *et al*, 2017; Twyman, Keegan and Shaw, 2017). In my case study, my data analysis suggested it was the streaming of a fictional depiction of an event (the Great Smog of London), rather than events in physical space (e.g., air pollution events taking place in Delhi at that time) that was associated with spiking in searches, editing and page views of related Wikipedia articles. I also found indications of spikes of Wikipedia page-views and Google Trends in relation to the release of other fiction depictions. A TV mini-series on Chernobyl (released in May 2019) was accompanied by a spike of page views of the Wikipedia article in English and Russian, and related popular searches on Google Trends on Chernobyl. Knowledge graphs may have supported intratextuality between Wikipedia and

Google, and other digital organisations such as Netflix. Netflix, for example, is said to use knowledge graph technology to organise information on content (Marr, 2019), and this may reference data from Wikipedia and Wikidata.

The intratextuality suggested by the statistical charts generated by Wikipedia and Google Trends indicated that semantic technologies such as knowledge graphs potentially created the conditions where text representing fact and fiction intermixed. The intertextuality and recontextualisations taking place between Netflix, Google and Wikipedia, however, were complex. The naming of the pollution event as the 'Great Smog' was shared across Wikipedia, Netflix and search engines. Nostalgic imagery was also similar and shared. The linking of the Great Smog to other disasters by the Google Knowledge Graph, however, seemed to be different from the connections created in the Wikipedia article. The Wikipedian categorisation of the event was that of an industrial pollution disaster. The Google Knowledge graph (based on popular searches) made broader connections across many centuries and many disaster types.

The episode '*the Act of God*' was not an exact reproduction of the Wikipedia article on the Great Smog in English. The Wikipedia article described the disaster in terms of natural events (e.g., the weather) and other physically, objective things such as chemical combinations. The Netflix interpretation, in contrast, described the disaster as an 'Act of God' and focused more on elite actors – mainly in a positive light. Both Wikipedia and Netflix, however, adopted types of disaster (from typologies of disasters) that avoided associating the disaster with human actions and behaviours. Analysis of the text of the article and the transcript of the Netflix episode suggested that Wikipedia may have at the most, been drawn upon as a source of factual claims and imagery. Alternatively, both Netflix and Wikipedia creators may have both accessed similar sources on a relational web.

Connection between the Netflix depiction and the Wikipedia article of the Great Smog was strengthened through the adding of edits about the Netflix episode (on repeated occasions) to the highly visible text of the article. This also stimulated the adding of other information on commercialised, fictional accounts of the event. Information on such fictional accounts were then found in mini knowledge graphs stimulated through web searches on the term 'the Great Smog'. A commonality across Wikipedia, Google Trends and Netflix could be found in the marginalisation of the names, faces and voices of non-elite witnesses. Apart from the fictional

character of Venetia on Netflix, non-elite witnesses were only given the presence of a faceless mass. Wikipedia provided categories of vulnerable victims on Wikipedia (perhaps of interest from a medical science viewpoint) and lyrical descriptions of unknown individuals lost in the smog. Overall, those from groups that were most likely to suffer from air pollution due to low income, living in areas of concentrated pollution, etc, were not strongly represented in this self-referencing system. It seemed to provide very limited information that could help those in such circumstances to understand how they could learn from the past and take action (potentially with others) to avoid repeated exposure to dangerous levels of air pollution. The information provided through the memory representation on Wikipedia and shared across other new media institutions, for example, failed to identify how the social-political causes of air pollution could be connected to particular, accountable actors (e.g., political or industrial).

What was not clear, however, from the data available was how the fact-fiction (focused on notable regional/national actors) generated through the intratextuality of new media organisations interacted with readers. Benedict Anderson (1983) once described how nations were imagined into being, alongside the arrival of national languages and their standardisation through print capitalism. Not all citizens or subjects, however, became nationalistic. New corporate brands have arrived with the web and accumulated trust and a perception of always having been there. Such brands, however, have also been criticised by individuals and groups, and there has been substantial resistance to globalisation across populations. Best (2001) considered a range of case studies of how social claims spread across geographies and gave a range of possible factors that could interact with this. The form of diffusion was dependent on a range of issues and clustered around adopters recognising claims in the same way as earlier circulators (leading to rapid spread) or resistance arising due to perceived difference (slowing the spread). Such perceived differences could include language. Abstraction might be used to increase the likelihood of adoption across different audiences, but abstraction tends to dissipate as soon as attempts are made to evidence or implement at a local level i.e., local contextual factors come into play. This becomes more likely over time. Statistical charts generated through Wikipedia suggested a Western streaming services depiction of an air pollution event that happened in London in the 1950s may have been of limited interest to

many language communities. In addition, although Wikipedia separated out users from spider bots and automated agents, it was not possible to completely confirm that many page views were not the result of machines accessing and processing the data. Similar issues applied to the Google Trends data.

Figures on page views of Wikipedia articles and Netflix also need to be put into context. There are almost eight billion people on the planet (Chamie, 2020), but not all these people will have watched Netflix's series 'the Crown' since it began in 2016 (BBC, 2020). Although I had no access to information on audience reception, the use of Google Search does not guarantee that a web user will access pages or read information on those pages (Nguyen, 2019; Ray, 2019). In addition, almost 50% of the world's population do not have access to the web (Broadband Commission for Sustainable Development, 2017; Ofcom, 2019b, Blank and Dutton, 2019). Many other people who use the web use it in a very restricted way (French, Quinn and Yates, 2019). Taking these findings together suggest that there was limited indications that a singular narrative on a relational web would spread in an uninterrupted manner. There could be many potential barriers to the spread of information across wider populations. Some populations, however, might be more likely to perceive spreading claims. This might include the digitally included using an array of relational applications and viewing information on the web as a trigger for searching for further information. Those with limited critical analytic capability might then be caught up within an information labyrinth which they might find hard to escape from.

I considered what chronotope (as outlined in chapter 4) might help me describe the relations between representations on Wikipedia and other institutions. Any image would need to describe both separation and unity i.e., a form of self-referencing encyclopaedia with separated entries. Beyond the image of the encyclopaedia, I was drawn to a visual illusion – that of a Klein bottle (see figure 32 below).

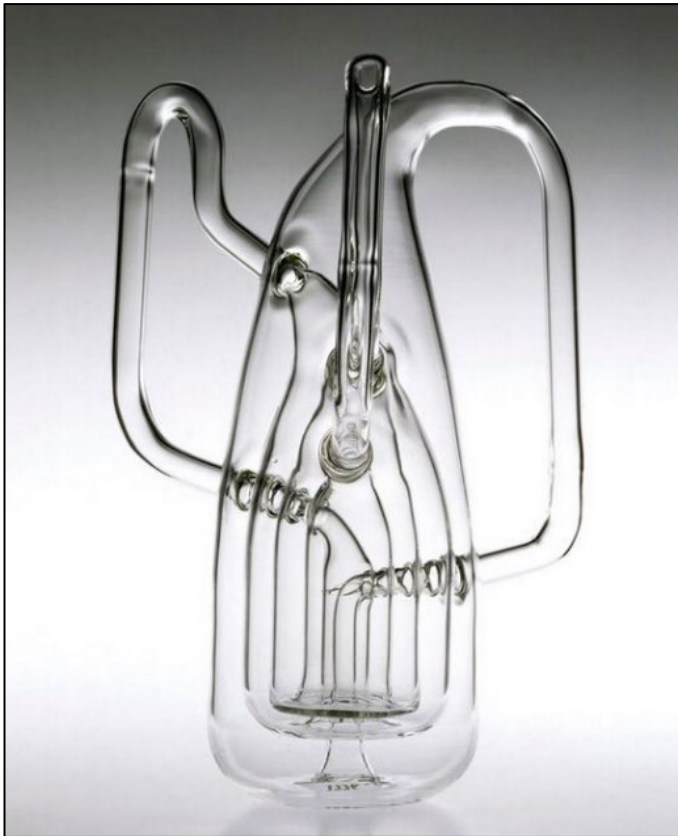


Figure 32: Klein Bottle by Bennett, 1995 (Science Museum Group, CC BY-NC-SA 4.0)

The above image is a two-dimensional (2D) representation of a three-dimensional (3D) representation of an imagined four-dimensional (4D) configuration. The 4D version of the above which would be a surface without edges, and no outside or inside - resembling 'the network' described by Latour (1996), but the 3D dimensional representation of the Klein bottle is the limit of physical fabrication beyond reference to shadows (Zamboj, 2018, p.476). In the absence of being able to materialise the 4D version of the Klein bottle, the 3D version requires self-intersection (a type of self-reference). Associating this visual illusion with the Semantic Web equated it with a human fabrication (that could be experienced and critically reviewed) rather than something beyond the realm of the human.

Some hypertext theorists have supposed that such intertwined forms would offer principles of connection and heterogeneity (Ciccoricco, 2000, p.5), where 'repeated encounters with local structure give rise to emergent global structure' through recombination and patterns that 'allow coherence to emerge when a narrative supports many different possible orderings of events' (Massumi, p.109 - 110). Self-referencing, however, has also been used to describe the arising of the

self-accrual of information that characterises institutionalisation (Kalliniko, 2006; Levy, Pisarevskaya and Scholten, 2020) and this may present a threat of closure and potential blindness to what it views at outside its experience. Singer *et al* (2014, p.517), for example, have proposed that Reddit (another online organisation) 'has transformed itself from a dedicated gateway to the web to an increasingly self-referential community that focuses on and reinforces its own user-generated image and textual content over external sources'.

This construction of memory of the Great Smog of London (within this self-referential system) mainly sustained the connection of notables (who/which had accumulated privileges) with the most visible text – and reinforce a class system supporting the maintenance of normative social-tech patterns seen to be necessary to enable the Semantic Web and related semantic technologies. Although it might seem to some that this construction had fragmented (into regional webs), referencing the Klein bottle as a chronotope suggested it might remain a single structure with different, seemingly distinct arms feeding back into itself. Wikipedia data, for example, continues to be used across regions and scholarship from highly ranked universities across regions continue to be prioritised in Google Scholar. As a container, however, such a construction could be placed under additional external pressures and could crack, be eroded and fragment - particularly if the surrounding environment became less stable and placed new pressures on it. To become more aware of such changes and perhaps reduce related pressures through reformation, it would need to become more capable of absorbing information and understandings from outside itself. This could include content from the marginalised/excluded - including due to demographics, social perspectives, location, etc. Klein bottles, however, are notoriously hard to empty and refill as their existing formation resists such processes. Similarly, new content produced by marginalised groups would not necessarily meet the requirements of what would be considered well-formed machine-readable data by contemporary technologists.

