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Memory Studies published online 8 July 2013

DOI: 10.1177/1750698013490590

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0(0) 1–24

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DOI: 10.1177/1750698013490590

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Abstract

Collective memory processes have been studied from many different perspectives. For example, while psychology has investigated collaborative recall in small groups, other research traditions have focused on flashbulb memories or on the cultural processes involved in the formation of collective memories of entire nations. In this article, considering the online encyclopedia Wikipedia as a global memory place, we analyze online commemoration patterns of traumatic events. We extracted 88 articles and talk pages related to traumatic events, and using logistic regression, we analyzed their edit activity comparing it with more than 370,000 other Wikipedia pages. Results show that the relative amount of edits during anniversaries can significantly distinguish between pages related to traumatic events and other pages. The logistic regression results, together with the transcription of a group of messages exchanged by the users during the anniversaries of the September 11 attacks and the Virginia Tech massacre, suggest that commemoration activities take place in Wikipedia, opening the way to the quantitative study of online collective memory building processes on a large scale.

Keywords

Collective memory, commemoration, edit activity, traumatic events, Web 2.0., Wikipedia

Introduction

On 11 September 2001, the US people were shocked by one of the worst terrorist attacks in world's history: two hijacked airplanes were crashed into the Pentagon and hit the World Trade Center causing both towers to collapse, killing nearly 3000 people. On 26 December 2004, a 9.1-magnitude earthquake struck off the west coast of Sumatra, Indonesia. The resulting tsunami devastated the coasts of 14 countries with waves up to 30 m high, killing 230,000 people. Few months later, four suicide bombers attacked the London's public transport system in the morning rush hour. It

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was 7 July 2005: the blasts killed 52 people and injured hundreds. Each of these shocking events left indelible marks on people's consciousness all around the world, producing widespread collective mourning, commemorative ceremonies, and the construction of monuments (Brown and Hoskins, 2010). But long before the emergence of these commemorations, another kind of collective remembering took place just few minutes after the disasters on the related articles of the online encyclopedia Wikipedia.

In this article, we open the way to the empirical study of collective memories of traumatic events in Wikipedia, following Pentzold's (2009) interpretation of the online encyclopedia as a global memory place. We believe that studying how collective memories are formed, particularly in the case of trauma, is important because they persist for entire generations and they play a crucial social role, in that the interaction of the cultural elements involved can influence attitudes not only toward the past but also toward the present of current societies (Pennebaker et al., 1997).

In the past literature, many different research traditions have contributed to the investigation of collective remembering processes. Wertsch (2002) observed that while the psychological tradition has studied memory from an individual perspective, focusing mainly on its accuracy, sociologists and other scholars of collective memory have focused on more global and cultural aspects, such as political processes, active contestation, and negotiation. In order to gain a deeper understanding of collective memory processes, Wertsch (2002) called for the need to overcome this "functional dualism" (p. 31), given by the implicit division between these strands of research. This can be done by recognizing that memory serves both of these functions, that is, on the one hand, to give an accurate representation of the past, and on the other hand, to serve the needs of a community in the present, which are often connected to its collective identity, such as the need to mourn or to get over a past trauma. In this regard, the online encyclopedia Wikipedia seems to encompass both the aspects described by Wertsch because, while it aims at "representing fairly, proportionately, and as far as possible without bias, all significant views that have been published by reliable sources" (Wikipedia: The Free Encyclopedia, 2010b), it also seems to pursue broader scopes, such as the goal of educating people, as explained in the "Discussion and conclusions" section.

Contemporary perspectives of remembering understand memory as an active process, where what is remembered is actively built and reconstructed every time, introducing the past into the present (Brown and Hoskins, 2010; Garde-Hanse et al., 2009). This active and dynamic role of memory can be dated back to the psychological tradition and particularly to Bartlett (1932: 213), who also argued that our memory is influenced by the presence of others and by our social organization:

Remembering is not the re-excitation of innumerable fixed, lifeless and fragmentary traces. It is an imaginative reconstruction, or construction, built out of the relation of our attitude towards a whole active mass of organized past reactions or experience.

The term "collective memory" was initially introduced by Halbwachs (1992), and since then, it has been used in different disciplines, such as sociology, history, philosophy, or psychology, to refer to a wide range of phenomena. As developed in the Durkheimian sociological tradition by Halbwachs, individual memory and individual identity are always conceived and mediated by some collectivity. For instance, individual recollections depend on the settings and collectives in which they are expressed, such as workplaces or families (see, for example, Middleton and Brown, 2005). In this perspective, memory is collective because it is supra-individual, in that it is located in the social resources that shaped it, and individual memory cannot be seen as detached from social factors and social influences. Indeed, even if it may be the individual who stores and collects information, every step of the memory processes is embedded in the social environment and

is influenced by the social resources provided by the environment (Eyerman, 2004; Halbwachs, 1950; Hirst and Manier, 2008).

In this work, following Olick and Levy (1997), we intend collective memory as a continuous active process of sensemaking and negotiation between past and present. As Zerubavel (2003: 28) pointed out, collective memory is more than the combination of individual memories: to gather the social shape of the past, we need to consider the “social time lines” built by mnemonic communities, thus investigating “social sites of memory.” In fact, it has been argued that the relationship between individual and collective memories can be examined empirically, studying collective and social remembering (Hirst and Manier, 2008; Wertsch, 2002).

One suitable perspective for the study of collective memory processes is in the framework of cultural trauma research (Alexander, 2004). As Eyerman (2004) pointed out, trauma as a cultural process is closely connected with the formation of emergent collective memory and collective identity of a group. Unlike psychological trauma, which entails a prominent emotional wound for the individual, cultural trauma affects a social group with some degree of cohesion, and the trauma itself does not need to be experienced by every group member. Most importantly, even if it is possible to identify some particular event that triggered the traumatic sequence, collective trauma is socially mediated by a number of cultural processes. In fact, events are not traumatic by themselves, but they are attributed a traumatic meaning when they shake the foundation of a group’s collective identity (Alexander, 2004).