In summary, my analysis of my data suggested that currently Wikipedia and the Semantic Web was unlikely to support the production of (re)constructed content that would be useful to those under pressures from repeated environmental disasters. Deaths from exposure to air pollution are currently rising at global level and are highly concentrated on low-middle income countries, although this is often

associated with indoor rather than outdoor air pollution (Fuller *et al*, 2022). There are, however, findings that continue to associate air pollution from a range of sources (including industry) with many health conditions (Mannucci *et al*, 2015). Findings from various countries suggest that marginalised groups, including racial minorities and lower-income groups are at higher risk of disease and death from contemporary air pollution (Hajat, Hsia and O'Neill, 2015; Jbaily *et al*, 2022). Meta analysis by Hajat, Hsia, and O'Neil (2015) found some variations to these patterns, but even where higher air pollution was concentrated in higher income groups, the effects of air pollution were found to be concentrated on those with low income. This was because lower income groups were not able to afford risk reducing precautions such as private transport, filtration systems, etc. This suggested different issues in different locations that would need to be recognised and addressed at a localised level. In some cases, marginalised groups, and those seeking to empower them, would need to raise awareness of the impacts of pollution caused by industrial land use in their communities and then how to politically mobilise to address this. The risk of a spike in air pollution (including one that may later be referred to as a disaster) will be higher in such areas, as well as general air pollution - and yet there are likely to be arguments from industrialists and other notable actors that they bring economic opportunities into an area. In other cases, resource disparities lead to increased risks for lower income groups and in such cases political campaigning might be focused on calling for industry and government support to improve access to better air filtration systems. Even in these cases, however, air pollutants cause wider ecological damage with implications for animal welfare, food security, etc (Liang *et al*; 2020; Ryalls *et al*, 2022; Kanakidou, Sfakianaki and Probst, 2022).

The findings from my case study differed from those set out by many other scholars of socio-technical memory on Wikipedia, including those who had written of Wikipedia as a global memory place where people accessed memory to process traumas in the present (Pentzold, 2009; Ferron and Massa, 2011, 2014; Twyman *et al*, 2016). To clarify how such differences had arisen, but also connect case studies to make wider observations, I compared my research approach and findings with those of Pentzold (2009). This comparison is set out in the next chapter.

Chapter 7 The Comparison of the Two Case Studies

7.1 Introduction

Burawoy's ECM includes a comparison of two case studies of the same site that have taken place at different times. This recognises the potential for change in orderings over time, as well as differences in the positionings and choices of researchers. In my comparison, I adapted Burawoy's Four Movements within the ECM (summarised in table 7) with reference to positionality; context, process and theory. These four dimensions structure this chapter. Only after completing analysis of my own data sample and developing my case study approach did I feel capable of reviewing Pentzold's (2009) use of theory and development of methodology in a critical, detailed way.

7.2 Positioning

Pentzold and I were both based in western academia and drew on the same intratextual system. There were, therefore, likely to be similarities as well as differences between our case studies. In the targeted literature review, I describe how Pentzold's 2009 publication on Wikipedia as global memory sets out his intention to support the institutionalisation of interdisciplinary memory studies. In contrast I did not specifically seek to support the institutionalisation of interdisciplinary memory studies or Wikipedia, rather my thesis took a critical approach to both interdisciplinary memory studies and Wikipedia. Unlike Pentzold (2009) who worked with well-established traditions of mnemonic warring and forgetting leading to consensus, I recognise my own positionality as someone who identified with a number of groups found to be marginalised on Wikipedia and sought to raise the profile of marginalised groups and their need to be able to share and process memory in a way that mitigated the impacts of repeated disasters. This perspective potentially called for challenge and social activism rather than a quick move towards consensus.

7.3 Methodological Choices

Pentzold (2009) and I both worked with CDA in investigating a crisis event taking place in London. We both worked with text, discourses and orderings on Wikipedia and considered reinterpretations of shared memory across new and traditional medias. There were, however, major methodological differences between Pentzold (2009) and my research. When I first started to read Pentzold (2009) and others who had previously investigated Wikipedia as socio-technical memory, I found it very difficult to evaluate their methodologies in any depth. Only through developing my own practice as a researcher did I come to realise that Pentzold had not: (a) considered different types of case studies (Ridder, 2017), or (b) made a deliberate choice of case study, or (c) implemented a case-study methodology. Instead, he created his own research framework out of various theories (mainly non-contemporary) and a contemporary critical method of data analysis. Each case study approach brings with it ontological, epistemological, and related temporal-spatial perspectives. It is argued within this thesis, that such temporal-spatial perspectives are politicised, and that a researcher must directly recognise and address this in their research. Pentzold, however, chose not to directly recognise his own positioning within his constructivist research or how this might interact with the politics of others. Without reference to a clear ontology, epistemology, and related temporal-spatial perspective, it can be easy to confuse different traditions which do not simply align with one another. Within Pentzold's constructivist study (which drew on CDA), Pentzold wrote of Wikipedia as providing almost laboratory-like conditions of memory work and operated with the expectation that his data would prove his theoretical framework and offer findings that could be generalised.

In contrast with Pentzold (2009) I deliberately chose relatively contemporary scholarship (Burawoy, 2009) working critically with social constructions including the investigation of power inequalities, marginalisation and resistances. Although Burawoy's ECM is not generally recognised as memory theory, the ECM works with the past as going beyond singular law or ordering. Other academics have also referred to the ECM as a form of memory (Auyero, 2010). Rather than taking a highly deductive approach, I sought to avoid expectations of a particular outcome and keep theory and practice in dialogue, while seeking to investigate complex interactions and issues of power. This included trialling and testing different

theories and approaches and then reforming my research project in response to my finding of gaps and the unexpected. I still became confused by the range of traditions included in my interdisciplinary readings, but through referencing Burawoy's description of the ECM throughout the PhD and taking critical feedback from my supervisors and examiners, I was able to recognise such problematics and attempt to take remedial actions. I, for example, sought to balance my interpretation of texts, discourses and their orderings, with consideration of wider material experiences (as required of the ECM and by many CDA frameworks). I was not able to undertake the ethnographic element of the ECM due to Covid19. I continue to regard this as a gap in my thesis and would recommend that others working on similar research studies seek to undertake hybrid forms (online/offline) forms of research in order to make strong connections between inequalities and marginalisation evidenced in discourse and the material realm.

I also came to question why I should allow Wikipedian narratives to define my interpretation of what was significant and took a suspicious stance in relation to information elites. This, and problematics arising in my data, led me to question the degree to which I could view normative power-editors as individualised, trustworthy members of a public space which I shared. I also came to question the appropriateness of being drawn into advocating mainstream narratives of Wikipedia. In contrast, Pentzold (2009), and several other academics that followed him evidenced little questioning of non-contemporary theory or mainstream Wikipedia narrative, including during their research processes. Pentzold (2009), for example, placed his consideration of power inequalities in his notes rather than the main text of his article.

7.4 Data Sampling Choices

Both Pentzold and I worked with talk page comments relating to a crisis in London that were taken from Wikipedia. Pentzold chose to limit his analysis to talk page comments on the English language version of the London bombings article. He noted that the edit history of the English language Wikipedia article on the London Bombings 2005 included 2580 edits made on the 7th of July and a further 1303 on 8th. The talk pages also included 624 comments on the 7th July and 360 comments on the 8th. In comparison there were only 6 edits of the English language Great Smog article on the day it was created (12 August 2003). Only 17

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edits were added in the year following this, and in total 1,293 were posted up to 19 September 2021. There were no comments added to English language Great Smog's talk pages until 7 December 2004 and by the 19 September 2021 there were only 47 comments on these pages. Later into my case study I also decided to sample edits and comments from all 36 language editions, although many of these were associated with relatively small numbers of edits and talk page comments. Pentzold (2009) gave little information on how he had worked with the data, beyond manually removing it from the site and coding it. I, however, spent several months on Wikipedia looking at the data on the site and how it connected across the site and to other applications. As a PhD student, I had the time and capacity to explore the data in this way. In writing his case study as an article for publication, Pentzold is likely to have been under greater constraints and would have needed to amend his article in accordance to peer review processes.

Pentzold's (2009) sample was taken from an article where editors were responding to a very recent event. This event was likely to draw in many interested parties, with differing viewpoints – so raising the possibility of conflict. Editors of the article would have had few alternative sources to news articles and programmes so soon after the bombings, and reference to such sources can cause disputes on Wikipedia (Smit, 2018). In contrast, the Great Smog article focused on the shared experience of people living in a city rather than a contestation of space by different groups. Editors of the Great Smog of London (in the 1950s) potentially had access to a wider variety of sources including academic publications and institutional archives. Due to the sheer number and complexity of edits, including non-normative and expressive edits (often related to arguments over media sources) the London Bombing article was, at times, placed under page protection by Wikipedia administrators. This limited the degree to which the article could be edited. This was not the case for the Great Smog article. There were few examples of polarised or controversial views expressed through edits or talk page comments. I was forced to think imaginatively about how I would develop my analysis. There was no simple way to align my data to contemporary concepts of politics and governance (such as contestation or consensus), instead I had to seek out novel approaches.

Pentzold (2009) decided to exclude administrative edits and talk page comments from his sample. I decided to work with all the edits and talk page comments within

my sample (otherwise my data would have been very sparse), and then came to question whether it was appropriate to separate out administrative and non-administrative edits on Wikipedia. For administrative norms strongly interact with the generation and outcome of many disputes on Wikipedia and the production of content. I also gave careful thought to the way wiki functions categorised and sorted - partly due to the lack of expressive content in the talk pages associated with the article on the Great Smog. After going through repeated explorations of the data I found that categorisations did not stand up to scrutiny in practice. Over time, I came to question the idea that digital representations on the site should be viewed as individualised and representing as diverse human editors from diverse localities. This contrasted with Pentzold who assumed that such editors were interacting with the site.

7.5 Processes

Pentzold focused on a move to consensus on Wikipedia, with reference to normative editing on the site and the expectation that such consensus would be arrived at. He gave no consideration to practices of domination, marginalisation and resistance as part of this. In contrast I specifically sought to reveal such social practices. I, however, found that I was limited in the degree I could reveal these due to the constraints of the data available from the Wikipedia site and the Covid19 lockdowns. It was, therefore, difficult to provide simple examples of marginalisation and resistance in a way that might be expected when using CDA. Rather, however, than focusing all my findings on dominant editors, I attempted to add some sense of how the site might be experienced by those new to it and highlight marginalisation arising from intertextuality on the site and across the Semantic Web. As part of this I recognised connections between different layers, and that these might change over time. I then focused on processes connected across layers that were not specifically investigated by Pentzold and I arrived at different findings.

7.6 Changes in Context: Wider Organisational Change

Burawoy's extended case study of relations in an American factory drew on an earlier dissertation by another academic (as a previous site visit). Through carefully re-examining the dissertation Burawoy found '*a series of small, but*

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significant changes' at the same site (2009, p.84). Working with the concept of socio-technical memory during 2019-2022, I gave prolonged attention to the templates of Wikipedia, and its interoperability with other organisations. This included exploring various embedded links associated with the article and asking how these were interacting with the textual content of the article. Pentzold had assumed that the site was being co-constructed between its affordances and diverse human-being across different times and places. As I moved away from focusing on content as being produced by individuals, the organisation of Wikipedia became more visible to me, including the strength of the interaction of Wikipedia policies, templates and the content of the article. I explored the interactions between Wikipedia norms (i.e., policies and guidance), talk page comments, edits, sources, and the changing content of articles (across multiple language communities). Through this process I found that talk page comments only infrequently interacted with editing of the relatively uncontroversial article on the Great Smog. This contrasted with Pentzold's findings that talk pages automatically led to changes in the article (and ultimately consensus). Pentzold had not arrived at his findings through matching many talk page comments to edits of the article, but he rather referred to a specific edit (point in space and time) of the article as indicating the move from deliberation to consensus.

Pentzold (2009) provided limited information on the templates that he worked with while on the site. This made it difficult to explore whether differences in templates on the site between 2009 and 2020-2022 had interacted with our research, or alternatively differences across the case studies were due to choices we had made. It was apparent that Pentzold had explored various layers of Wikipedia in previous studies (e.g., Pentzold, 2006 and Seidenglanz). Data from Wikipedia (in my present) suggested that articles in several other languages had been initialised immediately after the London bombings. These should have been available to Pentzold (2009). He should have also had access to usernames and the sources used in the article, as these should have been in place on Wikipedia at the time. He should, for example, have been able to see who the most active editors were, particular types of edits (e.g., deletions), the detail of their contents (e.g., normative or non-normative), and which sources were being cited. There had, however, been noticeable some changes on the site since 2009. Page (2018) stated that there was 'no chronological architecture to structure the talk pages' (p.70). By 2022, I had access to such chronological architecture. Pentzold (2009)

may have only had access to curated archives of threads which would have restricted his understanding of the dynamics taking place on Wikipedia, particularly in terms of debates taking place on the talk pages and how these related to the editing of the article. If this was the case, however, he could have made this clearer in his case study.

Pentzold did not discuss the Semantic Web within his case study, although he referenced a publication on 'Building Semantic Webs for e-government with Wiki technology' (Wagner *et al*, 2006). At this time the Semantic Web was still in a relatively early stage of development and the findings from my literature review suggests it was not being used as a core technology by commercial applications across the web. It was, therefore, unlikely that there were connections on the Wikipedia site (and across the web) that could have suggested interoperability across semantic technologies and Wikipedia. Interdependencies between Wikipedia and Google, however, have been recognised by some for many years (van Dijck, 2013). As someone who had undergone training in Semantic Web programming, I recognised potential links between Wikipedia, Wikidata and the Semantic Web through looking at data on the site and noting findings from other studies (Garcia-Gavilanes *et al*, 2017; Miz *et al*, 2019). My recognition of the Semantic Web then triggered my interest in wider constructions.

7.7 The Theory

Instead of extending theory through critically reviewing of the data and reflecting on his findings, Pentzold assumed that he would find evidence of the transition from communicative to cultural memory alongside the transformation of dissent into a global form of consensus on Wikipedia. In his conclusion, Pentzold (2009) provided brief findings on how text and images from the Wikipedia article on the London Bombings had spread (via intertextuality) into traditional media (two newspapers). Pentzold, noted that the Wikipedia's article was prized by Newsweek 'because of 'its photographs, detailed timelines, contact numbers, etc'', and mentioned in the London Metro as part of a process by which the event became history, alongside other histories such as 'Joan of Arc's posthumous acquittal in 1456 and the 1947 Roswell UFO scare' (p.268). I left my thesis open to challenge and reinterpretation, and paid attention to the form of recontextualisation taking place across digital organisations. As part of this I recognised the possibility

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of different forms of interpretation arising. My examination of the interoperability of Wikipedia with other applications revealed both similarities and differences in interpretations of the Great Smog across interacting organisations on a Semantic Web. Such findings, however, did not necessarily indicate high level of openness across the system, or evidence of sustained interpretations challenging the normative narratives of information elites. Overall there was very limited finding of (re)construction that would support marginalised groups at higher risk from disasters to address their trauma and process learning that could support them in mitigating and preparing for repeated disasters.

The results of the above aligned with my research intentions to extend theory on the politics of memory on Wikipedia and the web to acknowledge the inclusion (or exclusion) of marginalised groups in the (re)construction of memories of crisis. Further extended findings also emerged when I combined my findings with both Pentzold (2009) and revisits to Wikipedia. Wikipedian statistical data (accessed December 2022) on Wikipedia articles that had been the subject of previous case studies of memory (see table 16) evidenced the degree that each article had been edited, discussed, viewed, etc. Several of these articles (in the English language edition) had been identified as 'vital' by Wikipedian i.e., of particular importance and so requiring a high-quality article. The articles drawing the highest levels of comments were concentrated on events in the USA, or strongly related to its interests. Crises relating directly to the USA also had high levels of editing, volume of text and pageviews and were identified as being of a relatively good standard according to Wikipedian content assessment/article evolution. Such activity did not necessarily relate to the recency of an event. Articles on the Vietnam War and the September 11 attacks, for example, were both highly controversial and widely viewed articles on Wikipedia. Several articles relating to events outside the USA or a non-nationalist form of social identity generally had a relatively high volume of text and number of sources, but relatively low number of edits compared to the articles on the Vietnam War and the September 11 attacks. This included English language articles on Black Lives Matters, the Egyptian Revolution 2011; the Downing of the Malaysia Airlines Flight 17, the Second Sino-Japanese War, the London Bombings 2005; and the Great Patriotic War. Other articles related to memories of past atrocities outside the USA (e.g., Latvian Legion) had been given much less attention, both in terms of editing and page views. They also had relatively high levels of bot activity in comparison with the other articles.

Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes (English language)	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Luyt (2014)	Vietnam War, 1954-75 (various categories relating to conflict, war and location)	Yes	301,727	355	17,813	24 pages of comments archived.	409 edits (2.3% of total)	741,176	C-Class (considerable editing needed). Level 4 vital article.
Ferron and Massa (2014)	September 11 Attacks, 2001 (various categories relating to the US, terrorism, and mass murder)	Yes	275,789	465	20,447	63 pages of comments archived.	373 (1.8%)	725,811	GA Class (meets all good article criteria). Level 4 vital article.

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Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Twyman <i>et al.</i> , (2016)	Black Lives Matter (various categories including social movements, protests and the US)	Yes.	264,433	472	4741	11 pages of comments archived	178 (3.8%)	169,584	GA Class. Level 5 vital article.
Ferron and Massa (2011)	Egyptian Revolution, 2011 (various categories including protest, revolution and crisis).	No, but the politics of Egypt is	240,649	401	8478	9 pages of comments archived	474 (5.6%)	31,138	B-Class (almost complete, but requires some work) Level 5 – vital article.

Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Smit (2018)	Downing of Malaysia airlines flight 17, 2014 (various categories e.g., international relations, aviation accidents, war)	Yes	240,264	398	8757	26 pages of comments archived	138 (1.6%)	272,922	B-Class

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Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Gustafsson, 2020	Second Sino-Japanese War, 1937-1945. (various categories including war, conflict and locations)	No	209,201	225	7855	6 pages of comments archived	279 (3.6%)	185,949	B-Class. Level 4 vital article.
Ferron and Massa (2014)	Virginia Tech Shooting, 2007 (Various categories including mass murder, and locations).	No, but the gunman is.	201,383	243	13,801	15 pages of archives	220 (1.6%)	182,759	C-Class

Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Dounaevsky, (2013)	The Great Patriotic War (named as the Eastern Front (World War II) on Wikipedia (Various categories focused on war and location)	Wikipedia does not use this event title	199,281	170	6395	12 pages of comments archived	234 (3.7%)	111,001	C-Class, Level – 4, vital article.

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Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Pentzold (2009)	London Bombings 2005 (various categories including mass murder, terrorism and location).	No, although this was put under page protection.	93,934	100	9478	11 pages of comments archived	170(1.8%)	80,989	B-Class, Level 5 article.
Kaprāns and Makhortykh, (2017)	Latvian Legion, 1943 (various categories relating to military history).	No	33,035	43	512	No archived pages.	77(15%)	5829	Start Class (still in development and may be lacking reliable citations)

Study	Event and Wikipedia Category	Identified as controversial on Wikipedia	Page size in bytes	Number of citations in text	Edits	Talk page comments	Bot edits	Page views in last 60 days	Wikipedia quality grade (Wikipedia, 2022g; 2023d)
Kaprāns, (2016)	The Soviet Story, 1940s (various categories focused on films).	No	28,231	37	792	1 page of comments archived	60 (7.6%)	2169	Start to C Class.

Table 16 Activity on articles that were the focus of previous site visits.