Still, even if cultural trauma is a construction of the society, it is possible to outline a number of features which characterize potentially traumatic events. According to Neal (1998: 9–10), the traumatizing event should be a “volcano-like,” “extraordinary event” that causes “disruption” and “radical change ... within a short period of time.” Sztompka (2000) pointed out that to be potentially traumatizing, an event should be sudden, radical, and deep, perceived as imposed from outside, unexpected, surprising, shocking, and repulsive. Sztompka provides also a list of social changes that meet these characteristics and are therefore in condition to trigger a cultural trauma. Among these, there are revolutions, genocides, deportations and ethnic cleansings, mass murders or assassinations of political leaders, acts of terrorism, lost wars.

These precise characterizations allow to consider events such as the World Trade Center attacks of 11 September 2001, the London bombings of 7 July 2005, or the tsunami that devastated Indonesia on 26 December 2004 and to classify them as traumatic events. So, in order to reduce the ambiguity around what can be considered an object of collective memory processes or not, in the following, we focus on the formation of collective memories about traumatic events.

In this article, we argue that Web 2.0 platforms and, in particular, Wikipedia offer a new opportunity for enriching collective memory research, opening the possibility for new forms of collaborative remembering. Moreover, digital archives allow social scientists to access huge amounts of data about people’s thoughts, feelings and communicative interactions in an unobtrusive way and almost in real time.

In the following sections, we discuss the mediatization of memory, introducing the main characteristics of Wikipedia and our interpretation of the online encyclopedia as a global memory place, also considering other online commemorative communities. Then, we provide an empirical validation for the study of collective memories in Wikipedia, analyzing the differences in edit activity of Wikipedia pages and focusing on commemoration.

Web 2.0 and social network memories

In the last decades, social memory studies grew substantially, producing a number of diverse conceptual definitions and typologies of collective memory (Harris et al., 2008; Hirst and Manier,

2008; Olick, 2008). Wertsch (2002) pointed out that as human beings are essentially social in nature, remembering is situated in a particular cultural context and is mediated by the sociocultural tools provided by the society. In this way, remembering is also a distributed process that involves both the individuals who remember and the tools that serve the remembering process, such as narratives or, especially in the Internet era, computers. Garde-Hanse et al. (2009b) proposed that the influence of media and their associated technologies can be at least in part accounted for the recent increased and diffused attention to memory studies. Television has increasingly contributed to the formation of collective memories with movies, news, television documentaries, and commemorations (Sturken, 1997), for example, with the miniseries on NBC in 1978 on Holocaust (Shandler, 1999).

Today, the widespread diffusion of new digital media and technologies raises the need for a paradigmatic shift that takes adequately into account the novel relationship between memory and media (Hoskins, 2009a). Our everyday life is indeed deeply meshed with digital technologies: we often blame information overload and the excess of connectivity in our lives, but at the same time, we are always online, worried about information loss, obsessed with recording, keeping track, retrieving and archiving information. In this new “digital memory culture” (Hoskins, 2009b), we are provided with virtual places where we can edit our lives, store, and make immediately accessible affective and personal moments on the Internet. We can share online personal memories, such as photographs, videos, text messages, blogs, digital archives, and storytelling (Hoskins, 2009a). Through Web 2.0 and social networking sites (boyd and Ellison, 2007), we can contribute content as easily as we can consume it (Hoskins, 2009b). We can interact publicly on platforms such as Facebook or MySpace, talking about our lives and sharing our personal thoughts and emotions; we can upload family videos and photographs on YouTube and Flickr; and we can also collaboratively write the story of public events such as September 11 attacks or 7 July 2005 London bombings on Wikipedia.

In this sense, digital media allow the formation of a new hybrid form of memory. This new memory is public but also private in that although personal digital memories can be continuously modified, they are also resistant to total erasure (Hoskins, 2009b). New digital media and their associated technologies also provide fast access to sites of memory and collective identity in times of mourning and grief (Hoskins, 2009a). In other words, the contemporary bottom-up participatory culture allows for an evolution of memory production processes: memories are not anymore just consumed but also creatively produced in a participatory and decentralized way. Thus, the resulting new memory, dynamically formed through our digital practices, our interactions with technology, and our connection to digital networks, is potentially visible and accessible to everyone. Moreover, it is fluid because it can be collectively shaped and modified. This memory also becomes a social network memory, which has the potential for forging and sustaining communal relationships and activities, and since it is based on peer-produced relationships enabled through social networking, it is “fluid, de-territorialised, diffused and highly revocable, but also immediate, accessible and contingent on the more dynamic schemata forged through emergent sociotechnical practices” (Hoskins, 2009b: 29).

Interestingly, the widespread accessibility of these online digital practices and collective memory building processes allows for new research opportunities toward empirical and quantitative work at large scale. Researchers can now directly access the communicative exchange between Web 2.0 platforms’ users representing people’s thoughts and feelings without giving up the spontaneity of interactions. The Internet provides a large amount of data which researchers can collect in an unobtrusive way and almost in real time, and the massive backup into digital archives allows researchers to conduct longitudinal studies on these data (Cohn et al., 2004).

Wikipedia as a global memory place

One of the most stimulating Web 2.0 environments for the study of collective memory building processes is Wikipedia. Launched in 2001, Wikipedia is an online encyclopedia built by the independent work of millions of people. In fact, Wikipedia articles can be edited directly on the website by anyone. Indeed, Pentzold (2009) proposed that the online encyclopedia can be seen as a global memory place, a concept drawn from the Pierre Nora's (1989) *lieu de mémoire* or "site of memory," which is where "memory crystallizes and secretes itself" (p. 7). This is especially true in the case of Wikipedia pages about traumatic events, such as the September 11 attacks, where memory is negotiated through the discussion of different points of view.

Every Wikipedia article has a related talk page in which anyone can freely discuss the article content and structure, negotiate, and suggest improvements or changes. Usually, contributions are signed, and this allows to associate every edit with the user who wrote it.

The MediaWiki open-source web platform, powering Wikipedia, records any change made by any user to any article or talk page, so that it is possible to reconstruct the history of each user's contributions. Indeed, every edit is recorded along with the respective date and time, the author, and the optional comment that justifies the edit.

At September 2012, the English Wikipedia counted more than 17 million users, about 28 million pages, and more than 4 million articles, which makes Wikipedia an interesting platform for empirical studies of social processes on a large scale.

It can be argued that Wikipedia is one of those Web 2.0 services that answer the contemporary need of recording, keeping track, and archiving information (Hoskins, 2009a). In fact, many of the articles related to the most shocking contemporary traumatic events have been created just few hours, if not minutes, after the beginning of events, as we report in the following section. For example, the Wikipedia article on "7 July 2005 London bombings" was initiated at 09:18 a.m., only few minutes after the first bombings. Just in the course of that day, the article was edited 2581 times. The associated talk page was created on 7 July at 09:59 a.m. and received 626 contributions in its first day.

According to Pentzold (2009), Wikipedia's processes of discussion and article construction can be seen as the discursive formation of memory or, in other terms, as the transition from communicative memory, which is interactive, informal, nonspecialized, reciprocal, disorganized, and unstable, to cultural memory, which is formal, well organized, and objective (Assmann, 1995). In this sense, in Wikipedia, memories are formed through the social interplays between users and through their interactions with the digital medium, reconfirming remembering as a situated activity (Brown and Hoskins, 2010; Hirst and Manier, 2008).

From this perspective, editing activity of articles about traumatic events can be interpreted as a sign of active participation in remembrance, where the collection of different accounts and pieces of stories can dialogue with each other and together compose a unique representation. In Wikipedia, all the different pieces of information added to an article or talk page, or even deleted from it, are archived and accessible in the revision history, thus serving a narrative function, in that they tell the unique history of a page, defining what will or will not be included in the final shared representation of an event.

The dynamics of collective remembrance take place not only in the public sphere but also in the private sphere, for example, family dinners, class reunions, and visits with old friends, and it is not sufficient to study the past and understand its representation prescinding from these communities of memory. As Irwin-Zarecka (1994) pointed out, "how people attend to the past, if at all, and how they make sense of it is very much grounded in their experience" (p. 56). Considering the novel

relationship between the public and the private in the new media context, Wikipedia can be seen as laying in the middle way between the public discourse and the private interactions. Indeed, while its pages are accessible to everyone and visited by an increasingly number of people every month (Pew Internet and American Life Project, 2011), the dynamics of communication taking place in the platform are in the form of everyday interactions. On the talk pages, the individual points of view and private thoughts of the participants are discussed and negotiated to reach a consensus. According to Irwin-Zarecka (1994), if collective memory is “a socially articulated and socially maintained ‘reality of the past’, then it also makes sense to look at the most basic and accessible means for memory articulation and maintenance—the talk” (pp. 54–55). To this end, Wikipedia is particularly suitable because the communicative interactions are registered and archived.

Even though the concept of collective memory suggests the presence of consensus among a community, often the social processes involved in its construction imply heated disputes and even conflicts. Collective memory is indeed formed by large numbers of people who seek consensus, but the struggle for a shared interpretation of the past is the consequence of the articulation of highly different perspectives and opinions. Sometimes, the public debates about the past also serve to stimulate reflection about important social questions and to mobilize people to take part in social actions.

Technologies and their associated sociotechnical practices play a key role in shaping how memory is formed and constructed, as noted, for instance, by Bowker (2005), Van House and Churchill (2008), and Garde-Hanse et al. (2009). This is true also for Wikipedia in its interpretation as a global memory place. For instance, detailed policies and guidelines provide fundamental behavioral rules that influence the way articles are written. One of the most relevant is the “neutral point of view,” meaning that articles should be accurate, state verifiable information, provide authoritative references, and be written without biases (Wikipedia: The Free Encyclopedia, 2010b). Moreover, the goal of Wikipedia is to be an online encyclopedia, and therefore, it does not promote original research, advertising, personal opinions, and memorials of deceased friends, acquaintances, or relatives (Wikipedia: The Free Encyclopedia, 2010c). These elements indicate that Wikipedia cannot be considered a place whose primary objective is to create collective memories and, as a consequence, the interpretation of Wikipedia as a memory place must be done by acknowledging that the rules, the social practices, and the technologies that are in place in the Wikipedia sociotechnical system strongly influence how users write articles, even when interpreted in the context of collective memory formation. Nevertheless, Wikipedia articles and talk pages seem to accomplish also a cultural function that serves the need of the community in the present, for example, providing ways to express grief and mourning, as we will report in the following sections. Hence, Wikipedia becomes an interesting playground for the study of collective memory building activities.

It is a place where public discourse takes place, and most importantly, the written controversies are available in the talk pages associated with articles, and even when a discussion is over, they are archived and remain available to everyone. This is an extensive amount of tangled arguments, debates, interpretations, claims, criticisms, and agreements, which scientists can tap into in order to study the dynamics of memory also from a longitudinal point of view.

Commemoration of traumatic events in Wikipedia

Theoretical research emphasizes the importance of the functional nature of collective memory and its close connection with the collective identity of a community (Harris et al., 2008; Hirst and Manier, 2008). Taking into account the growing interest of psychology for collective memory

processes, Hirst and Manier (2008) argued that a functional perspective could help to distinguish collective memories from “shared memories,” which have little to do with the collective identity of a group. Indeed, one of the major functions of collective memory is to satisfy the needs of the communities in the present such as, in the first instance, the construction and the support of a group’s identity, cohesion, and continuity (Harris et al., 2008).