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Creating a similar table (table 17 below) for all the events included in Wikipedia's category of industrial disasters (the category including the Great Smog of London) evidenced that the majority of these articles (for the English language edition) were much smaller in terms of article size, number of edits, citations and pages views than the articles included in categories relating to war, terrorism, democratic protest and other forms of conflict. None of them had been identified as 'vital' articles, and many were classified as being of mid to low importance (i.e., peripheral or trivial information). Many were at a relatively early stage of development according to Wikipedian content standards. Only four were identified in a list of controversial issues on Wikipedia (Wikipedian contributors, 2022t) including (a) the Bhopal Disaster; (b) the Love Canal Disaster in the USA; (c) Minamata Disease, Kumamoto, Japan; and (d) the Three Gorges Dam in China. This suggested that this set of articles had not generated the same level of attention and deliberation from editors of differing viewpoints. This was aligned with a low number of talk pages comments and reverts for many of the events in this category. Many of these events had much higher levels of bot editing than the articles on war and other conflict included in table 16. Talk page comments focused on normative Wikipedian editing issues. The Bhopal Disaster article was semi-protected from general edits after someone attempted to add a podcast claiming to give the first-hand accounts of survivors and present-day activists. These were not seen as reliable sources. In the case of the Love Canal Disaster, some editors identified the possibility of pro-industry bias in the article and discussed this in terms of needing to adhere to normative editing on neutrality. Similarly, discussions on neutrality were included in the talk pages for the article on the Three Gorges Dam.

The majority of crisis events included in the Wikipedia category for industrial disasters identified took place in the USA, China, Europe and Japan, with more recent events focused on the USA and China. The Bhopal Disaster (in India) was the article only article in this group to be over 100,00 bytes and reference over a hundred sources. It also had the highest number of edits and views in this category. The Great Smog received a relatively high-level editing and viewing attention in this group. Editing and viewing numbers were relatively low for many of the disaster events in China, compared to those in the USA, Japan, Canada, Australia and Europe. In addition to the events included in the Wikipedia category of industrial disasters, there are likely to be many industrial pollution events that

have taken place across the world, including in developing economies. The absence of such disasters may be due to a lack of media and other sources which Wikipedians would view as trusted sources, and/or a lack of interest on the part of the so-called Wikipedian Community.

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Table 17: Activity in articles included in Wikipedia's industrial disasters.

Event	Identified as controversial on Wikipedia	Page size in bytes	Number of citations	Edits	Talk page comments	Bot edits	Page views of the last 60 days	Wikipedia quality grade
Bhopal Disaster, India, 1984	Yes	119,816	123	4,250	2 pages of comments archived.	205 (4.8%)	214,730	B-Class
Love Canal toxic waste, USA, 1970s to current.	Yes	77,244	84	2347	1 page of comments archived	131 (5.6%)	32,411	B-Class, Low to High importance. High = contributes a 'depth of knowledge'. Low = marginal or trivial knowledge.
Kingston Fossil Plant Spill, Tennessee, USA, 2008	No	65,816	83	788	Substantial number of comments but no archived pages	35 (4.4%)	7077	GA-Class, Mid importance. Mid =fills in some minor details.

Event	Identified as controversial on Wikipedia	Page size in bytes	Number of citations	Edits	Talk page comments	Bot edits	Page views of the last 60 days	Wikipedia quality grade
Minamata Disease, Kumamoto, Japan, 1932-1968.	Yes	62,059	59	1243	No archived comments	76 (6.1%)	45,419	B-Class Class – Mid to High importance.
Sydney Tar Ponds, Australia	No	27,578	24	351	No archived comments	21 (6%)	1902	C-Class, Mid importance.
Seveso Disaster, Lombardy, Italy, 1976	No	26,986	21	524	No archived comments	64 (12.1%)	13,903	Start – C Class, Low -Mid importance.
The Great Smog of London, UK, 1952	No	24,443	33	1372	1 page of comments archived	99 (7.2%)	187,073	B-class, mainly Low-importance.
Ital-ital Disease, Toyama, Japan, 1912	No	20,618	16	309	No archived comments	34 (10.9%)	8,654	Start-C Class, Low-Mid importance.
Phillips Disaster, Texas, USA, 1989	No	15,761	11	264	No archived comments	17 (6.4%)	5769	C-Class, Low importance
Donora Smog, Pennsylvania, USA, 1948	No	14,311	12	254	No comments	24 (9.4%)	13,487	C-Class, Low-Mid Importance
Jilin chemical plant explosion, China, 2005	No	13,762	11	332	No archived comments	24 (7.2%)	1474	C-Class, Low importance

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Event	Identified as controversial on Wikipedia	Page size in bytes	Number of citations	Edits	Talk page comments	Bot edits	Page views of the last 60 days	Wikipedia quality grade
Ontarian Minamata Disease, Ontario, Canada, 1970	No	12,453	11	124	No archived comments	28 (22.6%)	1043	B-Class, Low importance
Shenzhen landside, China, 2015	No	10,573	21	153	Few Comments	13 (8.5%)	235	Start Class, Low importance
AZF chemical factory explosion, Toulouse, France, 2001	No	8316	12	327	No comments	7 (33.3%)	2911	Start Class, Low importance
Baia Mara Cyanide Spill, Romania, 2000	No	7637	8	142	No comments	18 (12.6%)	3801	Start Class, Low Importance
Bohai Bay Oil Spill, China, 2011	No	6997	7	54	No comments	10 (18.5%)	171	Start Class, Low importance
Guangxi Cadmium Spill, China, 2012	No	4701	10	56	No comments	14 (25%)	165	Start Class, Mid-Low Importance
Sandoz Chemical Spill, Switzerland, 1986	No	4437	10	97	1 comment	12 (13.4%)	2013	Start Class, Low Importance
Release of sulfur dioxide at Al-Mishraq plant, Iraq, 2003	No	4399	5	84	No comments	117 (20.2%)	262	Stub-Class, not received an importance rating.

Event	Identified as controversial on Wikipedia	Page size in bytes	Number of citations	Edits	Talk page comments	Bot edits	Page views of the last 60 days	Wikipedia quality grade
Fujian Quangang Carong Nine Leakage event, China, 2018	No	3537	8	18	No comments	4 (22.2%)	123	Start Class, Low Importance
Guangxi chemical plant explosions, China, 2008	No	2,831	3	46	No comments	8 (17.4%)	99	Start Class, Low importance

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A further set of events were mentioned within wider articles on locations, etc.

- Spring Valley, (Washington, USA) and chemical weapons, World War. (Not identified as controversial)
- Times Beach, Missouri, USA, 1983 (Not controversial)
- Release of toxic chemicals into Alamosa River, Colorado, USA, 1990. (Not controversial)
- California's largest hazardous chemical spill, 1991. (Not controversial)
- Health Issues on the Aamjiwnaang First Nation. (Not controversial)
- Environmental Issues with the Three Gorges Dam (Yes, controversial)
- Baogang Tailings Dam, China. (Not controversial)
- Release of Lead Dust into Esperance Harbour, Australia, 2007 (Not controversial).

7.8 Conclusion

By choosing a different type of crisis than Pentzold (2009) and other scholars that had followed him, my research led to an expansion of theory on memories of crisis on Wikipedia. In summary, I found that a focus on history wars relating to past conflicts and national identities - established in the wake of world wars and cold wars in the twentieth century - were potentially creating a backwards facing focus that could distract from other major policy concerns in the present across different localities. The system, for example, was likely to reduce the visibility of industrial disasters (including the role of human beings in such disasters) in contemporary knowledge-making systems. As well as reducing such visibility on Wikipedia, a lack of editing attention might also mean that articles on industrial disasters would be viewed as less authoritative information within the wider system and so less likely to be referenced. These findings engaged with interactions between Wikipedia and other institutions, copyright law and various studies of memory. The conclusion of the thesis explores such issues in more detail and addresses my research questions.

Chapter 8 Conclusion

8.1 Introduction

This chapter summarises key findings from my thesis which address my research problem and questions. These findings are used to extend existing understanding of how socio-technical memory is constructed on Wikipedia. Later in the chapter I also begin exploring a line of research in response to the main problematic I identified through my research. Finally, I consider the limitations of my case study and other possible lines of research that I was not able to follow through my own research project and data samples. The basis for my research (i.e., its significance) was to extend understanding of the politics of the memories of crisis on Wikipedia, with particular attention given to the inclusion or exclusion of those at greatest risk from disasters. This was with recognition (drawn from the field of disaster risk reduction) that the construction of shared memories of environmental disasters can play a part in preparing for repeated disasters and potentially mitigate the impact of these. My findings were delivered using a deductive-inductive methodology, with reference to the following research questions.

- How are articles about past crises (re)constructed on Wikipedia with reference to other memory representations?
- How do the re(constructions) engage with marginalisation.

The following sets out a summary of the findings from my thesis, including my case study and its comparison which sought to address the above questions.

8.2 Summary of Case Findings and the Addressing of my Research Questions

Findings from the literature review and case study suggested that the construction and operations of the Semantic Web (including Wikipedia) were based on software engineering concepts of deep learning (as relational and layered). These have interacted many academic theories and concepts, including Leibniz concept of universal language (Vrandečić, 2021); Hegel's Encyclopaedia (O'Sullivan, 2011), the Durkheimian concept of solidarity (Piskorski and Gorbatai, 2013), Alexander's

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(1979) pattern languages and the ideas of many other Western thinkers (Provo, 2022). Working with other regional semantic webs might have suggested other influences.

Halbwachs concept of pluralist, collective memory (drawing on Durkheimian tradition) has come to be associated with the concept of pluralist democracy (Mitsztal, 2005). This could appeal to all political ideologies aligned with democracies - as the narrative of any interest could potentially become dominant through pluralist interactions and viewed as legitimate common sense. The creation of a universal language and free educational content (from pluralist language communities) could also appeal to various ideologies - whether these emphasised global knowledge and solidarity (Vrandečić, 2020) or competitive, commercialised opportunities (Maksakis, 2019). A conceptualisation of solidarity through collective memory might also call for forgetting (Connerton, 2008) to support post-conflict (whether in relation to conflict between nations, ideologies or social identities) and economic recovery.

According to certain narratives, a hegemonic system as a third mode (or way) of governance (Kioupkiolis 2022, p.57-59) had come to be administered by representatives of a wide-range of interests and beliefs. This might be seen to be supportive of forms of democratic citizenship – potentially aligning with critical theory and the concept of deliberative democracy (Schröder, 2019), but also the avoidance of physical and cold wars. Within this system, representatives (as power editors) could accumulate privileges, potentially win normative debates (including challenges to the norms themselves e.g., through the ‘no rules’ principle on Wikipedia) about what should or should not be sustained as visible text. Representatives of different groups could push for increased data on what they considered most meaningful for their groups, including notable figures and events (e.g., female artists, disabled politicians, etc). They might choose to attempt to use generic entities of the Semantic Web to construct counterhegemonic ideological discourse in opposition to dominant hegemonic discourses. From the perspective of committed Wikipedians, intensive editing activity by a diverse group of editors, including through contestation, might even be seen to strengthen the authority and quality of an article (Wilkinson and Huberman 2007; Osman, 2013). A hegemonic approach could also potentially be used to counter what is viewed as misinformation within a particular region. The generation of the resulting ‘social

facts' (i.e., facts widely accepted as authoritative, legitimate and common sense by a society or multi-language communities) could be useful for various purposes (from intelligence gathering to providing ideas for film scripts) and be used to generate hybrid forms of knowledge (as knowledge graphs) to support the training of AI.