Among the complex processes through which collective memories are formed and accomplish their functions, commemoration plays a crucial role. In fact, commemoration offers group members the possibility to elaborate past events through the creation and negotiation of different narratives, interpretations, perspectives, and points of view (Zerubavel, 1995).

According to Wang (2008), commemoration is also strictly connected to other functions of collective memory: emotional bonding, therapeutic practice, and directive function. With regard to the first, he proposed that collective memory processes, also through commemorative ceremonies, may help to strengthen the emotional ties among group members, contributing to develop a sense of closeness, cohesiveness, and solidarity in the community. Especially with regard to traumatic events, commemorative rituals, through memory retelling and externalization, allow groups to carry out coping strategies and to recover from traumatic experiences, accomplishing a therapeutic function. Communities can also reflect upon their past traumas, directing future actions by learning from their mistakes, in order to avoid the same traumas to happen again.

In general, acts of commemoration consist of monuments, rituals, and ceremonies. However, in recent years, the widespread diffusion of Internet technologies and social networking sites (boyd and Ellison, 2007) has led to the propagation of online memorials devoted to the preservation of collective memory and to the commemoration of traumatic events. Recent and older collective upheavals such as the September 11 attacks of 2001, the Hurricane Katrina in 2005, or the earthquake in Abruzzi, Italy, in 2009, have been widely commemorated through digital archives and social networking sites.

Arthur (2008) analyzed the online commemoration practices taking place in the September 11 Digital Archive (<http://911digitalarchive.org>), the Hurricane Digital Memory Bank (<http://www.hurricanearchive.org>), and the World is Witness geoblog (<http://blogs.usmm.org/worldiswitness>). The September 11 Digital Archive and the Hurricane Digital Memory Bank are two examples of digital archives, which rapidly spread in the last years, and basically are online databases where people can upload and browse their personal thoughts and stories, images, videos, or other files. Slightly differently, the World is Witness geoblog is a commemorative project with the specific purpose of increasing people’s consciousness about crimes against humanity, by geographically locating the sites of interest, and thus not focusing on a specific traumatic event but on multiple episodes of violence.

Acknowledging the cathartic function pursued by these websites through the storytelling and social sharing of emotions enacted by their users, Arthur (2008) recognized that, in fact, they do not create collective memories, but are best to be interpreted as sites of “collected memories” (p. 8). Although these digital environments may in the long term contribute to a better understanding of past events, their individual fragments do not interweave each other to form a coherent narration, but on the contrary, they form “a picture full of gaps or made up of fragments” (p. 16).

Micalizzi (2012) analyzed the content of Facebook groups dedicated to the commemoration of the earthquake in Abruzzi, Italy, in 2009, and interviewed 25 users to better understand their motivations for participating in the groups’ activities. She identified four main functions in the users’ practice of sharing their experiences and feelings about the earthquake. First, a pragmatic function, conveyed by posts aimed at finding news about relatives or friends living in the region, promoting solidarity actions and providing useful information about the official emergency organization

plans. Second, a socio-affective function, which can be found in messages expressing anger, frustration, solidarity, and empathy toward the victims. Third, an auto-therapeutic function, which can be found, for instance, in people posting messages about a similar trauma they experienced in the past. Finally, fourth, a memorative function, through which users leave their personal anecdotes, remember the victims, and document the tragedy in order to preserve its memory for the future. In line with Arthur's (2008) conclusions, Micalizzi argued that Facebook groups' activities cannot be considered in the framework of collective memory building processes because users' participation is fragmentary and plural, and lacks two important characteristics of collective memory: order and selection. In the Facebook groups dedicated to the earthquake, there is no dialogue between single posts, which are rather autonomous and independent. On the contrary, collective memory practices are the result of complex and dynamic processes of selection and discussion of relevant information, which are ordered into coherent narratives shared by a community, as it happens in Wikipedia articles and talk pages (Pentzold, 2009).

Similar to Arthur (2008), Recumber (2012) analyzed the September 11 Digital Archive and the Hurricane Digital Memory Bank, interpreting them as sites of prosumption, where users can both consume and produce content. Recumber studied the messages uploaded by users to these two digital archives in order to better understand online commemoration practices, and found that the stories recounted are often related to emotions and healing, and therefore have a therapeutic significance. Acknowledging the healing power of memorials, such as the Vietnam Veterans Memorial, Recumber focused specifically on the therapeutic function of digital archives and memory banks. These websites flourished to allow users to reflect upon a traumatic experience and to empathize with victims and survivors through the spontaneous sharing of their personal stories and thoughts. Such online platforms, through the interaction and active participation of their users, produce a wide network of entangled threads, posts, photographs which seem fragmentary, built on the model of a database rather than a narration.

Recumber recognized different functions of online commemoration practices in the analyzed digital archives. One of these functions is commemorating the dead, usually particular victims such as a brother, a friend, or a mother. In this case, users describe how they experienced the loss or remember significant aspects of the victim's life and personality. Another function accomplished by the digital archives is a therapeutic one, through which users, telling their personal stories, refer to the psychological consequences they went through, such as depression, distress, or sleep disturbances, seeking to overcome the traumatic experience through the social sharing of their feelings. Connected to this therapeutic function, Recumber found a substantial amount of messages with a spiritual or religious content. On the contrary, the commemoration activities allowed users to vent their frustration, fear, and sadness, directing their anger toward the state and the local government in the case of Hurricane Katrina and toward the terrorists in the case of the September 11 attacks. However, in spite of the therapeutic function accomplished by digital archives, Recumber observed that the recollection of the past through collective memory practices needs to be an active and constructive process and not only a fragmentary collection of pieces of information. Indeed, memory banks appear to be exploited more as individual healing tools where prosumers leave their messages and browse others', in order to work through the traumatic experience. Hence, digital archives appear to have missed the opportunity to foster a "collective experience" (Recumber, 2012: 547), reflecting an individualistic and therapeutic attitude, with users contributing in an inward and atomized manner. On the contrary, the online encyclopedia Wikipedia can be interpreted as a global memory place where collective memory building takes place because the individual pieces of information are selected and ordered into a coherent narration, through users' discussion and active participation in remembrance.

The digital memory practices considered so far can all be interpreted as commemoration activities, aimed at the social sharing of personal feelings and experiences in order to not forget the past. Nevertheless, when it comes to commemorating, there is a widespread need to do so on specific days and at specific intervals, and this applies to private as well as to public events, traumatic or not (Frijda, 1997). During the commemoration of traumatic events, which are usually held at regular intervals starting from a year after the original episodes, people reexperience the trauma and devote their attention to remember it. Similar to other recurring events, such as birthdays, funerals, or Christmas, commemorations are occasions to think about some persons or historical happenings in specific and publicly recognized days, which bear a temporal relation with the events being commemorated. According to Frijda (1997), in this way, people can satisfy their need for a temporal orientation, structuring time by identifying precise demarcation points and thus giving an order to its flow.

The re-appropriation of the past taking place during commemorations is part of the definition of the collective identity of a community, which is deeply related to its collective memory. During commemorations, people take the opportunity to understand past events and negotiate their meaning. Thus, commemorations reinforce the need for temporal orientation, for the appropriation of the past, and for the definition and maintenance of a group's identity and cohesion.

Frijda recognized three major features defining the functions of commemoration. The first is related to the need for temporal orientation, according to which commemorative ceremonies usually happen during publicly recognized days which are socially shared by a community. The second feature of commemoration is its symbolic and communal nature. Commemorating activities are usually shared with others: people get together in front of a memorial to listen to a public speech or to a band playing a national hymn and participate in other public activities. Third, the communal context in which commemorations take place relates them to rituals. In general, rituals are performed to provide order, stability, and coherence and are usually defined by a community or by tradition to pursue an emotional and a moral goal through the re-evocation of the past and the reinforcement of a group's identity.

Commemorations are also frequently emotional occasions: the emotions aroused may be most often of sorrow and grief, anger or sadness, and sometimes also of pride for a former victory or national achievement. During the ritual of commemoration, people are socially accepted by others as emotionally affected individuals, and the social sharing of these feelings allows to empathize with each other strengthening group solidarity and to come to terms with the traumatic experience, stating its emotional and social meaning.

Finally, similar to Wang (2008), Frijda proposed that commemoration rituals are not only motivated by the need to structure the past and to come to terms with it. Also, they usually relate the past event to its implications in the present and the future, to awaken people's awareness in order to prevent the same traumatic experience to happen again.

Considering the functions of commemoration previously mentioned and interpreting Wikipedia as a global memory place, this article aims at introducing quantitative methods in the study of collective memory building. If Wikipedia is a place where collective memory is formed through the active collaboration of its users (Pentzold, 2009), then the typical functions of collective memory processes should emerge from the patterns of edit activity and from editors' comments in the discussion pages related to traumatic events. Focusing on these articles and talk pages, related to events such as the September 11 attacks or the 7 July 2005 London bombings, we expect to find significant boosts of users' activity during anniversaries. The increased participation in the construction of a common representation of the past at regular intervals would indeed confirm the presence of commemoration activities in Wikipedia, making visible users' need to engage in the

periodical re-appropriation of the past, taking part in the formation of the collective memory of traumatic events. A further analysis of meaningful comments in the discussion pages during anniversaries of traumatic events will finally highlight the presence of the characteristic functions of collective memory formation in Wikipedia.

Methodology, analysis, and results

In this section, we describe the data collection methodology and analysis technique we implemented to test our hypothesis that if a page has a high relative amount of edit activity during anniversaries, it is likely to be related to a traumatic event.

The Wikimedia Foundation maintains Wikipedia servers and provides datasets containing every edit made to every page for the different languages of Wikipedia.¹ Specifically, we downloaded and processed an XML file including the full revision history of all pages of the English Wikipedia at 16 September 2010. The file counts more than 400 million edits to more than 3 million articles. We developed a script for processing the XML file and released it as an open source along with the dataset we collected at <http://sonetlab.fbk.eu/data/>.

An initial exploration is presented in Figure 1, which shows a visual representation of the monthly number of edits over time for the articles on “September 11 attacks,” “7 July 2005 London bombings,” and “Chernobyl disaster.” It is possible to visually observe the presence of spikes in users’ edit activity around anniversaries. For example, the article on “11 September attacks” received a very large number of edits during the months of September 2005 and 2006. For the page “7 July 2005 London bombings,” edit activity clearly increased in July 2006, 2008, and 2009, while for the article on “Chernobyl disaster,” which occurred at night between 25 and 26 April 1986, a pronounced peak of activity can be observed by the 20th anniversary in 2006. There are also few increases in edit activity occurring outside anniversary periods that may be due to different reasons, such as news updates about the events triggered by new information about trials, or emerging debates among Wikipedia users.

While graphs reported in Figure 1 are visually revealing and hint at the presence of regularities in edit patterns, the next step is to test if these patterns are statistically significant. In other words, our purpose is to quantitatively verify whether spikes of activity are a characteristic of pages related to traumatic events that allow to discriminate between these and other Wikipedia pages.

For every article and, separately, every talk page, we extracted from the XML file the total number of edits occurred since their creation on Wikipedia (column “Total edits” in Table 1), maintaining also the information about the number of edits occurred in each day, in order to group edits made around anniversaries as explained in the following. We also computed the average number of edits per day for each page (see Table 1).