Within this thesis I have examined my data sample with reference to a methodology that has drawn on Gramscian theory. The analysis I undertook suggested that the normative policing in this system challenged the degree to which it could be viewed as a form of global, democratic memory and instead increased the likelihood of gaming (across scales and layers) by those who had intensive knowledge of the norms of this system. Findings across different studies that Wikipedians tend to focus on the concerns of the United States raised the risk that Wikipedian dynamics might resemble Bittner's (2017) findings. Edits wars could take place between members of the same national community, even though it might seem that these wars involve a wider group of participants. In addition, the focus of Wikipedians were on so-called contentious articles – often focused on some form of past conflict, while other articles on other issues of political significance (including industrial disasters) were given less attention and had larger percentages of bot edits. This aligned with previous findings that a small number of highly edited articles are viewed as high quality by wikipedias and so gain high visibility (Wilkinson and Huberman, 2007).

Working with my data, I found a system that favoured civil institutions long associated with the nation-state (e.g., museums, archives, libraries, etc) and potentially favouring nationalist perspectives of memory through referencing older publications (out of copyright) and the use of content viewed as politically neutral by normative Wikipedian editors. Added to this were the new institutionalisations (e.g., Google, Facebook), that had emerged out of the USA and reached high regional visibility. These new institutions had come to accumulate high levels of trust and related visibility as part of a self-referencing Semantic Web consisting of state, civil and commercial interests. My analysis demonstrated that this formation could be made visible data from the Semantic Web and seemed to have been designed and maintained to support the development of semantic technologies. This construction, however, was not highly visible to the many - including for

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scholars working outside the computing and information sciences due to different subject databases, etc.

In summary, all the institutions engaged in the Semantic Web were highly intertwined and so difficult to distinguish from one another in a period of mature capitalism, with implications for accountability (Sørensen and Torfing, 2021, p.1593). If there were intentions for this system to support open, hegemonic struggles, such operations were unclear from the data set that I worked with. Instead, the norms of this system supported the sustaining of politically neutralised content that was either provided by national medias (particularly in the case of highly contemporary events) or academic content (open access or outside copyright). This effect tended to drag the most visible text towards

- being highly contained within a national space-time and traditional understandings of authority.
- Perspectives preferred by sustained, powerful national or regional interests, including a focus on conflict between nations, with less attention given to forms of crisis, such as industrial disasters, where responsibilities could potentially be associated with powerful, domestic actors and their economic allies.
- Notable actors as being highly visible custodians, with little to no attention being given to socially marginalised individuals experiencing crises.
- The focus on issues of importance to the United States, which triggered associations with the 'World Book' (a US hardcopy Encyclopaedia with global ambitions).
- what Wikipedians viewed as neutral political content i.e., linear, scientific causal explanations, rather exploring complex socio-political causation calling for political challenge and activism.

This system skewed towards valuing accumulated notability combined with technical recursions, hierarchical class systems within computing and pattern languages supporting maintainability. This meant that this self-referencing system was at risk of becoming a rigid class system, with self-referencing notables (including as representatives of diverse groups) positioned towards the top of a globalised hierarchy while others (in the groups being represented) were

increasingly made invisible within the self-referencing system constructed by such notables.

Although some Wikipedians might argue that this system prevents legal infringements and addresses misinformation, it also produces social facts about past events closely associated with out of copyright texts (from many decades ago). As such it dissociates social facts from present social attitudes within particular contexts. Looking at how the memory of an industrial disaster was shared across Wikipedia and the Semantic Web suggested that the normativity of this system (as social practice, governance and ordering) supported the generation of interpretations of such disasters that would be of very limited use to those most at risk of such disasters. These included Wikipedia's linear (re)construction of a mainly traditionally authoritative account which recognised physically objective things rather than complex social-political dynamics as causal factors. There were also indications of an elite, nostalgic and commercial (re)interpretation through Netflix's depiction of an 'Act of God' (2016) that connected across to other institutions including Google, Bing and Wikipedia, including through direct editing to Wikipedia and the generation of related knowledge graphs. The degree to which human readers of information interacted with and shaped this process could not be evidenced through my data. The system may have been highly influenced by quantification and clicks on pages, including as the activities of bots or unfriendly agents.

There was evidence that the English language interpretation of the Great Smog had been widely transferred across to other language editions (including through reference to English language sources). Peaks in page views and editing of the Great Smog were triggered by a fictional depiction rather than a similar disaster in the offline world or anniversaries of the Great Smog. The spread of the peak in viewings of Wikipedia pages on the Great Smog (following the release of the 'Act of God', an episode of the Crown), however, seemed to differ dependent on language suggesting limits to the spread of interpretations across the world. Having identified the problematics of Wikipedia from the perspective of my own research problem and questions, I then considered how this might be further explored and addressed from the perspectives of researchers, technologists and policymakers. My thoughts on this are set out below.

8.3 Response to the Above Findings and the Problematics Identified.

Some might call for global rights based or economic approaches to support improved social justice for marginalised groups at risk of negative impacts from repeated disasters and argue for this to be supported through a highly interdependent system. This could potentially be supported with reference to Gramscian theory (Ekers *et al*, 2012). Reviewing the circumstances of the present, however, requires reference to repeated crises that many, including with marginalised groups, now face. Environmental disasters can include widely experienced industrial pollution over time as well as spikes in such pollution. There can be tensions between actors at different scales over responses - including in the accessing of resources. In the conclusion to my case study, I explored the potential problematics of globalised perspectives of air pollution in view of the interactions between air pollution, complex socio-technical factors and localised realities. Global actors may call for a global response which associates together different problematics e.g., black carbon emissions (highly associated with smog) contribute approximately 8% of the net warming effect of all anthropogenic activities (Fuller *et al*, 2022) and transboundary issues. This, however, may ignore localised difference and result in a focus on forms of air pollution associated with climate change which may not be relevant to all localities to the same degree and cause a switch (by industry) to different forms of pollutants or variations in emissions which may be harder to measure and/or regulate. Global perspectives, therefore, can result in a blindness to local circumstances. There, however, remains the need for information on such problematics to be shared across localities and empower groups at localised level (Cretney; 2018; Jacobs, 2019).

Similar issues may arise in the case of environmental disasters attributed to the longer term crisis of climate change. Again, experiences may vary across locations. It is argued that, in the present, attention must be specifically given to how global ideals of solidarity (recognising and addressing climate change) can be balanced by local material needs as repeated environmental disasters (either as longer-term exposure or severe spikes) increasingly impact on marginalised and other groups. How, for example, could structures flex and change to support the stimulation of social activism to mitigate climate change at scale, while supporting

the sharing of memory processing in a way that increases continuous localised adaptation that does not place all responsibility on the individual at localised level?

Studies from the field of disaster risk reduction suggest there is a specific need for shared memory to give recognition of highly localised contexts and enable the processing information beyond identification with sustained notables (e.g., as events or individuals) at global, regional or national level. At the level of repeated environment disasters, all individuals will need to consider and learn from what has happened to them with reference to those sharing in their immediate material circumstances. They will also need to process the possibility that they are likely to face further disasters that will be both similar (e.g., further flooding) and different (e.g., more severe). Even though repeated environmental disasters (e.g., droughts and floods) are regularly taking place across the world, research in the UK by the Institute for Public Policy Research found the climate crisis is often understood locally as 'a high-level, geopolitical issue'. UK participants viewed this as something discussed in Westminster and the United Nations, disconnected from local priorities (Webb *et al*, 2021, p.18). Those participating in place-based climate adaptative partnerships can view top-down policy and advice as counter-productive, and instead seek to use the concept of place to activate horizontal stakeholder relationships to scale-up (Howarth *et al*, 2022). Power asymmetries between partners, however, can also potentially lead to a lack of perceived justice, equity and legitimacy and there can be attempts by environmental professionals (operating across scales) to separate out wider socio-economic issues of marginalisation from environmental problematics. In the field of transitional justice, it has also been recognised that high levels of connection between locally groups at risk and actors working at others scales may create imbalances that negatively impact on bottom-up forms of transitional of justice (Jones, 2021) and adaptation (Erikson *et al*, 2021). Studies have found that those at high risk may be officially included in disaster preparedness and recovering processes, but lack the political power to influence decision making, and powerful actors may use processes to maintain the status quo or benefit from any initiatives (Oliver-Smith *et al*, 2017). There have also been examples of recent disasters, such as the rail disaster at East Palestine, Ohio, USA, where actors working at other scales have sought to transform the disaster into a mediatised culture war (The Economist, 2023).

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Critical scholars position disasters within human-environmental relations, contest their objectification as natural events, and resist the idea that community participation should be used to create a narrative of self-reliance or self-adaptation around disasters. It is also recognised that in cases where environment damage becomes highly visible, polluters may also use the adaptation agenda to deflect attention away from addressing environmental pollutants and damage (Nyberg and Wright, 2022) or adopt a risk-based approach to move the political focus away from responsibility and liability in the present. Critical accounts of repeated environmental disasters, therefore, view them as systematic processes over time, call for disaster planning to recognise how disaster vulnerability interacts with social and economic inclusion (Cattino and Reckien, 2021, p.104). They also emphasise the importance of allowing those directly experiencing repeated disasters to share memory with each other in a way that will enable mitigation of, and preparation for, future disasters (Oliver-Smith *et al*, 2017; Fuenteable, 2021; Barbosa and Coates, 2021). The following explores what factors would need to be considered in designing a site for the re(construction) of such memories.

8.4 Sites for Remembering and Preparing for Environmental Disasters

Those at highest risk from repeating environmental, anthropogenic disasters (whether viewed as longer term exposure or spikes in such exposure) need sites where they can share their experiences of such disasters and be supported to process their memory in ways that reduce the likelihood of repeated disasters impacting on them in the future. Such sites need to align with particular combinations of geographies and social circumstances associated with risk of worse outcomes due to exposure. Many will rely heavily on contacts in their immediate locality or neighbouring areas, during or in the aftermath of a disaster. In the case of environmental disasters this might be associated with clustering of particular sources of pollution, rivers and coast-lines prone to flooding, areas prone to droughts, etc. Such space-time formation (acknowledging the addressing of complex place-based repeating disasters) would not be supported by the current anonymised normative space of Wikipedia and the Semantic Web which emphasises global notability, neutrality and traditional forms of authority. The capacity of many individuals within marginalised groups to build up sophisticated

levels of programming skills and adopt to Wikipedian norms (reflecting a particular space-time configuration) to power-edit across times and spaces is highly questionable, particularly as many have other responsibilities (Shandra, 2017; Dean, 2022). In addition, supporting the few to act as their representatives by becoming normative in the same way as the existing dominant, global narrative will not help those at high risk process their memory in specific local contexts in ways that allow them to prepare for future disasters (Camacho and Matus, 2021). Wikipedia's blindness to locally experienced geographies in the present would also act as a barrier to this. Osborne, Graham and Dittus (2021, p.92), for example, found that Wikipedian activity focused on the geography of Berlin was 'highly uneven and clustered in the city centre, leaving most districts illegible and invisible with the exception of the German edition'. This was also accompanied by contested memory (edit wars) that tended to focus on the 'city's national-socialist and communist history'. The most contested articles were not in German or generated by editors based in Germany.

Social media can potentially be used to shared experiences of local disasters, including industrial disasters. In very close networks (between friends, family and neighbours - where the connection is both online and offline) such sharing might be useful (Smith and Yell, 2020). Digital technologies, however, are not accessible to all, particularly in the case of low- income, marginalised groups. Digital technologies are also at high risk during some environmental disasters (e.g., flooding) due cascading failures across infrastructures. In addition, there are problematics at higher scales (where users become anonymised), as unfriendly externals (e.g., agents of those responsible for the pollution incident or seeking to capitalise on it) may seek to influence information exchange or collect information to protect themselves against legal challenge, extract resources, etc.

Any site used to support marginalised groups and those at higher risk to process memory as re(construction) would need to be designed to focus attention on the needs in particular local contexts within the present and the identities that are meaningful within that context - rather than enable edit wars between notables at other scales. Any attempts to guard such a system against interesting seeking to manipulate, or sabotage, attempts by marginalised groups to process information on repeating disasters, would need to have a highly sophisticated understanding of how time (as a direction) can interact with space (as imagined presence).

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Nostalgic or habitual memories, for example could be useful in raising awareness that disasters can take place in a locality, particularly among younger generations or migrants into an area who have not experienced them. This, however, would need to be balanced with a data system that enabled appropriate preparedness for future risk and supported live response in the present (Harms, 2012; Boret and Shibayama, 2018; de Guttery and Ratter, 2022). Individuals might also need support evaluating their resilience across different situations, as well as recognising that there might be people present in their locality who were unfamiliar with that locality e.g., those who had recently migrated into an area, travellers and tourists (Appleby-Arnold, *et al*, 2018). Climate change is likely to increase migration away from severely affected localities to other localities. There will, therefore, be an increasing the need for integrating new arrivals into local systems of disaster preparedness, response and evaluation, while also ensuring that existing residents from marginalised groups (e.g., older, disable people) are also made visible and given the opportunity to process memory in a way that could help mitigate the impact of disasters (McKinnon, Gorman-Murray and Dominey-Howes, 2016). As in the case of other communication systems, there would need to enable individuals from marginalised groups to share memory with each other and wider local communities, while identifying and addressing discrimination against these groups.

This system would also require the capacity to connect those who could assist each other in specific (and potentially) novel circumstances, while avoiding forms of over-connection (interdependency) that might lead to cascading failures. A system supporting local bonding capital could still support wider social activism (including demands for greater resource distribution based on marginalisation combined with risk) driven by a more bottom-up approach. Localised social memories of previous disasters might also be connected to a wider system of sensors to enable live data analysis and collect evidence on the outcomes of localised memory sharing in terms of reduced damage to individuals (including those from marginalised groups) in the present and over time. Sørensen and Torfing (2021, p.1603) propose that the

‘accountability deficit owing to the self-organized character of collaborative governance arrangements may be overcome by combining top-down political

and administrative meta governance (2016) with bottom-up forms of social accountability (Schillemans 2008)'.

The above summarises my findings with reference to my research intentions and questions. These findings suggested problematics with current system of memory (re)construction at scale (via Wikipedia and the Semantic Web), from the perspective of disaster risk reduction. I have then set out a brief policy discussion of possible ways to address such problematics in relation to a wider crisis emerging across localities. It should, however, be noted that there were limitations to my research, partly due to the circumstances during which it was undertaken (during the Covid19 lockdowns). These are further explored below.

8.5 The Limitations of My Thesis and Potential for Further Research

It was not my intention to be reliant on analysis of online discourse to investigate the politics of power-inequalities, marginalisation, and resistance. I was aware of decades of research on media effects that evidenced that the social effects of mediated messaging are limited when observed in large heterogeneous groups. Modern models (from psychology and audience reception studies) propose conditional media effects – where media effects can be enhanced or reduced by individual difference and social context variables (Valkenburg *et al*, 2015 p.325). Due to a lack of information on readers of Wikipedia (Singer *et al*, 2017), the degree that audiences regard Wikipedian generated fact as common sense, remains unclear. My reliance on archival data also meant that my own work became a network of references to dominant narratives and elite institutions. Relying on data from virtual archives it could be argued that the construction of my own thesis interacted strongly with the self-referencing encyclopaedia, even though I attempted to disrupt this in my interpretation. If I had been able to undertake a localised ethnography that gave attention to material circumstances, I could have given more attention to audience reception. Without being able to undertake an ethnography, I was reliant on my own perspective as someone who identified with groups more likely to be marginalised on Wikipedia. I used this within my reflexive methodology. I, however, believe that my critical approach would have been strengthened by face-to-face work with marginalised groups in

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their preferred space-times, without the direct involvement of Wikipedians or the Wikimedia Foundation.

In addition to recognising that blended research (between the online and offline realms) could have strengthened my PhD, there were other issues raised in my data which I was not able to fully explore through my own data set. This included the relations between article categories/topics and deliberate non-normative editing. This might be an interesting area for further research as it could provide more indication of whether such deliberate non-normative editing is the work of random individuals, a form of social protest, or a more concerted effort to disrupt Wikipedia and those technologies drawing on its data. Another researcher might also wish to extend my findings to consider the degree to which fictional rather than real world events are triggering editing and page views of the articles on past events. Working with the extended case study method, I also recognise that other researchers could further extend theory on the politics of the memory of crises on Wikipedia and the Semantic Web through revisits, including through focusing on memories of other forms of crisis not covered in this thesis - such as environmental disasters attributed to climate change.

8.6 Conclusion

In conclusion it is recognised that Wikipedia and the Semantic Web may have been constructed to support changing relations across space and between strata (i.e., past traditions, present experiences and future expectations), but there are elements of its construction and operations that tends to pull it back into normative pasts. Evidence of the normative pasts are found in the text generated through normative governance structures and related social practices across the Semantic Web and its institutions (including Wikipedia, Google, Netflix, but also museums, universities, archives, etc). Sustaining of such text may be viewed as some (e.g., those influenced by Durkheim) as supporting social solidarity through sustained social facts, and this may be felt to be particularly important in the case of post-conflict recovery and combating misinformation. The application of this system, however, may be inappropriate in relation to repeated and worsening environmental disasters - where those at highest risk must process their experiences of localised disasters in a way that reduces further damage to them. These groups will need to access wider resources but opening them to any

interest may negatively impact on such learning processes. It is suggested that alternative forms of memory sharing are therefore needed. Some initial exploration of such forms is provided in this concluding chapter. Overall, my thesis extends the understanding of the politics of the memory of crisis through giving particular attention to perspectives and needs of marginalised groups at risk from repeated disasters.

Appendix A Glossary of Terms

- Actor network theory A theoretical approach that is particularly associated with the work of Bruno Latour. It is based on the idea that phenomenon can be described through connections.
- Antagonistic A form of opposition or hostility, and a term widely used in the field of politics.
- Application A programme (computer code) that supports specific tasks to be performed.
- Archive Structured set of records which may be further (re)structured over time by those specialising in such (re)structuring (i.e., archivists or curators).
- Augmented intelligence. Adding or extenuating a socially perceived form of intelligence e.g., memory, speed of thought, etc. The technology sector can view this as human capacity added to that of a machine, or vice versa.
- Axiom A belief taken as a starting point for further thought.
- Baiku Baide An online Chinese encyclopaedia owned by the Chinese based technology company Baidu.
- BBC A British national broadcasting company and platform.
- Big data The processing of large amounts of statistic information using applications.
- Bing A form of application used for electronic searches, owned by the US based company, Microsoft.
- Bot A computer programme - programmed to undertake particular tasks.
- Change Blindness The inability to notice indications of change or difference arising e.g., failing to notice indications of the development of cancer in a health scan.

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- Chronotope A theoretical concept associated with the theorist Mikhail Bakhtin - used to describe how the temporal and spatial interact with narrative.
- Cognitive sciences Within this thesis, I am mainly referring to psychology and, to a less degree, neuroscience.
- Collective Memory Term used by some scholars to describe pluralist, shared memory. This term is often associated with the theorist Maurice Halbwachs.
- Commemoration Activities recognising a past event and/or people e.g., the commemorating of wars and those who died in wars.
- Commons Wikimedia ... An application acting as a media repository under the Wikimedia Foundation.
- Constructivist A theoretical concept and model that rejects the idea of an objective reality or natural state, for the idea that perceived structures are fabricated.
- Convolutional neural networks. Computer programming inspired by the way neuroscientists have described biological perceptual systems. Where multiple layers are stacked on one another this is known as deep learning. Where these are designed as inputs feeding forward into each other they are referred to as feedforward neural networks. Neural networks are used for a range of purposes including image recognition.
- Coproduction..... A production involving more than one party - where they act upon one another.
- Counter-memories Memory narratives that differ from, and contest, dominant hegemonic memory narrative.
- Creative commons An application with very loose licencing rules - allowing general access to a wide range of content, while reducing the likelihood that content taken from the application will go against copyright. This, however, is not assured. The online version was initially set up by individuals

representing a range of commercial and non-commercial interests, including academics.