We decided to take into consideration only pages with an adequate level of participation since this makes possible the unfolding of collective memory processes. For this reason, we computed the number of *unique editors* for every page and excluded from our dataset articles and talk pages edited by less than 50 different users. This filtering reduced our dataset to a representative core of 396,412 articles and talk pages. With a separate process, we looked for traumatic events that met the characteristics outlined by Neal (1998) and Sztompka (2000) and represented in Wikipedia as specific article pages. In order to find traumatic events, we exploited the large structure of Wikipedia’s internal categories, such as “Events by topic,” “Man-made disasters,” “Earthquakes,” and many more, and also lists of important events available on Britannica Online Encyclopedia (2011), History Central (2011), and Information Britain (2011). In this way, we identified several traumatic events that were represented in Wikipedia and precisely those who passed the

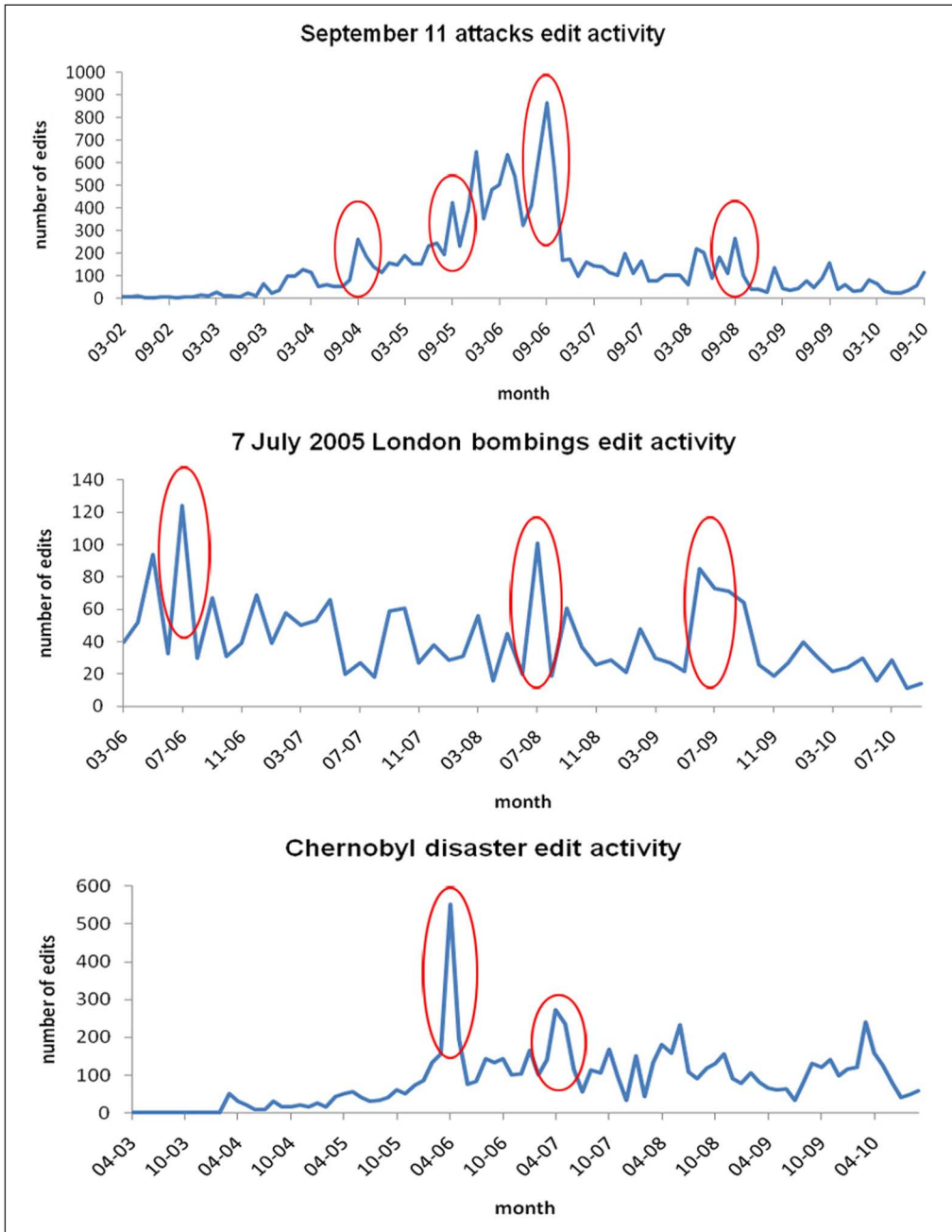


Figure 1. Number of edits per month over time to the articles on September 11 attacks, 7 July 2005, London bombings, and Chernobyl disaster.

requirements of being edited by at least 50 different users were 88 pages (57 articles and 31 talk pages) related to traumatic events, such as “September 11 attacks.” The remaining group of pages

Table 1. Few examples of the information we computed for every page of English Wikipedia.

	Unique editors	Total edits	Average edits per day	Anniversary edits	Average anniversary edits per day	Average anniversary edits per day/average edits per day
<i>Pages related to traumatic events</i>						
Article						
11 September attacks	4697	14813	4.62	1969	10.70	2.32
Attack on Pearl Harbor	3223	8299	2.59	1011	5.35	2.07
John F. Kennedy assassination	3222	8057	3.11	794	5.40	1.73
Chernobyl disaster	3795	7740	2.65	1164	6.93	2.62
Hurricane Katrina	5969	6826	3.52	579	5.51	1.57
Talk page						
11 September attacks	2204	17468	7.22	2198	15.48	2.14
Attack on Pearl Harbor	424	1689	0.57	120	0.71	1.26
Mean (SD)	740.53 (1108.50)	1531.16 (2872.90)	0.63 (1.10)	182.21 (365.09)	1.36 (2.43)	2.20 (1.35)
<i>Other Wikipedia pages</i>						
Article						
Gregor Schlierenzauer	125	242	0.18	13	0.20	1.17
Carlo Gambino	325	691	0.24	40	0.27	1.12
Master P	1227	2432	0.87	138	0.94	1.08
Christine Keeler	188	269	0.10	14	0.19	0.99
Quentin Tarantino	2759	4878	1.44	260	1.38	0.95
Talk page						
Sassanid Empire	128	394	0.20	19	0.18	0.90
Zionism	431	3239	1.22	170	1.16	0.94
Mean (SD)	180.59 (296.56)	359.66 (720.98)	0.17 (0.30)	21.36 (49.53)	0.20 (0.50)	1.13 (0.95)

SD: standard deviation.

The complete dataset is available for download at <http://sonetlab.fbk.eu/data/>.

hence represents other Wikipedia pages, that is, pages that are not related to traumatic events but can be about anything else, such as “William Shakespeare,” “Infinitesimal calculus,” or “Italy.” This comparison group was composed of 377,651 articles and 18,673 talk pages. The relative difference in the number of articles and talk pages is due to the fact that the talk page related to an article is created only if at least one Wikipedia user intends to discuss the article’s content. Moreover, talk pages tend to have fewer contributors than articles and hence requiring at least 50 different editors filtered out many more talk pages than articles. The complete list of articles and talk pages, along with the computed measures, is available in the released dataset.

Since we are interested in the construction of collective memory through people collaboration, we excluded from the full dataset edits made by *bots*, automated tools that carry out repetitive tasks to maintain Wikipedia pages. There are currently more than 1000 bots in Wikipedia, which are commonly used to perform minor edits, such as fixing unsigned comments, correcting broken links, and reporting possible copyright violations. The Wikipedia articles and talk pages included in our original dataset received in total 211,364,715 edits, 7.77% of which were made by bots.

For every article and talk page, we also collected the date of first edit, that is of creation of the article or talk page. Wikipedia pages about recent traumatic events tend to get created the same day of the event or just few days later. We have already reported how the Wikipedia article on “7 July 2005 London bombings” was initiated at 09:18 a.m., only few minutes after the first bombings, and received 2581 edits just during the first day. Our dataset contains 30 articles about traumatic events happened after Wikipedia was launched in 2001. Out of them, 23 (77%) were created within 2 days after the event (18 were created the same day). In a similar way, out of 21 talk pages about traumatic events that happened after Wikipedia was launched in 2001, 13 (62%) were created within 2 days after the event (11 were created the same day).

As introduced earlier, in this article, we focus on commemoration practices considering the amount of edit activity around anniversaries in Wikipedia pages related to traumatic events. Precisely, we consider the period of 21 days around the anniversary of the event, that is, a time window of 10 days before and after the anniversary. For example, for the second anniversary of the London bombings occurred on 7 July 2005, we consider all edits made to the related Wikipedia page since 27 June 2007 up to 17 July 2007.

Since our goal is to compare edit activity patterns between traumatic event pages and other Wikipedia pages, we consider for the latter ones, which do not necessarily refer to events with precise dates, the period of 21 days around the anniversary of the creation date. This assumption is reasonable since, as explained above, pages about traumatic events occurred after the launch of Wikipedia in 2001 tend to be created few minutes or days after the event occurs. In this sense, page creation date and event date are very close if not the same. In this way, we can enlarge our dataset and base our results on a larger evidence.

In this work, we focus on patterns around anniversaries, so we filtered out all the edits made in the first 6 months after the creation of a page, a period in which the discussion may be very heated but cannot be considered related to the commemoration activities on which we are focusing. In summary, our dataset consisted of 57 articles and 31 talk pages about traumatic events and other 377,651 articles and 18,673 talk pages, all of them edited by at least 50 different users.

In order to compare Wikipedia pages, we computed for every page two measures: the average number of edits per day excluding, as already mentioned, the first 6 months since page creation, and the average number of edits per day during the anniversary periods (see Table 1). As an example, we describe the first row of Table 1, referring to the article about the September 11 attacks.

Excluding the first 6 months, at 16 September 2010, the article counted 14,813 edits by 4697 different editors. During the 21-day period around the nine anniversaries occurred since the page

creation in 2001, the page was edited 1969 times. Hence, the average number of edits per day is $14,813/3207 = 4.619$, while the average number of edits per day during anniversaries is $1969/184 = 10.701$. Therefore, while on average, the article was edited more than 4 times per day, during anniversary periods, Wikipedia users modified it more than 10 times per day.

For comparative purposes, for every page, we computed an additional variable, the ratio between the *average number of edits per day during anniversaries* and the *average number of edits per day*. Intuitively, if there was no difference between edit activity during anniversary days and edit activity during other days (i.e. if the number of edits was almost the same every day), the ratio would be around 1. If this ratio was higher than 1 (e.g. 3) for a certain page, this would suggest that an edit during the anniversary is 3 times more probable than in any random day. For example, from Table 1, we can see that the ratio *average anniversary edits per day/average edits per day* for the article on September 11 attacks is 2.32, suggesting that an edit is 2.32 times more likely to occur during one of the nine anniversaries than in any random day. Over articles and talk pages related to traumatic events, the mean ratio is 2.20 (standard deviation (SD) = 1.35), while for other Wikipedia articles and talk pages, the mean ratio is 1.13 (SD = 0.95). This suggests that edits to pages related to traumatic events are 2.20 times more likely to occur during anniversary periods, while other pages are edited more constantly along the years.

In order to verify whether this ratio can significantly distinguish between pages related to traumatic events and other pages, we applied a logistic regression model with *traumatic* as binary dependent variable and the ratio *average anniversary edits per day/average edits per day* as independent variable. The basic idea of our approach is to predict if a page is related to a traumatic event or not depending on the ratio of edits that occurred during the anniversaries and in other days.

Specifically, we ran two separate regression analyses for articles and talk pages. With regard to articles, the regression coefficient for the ratio was statistically significant (0.315; $p < .001$). This means that an increase of one unit in this variable increases the log-odds in favor of an article being related to a traumatic event by an estimated 0.315 with a confidence interval of less than 0.1%. As for talk pages, the regression coefficient for the ratio was also statistically significant (0.223; $p < .001$).