- Critical discourse analysis. A form of analysis of textual data that seeks to reveal how discourse has been socially and politically constructed, including indications of domination and marginalisation.
- Crowded-Sourced Data thought to be generated by many editors.
- Cultural Turn Move away from focus on structures (such as relations between state and society) to emphasis agency and subjectivity.
- Cyberspace A sense of space created through interaction with digital technologies, and a sense of sharing that space with other users of the same technologies.
- Cyber-utopianism A description that has been given to highly optimistic perspectives of the potential for digital technologies to generate social opportunities and solve social problems.
- Dbpedia An application holding content taken from Wikipedia and structured for machine use - allowing for relations and properties of Wikipedia resources to be queried using technical languages developed for the Semantic Web. It is also strongly associated with linked data (see Linked data below). DBpedia is not owned by the Wikimedia Foundation, but rather is based in Germany and affiliated with the non-profit organisation 'the Institute for Applied Informatics'.
- Decidability Decisions arrived at through processing of data that avoid being caught within a perpetual state of indecision due to an inability to arrive at a correct answer from the perspective of the system in which the data is being processed.
- Decolonialisation Thoughts and actions aimed at removing colonialising memories (material and otherwise) from those who have been subject to colonialisation.

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- Deliberation..... A form of discussion involving careful consideration of other arguments. This is a term that is strongly associated with contemporary democratic systems.
- Determinism..... The belief that everything has been decided in advance, leaving no room for individual agency.
- Digital Commons..... The idea of public goods digitally held and widely accessible. The Creative Commons (see further definition in this glossary) is held up by some as an example of this.
- Discursive The expression of the social through discourse. This relates to constructivism (see definition above) and the idea that what humans perceive as their reality is the product of shared discourse expressing a range of social beliefs.
- Double hermeneutic This is associated with an interpretative research approach that rejects the belief that it is possible to work with phenomenon objectively, and instead recognises that the perspective of participants interacts with research. In the double hermeneutic there is recognition that the researcher is a participant in, and acts upon, the system they are researching.
- DuckDuckGo..... A search engine that claims it allows users to ensure that their data is maintained and processed according to their privacy choices. It is owned by an American company.
- Edit wars Conflicts between editors using the same applications e.g., overwriting each other's edits on Wikipedia.
- Episodic memory Cognitive scientists have defined this as a separate form of memory related to autobiographical memories (perceived to be the result of related temporalised-spatialised experiences and associated with a sense of self through self-reference). Tulving created the binary of episodic and semantic explicit memory (see definition of semantic memory below), but such distinctions are becoming increasingly blurred in the cognitive sciences.

- Ethnography..... A research practice whereby the researcher shares the space and time of their research participants in an attempt to interpret their culture from their perspective. In a digital ethnography a researcher will attempt to work with representations on the web (e.g., through data produced by users on open access applications). In a Hybrid ethnography they will work with research participants both online and offline.
- Ethnographic revisit When an ethnographer revisits a site that has previously been the focus of a study by a scholar and undertakes a new case study which can then be compared with the previous study.
- Extended case method (ECM) A form of ethnography developed by the Manchester School and then adapted by Michael Burawoy. Burawoy's adapted approach includes comparison with another visit by a researcher to the same site (a revisit).
- Facebook An application for social networking (e.g., enabling digital connections between friends, family and others). This is an American company which has been subject to intense media interest and scrutiny due to political advertising on the application.
- False memories Memories that are found to contradict what is socially perceived to be robust alternative evidence, for example the memory a witness has of a thief wearing a green jacket when other evidence (e.g., CCTV footage and a jacket placed in evidence) shows they were wearing a yellow jacket.
- Federated knowledge hosting. Where digitalised knowledge is shared with regard to data privacy e.g., sharing of multiple knowledge graphs (see definition of knowledge graphs below) from different organisations alongside the use of encryption or other privacy preserving technology. Different stakeholders

(supposedly in a decentralised system) can then maintain some control over their own knowledge graph or graphs.

- Global North..... This includes countries that are said to be in a mature stage of economic and industrial development including Europe, North America and some parts of Asia.
- Global South This includes countries that are said to be in an earlier stage of economic development including those in Africa, Latin America and some part of Asia.
- Great Smog of London. This is the term used by Wikipedia and a number of other digital applications for a major air pollution event that took place in the London area in the early 1950s.
- Google Search A form of application used for electronic searches that is owned by the US based company, Google.
- Google Translate An application owned by Google that has been designed to enable users to translate text from one language into another.
- Google Trends An application owned by Google that can be used to query popular search terms on Google according to a range of variables including location and time.
- Hegemony Within this thesis, the term hegemony mainly references Gramscian theory on hegemony. A hegemonic project is one of social unity favouring a dominant class. This includes the co-construction of what is viewed as thinkable (Gramsci refers to this as common sense) and a particular form (which Gramsci describes this as a historic bloc) which exerts moral, intellectual and political dominance. Such a form can only arise if both material and ideational conditions are favourable. This legitimises the bloc and gives it greater control over material conditions.
- Heuristic..... A simplification (e.g., a stereotype) used to solve something quickly and to the satisfaction of its user, particularly if recognising complexity would result in much

longer processing time and perhaps impact on decidability (see definition above).

Histography.....	Focused on the writing of history, with regard to changes in approaches to the writing of history.
Human computer interaction	A field of computing which focuses on interfaces between humans and computers, and how such interfaces can be optimised.
Hyperconnected.....	A phrase used to describe the feeling of being connected to others through hyperlinking technologies.
Hyperlinks	Numerical code enabling the navigation from one text or image to another.
Hypertext.....	Text connected to other text through hyperlinks.
Hypertext narrative.....	Narrative constructed out of hypertext. This can include narrative constructed into particular geometrical patterns.
Illusion of truth.....	A term used by some psychologists to describe an effect whereby easy of processing and supporting cues lead to an assumption of truth even in the absence of associated, robust evidence.
Infinite regress	Where arguments rely on the belief of related predecessors that chain backwards into infinity.
Interoperability	The capacity of different software components or applications to exchange information with one another, even though there may be differences between them.
Intertextuality	Ways in which text refer, or do not refer, to other texts and their interactions within a body of literature.
Interwiki Linking	Use of prefixes (codes) to link together different Wikimedia projects.
IP address	Numerical code (string of characters) setting out a unique address, as required under standard internet protocols. The IP address provides some data to websites visited by a user e.g., the supposed location of a device. This,

however, is not to the level of a personal physical address and such data can potentially be open to manipulation.

- ISP Internet service provider. These are companies which provide users with access to the Web and host content.
- Iterative Repeated
- Knowledge Graph Technologists have described these as graphs (or graph databases) of connections of machine-readable data on entities and their relations. This is represented in graphical format or representation of relations between its datapoints. Various techniques (using forms of logic and fusions) are used to automatically generate so-called knowledge (perceived as useful to those generating the information). They are, for example, perceived to be useful in the development of artificial intelligence. They are also known to be prone to data quality issues arising from the techniques used to create them.
- Knowledge-Power A concept described by Michel Foucault of how power is supported through knowledge and the objects of knowledge produced through power diffused and embodied as discourse.
- Lieux de mémoire' A concept described by Pierre Nora referring to the idea that national (French) memory could be represented by particular spaces or symbols. Nora put this forward as a replacement for traditional forms of collective memory of lived experience, which he felt were in decline.
- Linked data A set of principles related to the concept of open data and the Semantic Web (see definition below) i.e., data as on the web, in a non-proprietary format, machine readable, and linked other data entities.
- Mediatisation The interaction of the media, and other aspects of a culture or society. It has been described by some scholars as a process by which the discourses of a culture

or society increasingly become reliant on, and are transformed by, the design and operations of the media.

- Mental time travel..... An increasingly popular theory and modelling of memory and expectations within psychology (particularly evolutionary psychology).
- Meta Intertextuality..... When a bounded set of text reference to one another as a form of self-reference.
- Metadata High level description (including assertions and link relationship) of any resource/document with a URL that can be read by machines.
- Meta.Wikimedia This is described on the Wikimedia website as a global community site for its projects.
- Methodological individualism Focuses on individual choices and actions as the explanation of larger structures.
- Misinformation..... Information claiming to be truth or fact but which is perceived to go against wider social norms and associated with attempts to deliberately deceive or harm out of self-interest.
- Mnemonic Aids (e.g., a device or technique) that supports the recognition of a past.
- Netflix..... An application hosting streaming content including films and television series. A company owned by multiple entities.
- Network Governance ... This is a mode of governance that was widely adopted in developed countries towards the end of the twentieth century. Such governance was theorised as being more capable of identifying and addressed so-called 'wicked issues' that crossed different sectorial and institutional boundaries. The bringing together of different sectors and institutions in network governance was meant to enable more joined up approaches to problem solving (at both strategic and implementation level).

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- Networked..... Connected together and supposedly able to exchange information.
- Normative The expectation that particular thoughts and behaviours should be conformed to by the many. Marginalised groups may not necessary be willing and/or able to conform to such norms which may lead to additional exclusion.
- NVivo An application that supports the analysis of qualitative data produced by QSR International.
- Object orientated programming. Programmes that assemble data, including (a) properties and behaviours into objects and (b) objects into classes - to offer a desirable speed of processing and ease of usage. These are widely used in contemporary computing.
- Ontology There are two meanings of the term ontology in this thesis. In some cases, it is referred to alongside the term epistemology. In such cases, the term refers to questions over the form and nature of reality. In other cases, in the thesis, it refers to digital ontologies constructed of relations made between subjects and objects - forming the Semantic Web. Such ontologies can be created by humans or automatically, and could also be connected together (e.g., through a knowledge graph).
- Ontological versioning.. Ontologies are used in the construction of the Semantic Web (see definition below), and ontological versions is the retention of multiple versions of an ontology when changes have been made.
- Pareto principle That 20% of individuals contribute 80% of the work.
- Pattern languages..... Formations as grammatical or architectural design elements that are then used (reproduced or modified) to construct a global form e.g., a building or application.
- Peer-to-Peer A many to many model, supposedly enabling decentralised distributions.

- Perception Illusion..... Perceiving something as real which psychologists identify as an illusion through providing standardised definitions and related evidence of what forms an illusion.
- Platform..... A network that enables connections, communications and transactions between different people and/or organisations.
- Polarisation Within this thesis, this refers to opposing positions or opinions.
- Populism A political strategy aimed at convincing voters that politicians represent their interests rather than those of elites but can often indicate those politicians are representing elites.
- Post-Foundational..... a group of theories that view social orderings as open to contestation. They also question the distinction between ‘politics (as a mode of ordering society) and ‘the political’ (as the ever-present possibility for change) (Blakey *et al*, 2022)
- Positionality..... In the case of interpretative research this is where it is recognised that the researcher will interact with, and potentially act on, the phenomenon being studied. The interpretative researcher will therefore attempt to describe their position in relation to the research (i.e., in terms of beliefs, previous experiences, etc). This is seen to increase the trustworthiness and quality of their interpretation.
- Post-Structuralism A school of thought that emerged in the twentieth century which challenged the ideas of a previous school of thought (structuralism). Different proponents took different approaches, but all questioned the existence of fixed structures.
- Power-editing Editing at much higher volumes than the majority of editors e.g., tens of thousands to millions of edits.
- Proxy servers Use of these can alter IP addresses and location details.

- Public Sphere..... An idea put forward by various theorists. In the case of this thesis, this describes a site where potentially anymore could freely access and engage in shared communications and deliberations with others.
- Realism..... The view that phenomenon exist independently of the perception of an observer.
- Recursion..... A repeating function defined in terms of itself, which is used to arrive at solutions through dividing problems into what are perceived to be smaller and simpler versions (as steps) until the solution to these can be combined to solve the original problem (as a form of looping). It can be preferred over iterative approaches on the basis of ease and speed of processing.
- Reddit A social media application that operates through a hierarchy of decision-makers deciding what content is allowed or sustained. Voting is used to increase the visibility of particular posts and comments. Owned by a private US media company called Advance Publications but funded through various interests.
- Reflexive Consideration before response, rather than automatic/habitual recognition and a related response. As a research term it is used in interpretative research which recognises the interaction of the researcher with their research. It requires consideration of, and descriptions of the intersecting relations between the researcher and the participants. It is widely recognised as an indication of trustworthiness and quality in interpretative studies.
- Reify To translate abstract phenomenon into perceived reality e.g., as facts.
- Revert On Wikipedia, this is when an editor (human or bot) changes the text back to an early version and in the process 'reverts' the edit(s) of another editor.
- Relational web See Semantic Web below.

- Self-reference In the context of this thesis, this is mainly where knowledge of a sense of self is generated through reference to that sense of self, including as intersecting relations. In a broader sense, the term is said to indicate a statement or text that references itself. In the field of computing self-reference can arise as seeming paradoxes, including in semantic systems.
- Semantic memory A form of memory placed in a binary with episodic memory (see definition above). Semantic memory has been thought to hold orderings of symbols (including the rules and relations) that are needed for language, and be associated with social knowledge including shared concepts, ideas and facts.
- Semantic Web..... This has drawn on the concept of semantic memory through the organisation of information into ordered structures and their relations which can be accessed and processed by machines to automatically generate so-called knowledge. This has included the creation of semantic languages and forms (e.g., linked data and knowledge graphs – see definitions above) as enablers.
- Social construction of technology An alternative to deterministic readings of the history of technologies, through reference to pluralism, negotiation and choice.
- Social Facts Unique datapoints that can be widely argued to be authoritative, legitimate - even common sense - within a society, or across societies.
- Socio-technical This term represents the view that the social and technical are not separated, but rather reference one another and co-create social worlds.
- Spatial Turn..... A turning away from the concept of history (particularly that which was viewed as elite or determined) towards examining the imagining of space.

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- Structured data Data that has been ordered (often hierarchically) so it can be accessed and processed by machines. Data produced by humans can be reordered in this way. Sometimes such reordering is only partial - this is referred to as semi-structured data.
- Subaltern Groups and individuals who are not the dominant group in a hegemony.
- Sustained In the context of this thesis, this is where a text remains connected to the most visible text over time – with reference to normative policies and practices.
- Technology stack Where a technology is built on earlier generations/layers
- Thread Posts or edits shaped into a series. These, however, may not all be in response to one another within a linear sequence.
- Top-down processing... Cognitive processing drawing on existing habitual understandings of the world (mental models/theories).
- Transitional justice The development and use of justice to address regime changes whereby oppressions and abuses are made socially visible - creating a need for these to be visibly addressed e.g., through truth and reconciliation processes. Such processes, however, can become viewed as symbolic and create a further sense of injustice.
- Twitter An application that is particularly associated with political content. This is currently owned by Elon Musk.
- URL..... Uniform Resource Locator. This is a unique address on the Internet to support identification/location. It includes reference to internet protocols, virtual pathways and spaces. The URL is a type of human user-friendly representation of an IP Address (see definition above).
- Utilitarian A theoretical concept that places an emphasis on the best outcomes (in terms of increased happiness and reduced pain) for the many rather than the individual or few.

Ethical evaluations are then made on this basis, with the focus on outcomes rather than what leads to outcomes.

- Virtual ECM..... This is a version of the Extended Case Method that draws on imagined, rather than direct contact, with research participants.
- Virtual private network (VPN) Similar features to proxy servers, but with an added layer of encryption.
- Wayback Machine..... An application allowing for searches for archival content on the Web and may be used to address deadlinks (i.e., hyperlinks that no longer enable access to information). This is owned by a not-for-profit organisation but has been funded by various interests.
- Web 2.0..... Web 2.0 is used to refer to the revised version of the Web following a major collapse in the technology markets (known as the bursting of the dotcom bubble). Web 2.0 was meant to enable interactivity and participation through the creation and consumption of content by any user of the Web, as well as transactions between retailers and consumers.
- Wiki (technologies)..... These are webpages that are designed to enable collaboration between participants and offer a particular range of functions for this purpose.
- Wikidata An application acting as a depository of machine-readable data - across different languages, Under the Wikimedia Foundation
- Wikimedia Foundation.. A not-for-profit, US based organisation/platform hosting Wikipedia and a number of other projects using wiki technologies.
- Wikipedia bot A form of programming, delivering particular actions - approved by a particular group of elite editors of Wikipedia
- Wikipedia An application that (according to Wikimedia and its own narrative) encourages online participation in order to

create free knowledge that is available to everyone.
Under the Wikimedia Foundation.

Wikipedia guidelines There are many guidelines on Wikipedia on a range of issues including content, behaviours, editing, and style. These provide standards by which Wikipedia editors are expected to abide and have been approved by senior, registered editors. In theory, however, the 'no rules' principle of Wikipedia means that any standard, norm or rule can be considered and put aside on the basis of reasoning.

Wikipedia community ... This could apply to anyone contributing to Wikipedia or alternatively only apply to elite Wikipedia editors (i.e., based on experience and accumulated privileges).

Wikipedia contributor ... Anyone contributing to Wikipedia articles, but sustained content is more likely to have been contributed by registered users.

Wikipedia edit-a-thon ... An event organised to draw in people, including those who are new to Wikipedia or have been marginalised on the site. These are normally supported by Wikipedia. According to Wikipedia have been most likely to place in Wikipedia offices or educational institutions.

Wikipedia essay Wikipedia gives details on a range of different types of essays. These are not given the same authority as Wikipedia policies, principles or guidelines by experienced registered users. They are not necessarily created and edited according to mainstream Wikipedia norms, although they are not considered subversive and not automatically reverted by experienced users. They can be tolerated and sustained over time on the site.

Wikipedia Infobox..... A template that is included in some, but not all, Wikipedia articles. These are meant to provide essential factual information about an event (e.g., time and place) and in some cases this information can be accessed and used through semantic technologies.

Wikipedia language community. These are also referred to on Wikipedia as editions or projects that are meant to represent a range of languages across the world. In theory, rather than represent national perspectives, they are meant to enable anyone who can speak a language to post and edit content in that language. These projects are accessible through links to the side of articles and elsewhere on the site.

Wikipedia policy There are many guidelines on Wikipedia on a range of issues including principles, content, behaviours, and discipline. These provide standards by which Wikipedia editors are expected to abide and have been approved by senior, registered editors. In theory, however, the 'no rules' principle of Wikipedia means that any standard, norm or rule can be considered and put aside based on reasoning.

Wikipedia standard prefixes. Codes used on Wikipedia to define Wikipedia projects e.g., the English language project is represented by 'en'.

Wikipedia principle There are five main principles (known as the pillars) of Wikipedia including that it is (a) an encyclopaedia; (b) it is written from a neutral point of view; (c) it is free to anyone; (d) editors should be respectful to each other; and (e) there are no firm rules.

Wikiprojects..... A grouping of editors through a particular wiki which is aimed at achieving particular goals from the perspective of Wikipedia norms.

Wikipedia recentism ... According to Wikipedia narrative this is when a Wikipedia article gives too much consideration to recent events (e.g., as news) and does not give sufficient attention to a broader space-time in order to deliver on Wikipedia norms, including that of notability.

Wikipedia registered user. A user who has set up an account on the site and been given a unique user address. According to Wikipedian categorisations, editor types include registered users, IP addresses and bots. Bots and registered users are given names, while IP addresses exist only as a string of numbers. Registered users have access to pages and privileges that non-users do not - including personal user pages, contribution pages and talk pages, a Wikipedia private email system, and greater personalisation. Although Wikipedian policy advises against it, many registered users put substantial personalised data on their user pages which gives them much greater presence on the site. This can include photos and detailed information on their location, likes/dislikes, politics, gender, and job. Many also include information on their place in the Wikipedian administrative hierarchy, their contributions to the site over articles and years, and awards they have received from groups of other editors.

Wikipedia statistics (including page views).A range of applications are available through the Wikipedia site that generate automatic statistics. This includes statistic on editing (individualised and collective) and page views of articles. These are accessible through a number of links on the site, including a tab above articles.

Wikipedia source..... Refers to an external publication, usually online, which is regarded as trustworthy by experienced, registered editors. This is usually due to the publication being published by a publisher that is regarded as trustworthy e.g., particular media channels, institutions or journals. There are usually links to sources within a Wikipedia article and within lists of references.

Wikipedia talk pages Webpages where editors of the site can post comments and respond to other comments. They are meant to be

used to inform editorial decisions. They are available through a tab located with the main article.

Wikipedia watchers These are registered editors who monitor changes to content on Wikipedia (e.g., article content), which can then allow them to quickly respond to such content.

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