Although in this article, we focus on traumatic events, we also performed a comparative analysis on nontraumatic events. Precisely, we looked for events of the twentieth century of manifest historical importance, which were inherently nontraumatic and not related to traumatic events. We did this by following the same procedure we adopted for traumatic events, that is, by exploiting Wikipedia internal categories such as, in this case, “Cultural events,” “Sports events,” “Festivals,” “Ceremonies,” and more, and also lists of important events available on Britannica Online Encyclopedia (2011), History Central (2011), and Information Britain (2011). The filter on the minimum number of unique editors previously used was required for these pages as well, and only nine articles and four talk pages were found to have at least 50 different contributors (see Table 2). On the contrary, in the previous analysis about traumatic events, we found 57 articles and 31 talk pages. While this comparison cannot be considered definitive, this difference seems to suggest that nontraumatic events receive less attention in Wikipedia when compared to traumatic events. However, few nontraumatic events such as “Woodstock Festival” or “Apollo 11” attracted a large number of editors, 2274 and 2244, respectively (see Table 2), while, for instance, traumatic events of comparable historical importance, represented within Wikipedia in articles such as “Chernobyl disaster,” “Attack on Pearl Harbor,” or “John F. Kennedy assassination,” received contributions by 3795, 3223, and 3222 different editors, respectively.

Table 2 presents the analysis already reported for traumatic events (Table 1) considering nontraumatic events. Since the ratio *average anniversary edits per day/average edits per day* for these

Table 2. List of pages related to nontraumatic events of historical importance with at least 50 unique editors.

Pages related to nontraumatic events	Unique editors	Total edits	Average edits per day	Anniversary edits	Average anniversary edits per day	Average anniversary day/average edits per day
Article						
Apollo 11	2244	4803	1.47	534	2.83	1.92
Sputnik 1	859	1495	0.46	303	1.57	3.41
Sputnik 2	186	279	0.10	33	0.20	2.05
Explorer 1	211	511	0.17	107	0.64	3.71
Treaties of Rome	205	357	0.12	52	0.31	2.54
Treaty of Lisbon	1287	2879	2.46	103	2.45	0.10
Convention on Biological Diversity	134	229	0.07	16	0.08	1.22
Treaty of Nice	160	232	0.08	9	0.05	0.68
Woodstock Festival	2274	4560	1.42	562	2.97	2.10
Talk page						
Apollo 11	227	509	0.16	103	0.54	3.33
Sputnik 1	67	140	0.05	25	0.14	2.98
Treaty of Lisbon	318	1319	1.13	77	1.83	1.62
Woodstock Festival	139	278	0.09	54	0.28	3.30
Mean (SD)	639.31 (797.33)	1353.15 (1664.61)	0.60 (0.77)	152.15 (191.08)	1.07 (1.11)	2.30 (1.00)

SD: standard deviation.

pages is 2.30, these articles and talk pages related to nontraumatic events seem to follow similar commemoration patterns during anniversaries when compared to trauma-related pages. However, the small number of pages about nontraumatic events edited by at least 50 editors does not allow to test whether there are significant differences between the averages.

Moreover, the purpose of this article is to show that the investigation of collective memory formation of large numbers of traumatic events in Wikipedia is possible and interesting. Surely, it is possible to find commemoration patterns of Wikipedia pages related to highly historically important nontraumatic events, such as the first flight to the Moon represented in the article “Apollo 11,” but the aim here is to open the way to the study of traumatic events on Wikipedia because the related collective memory processes are strictly bonded to a community’s collective identity and can be extremely important to the understanding of present societies (Pennebaker et al., 1997).

In this section, we showed that the ratio *average anniversary edits per day/average edits per day* can significantly discriminate between pages related to traumatic events and others, meaning that pages characterized by a high relative amount of edits during anniversaries are more likely related to traumatic events.

In order to let other scholars reproduce our analysis and improve it, we released the full dataset used in this work. The complete dataset is accessible for download at <http://sonetlab.fbk.eu/data/>.

Discussion and conclusion

Considering Wikipedia as a place where the negotiation of different, and sometimes contrasting, interpretations of the past takes place, in this work, we make a first step toward the quantitative study of online collective memory processes on a large scale. Specifically, we consider the number of edits to Wikipedia pages to verify whether the relative amount of edit activity during anniversaries can significantly distinguish pages related to traumatic events from other pages.

In order to verify whether the observed pattern is a characteristic capable of discriminating pages as related to traumatic events or not, we implemented two logistic regression models for articles and talk pages. Basically, these models allowed to predict whether an article or talk page is related to a traumatic event depending on the value assumed by the ratio.

Results show that the relative amount of edit activity during anniversaries is a statistically significant predictor in discriminating pages related to traumatic events from other pages. In other words, pages with a high relative amount of edits occurred during anniversaries are more likely related to traumatic events. These results suggest the presence of increased discussions and commemoration activities carried out by Wikipedia users on pages related to traumatizing events, during their anniversaries.

While the overall number of contributions to Wikipedia’s articles about traumatic events may tend to decrease over time as the representation of the facts become more stable and crystallized, the regular peaks of activity during anniversaries, even several years after the originating trauma, highlight the “lack of closure” of such events (Sturken, 1997: 63). In Wikipedia, the creation of a shared narrative framework is continuously ongoing, as new information is recovered and interpreted. But anniversaries in Wikipedia seem to become an occasion for further reinterpretation of the past and the reconstruction of a shared memory, as well as a moment for grieving and mourning (Zerubavel, 2003). Remembering is a dynamic process that requires order and selection (Jedlowski, 2001; Sturken, 1997), and building a shared narration means to make decisions about what is worth recovering. Often, these decisions are highly controversial and result in conflicting opinions, heated debates, and sometimes edit wars.

The fervid activity that can be noticed on many articles and talk pages about traumatic events in Wikipedia shows that people are eager to record an accurate representation of these events. However, on the talk pages, these contributions seem to go beyond the encyclopedic intent of Wikipedia and recall several functions highlighted by scholars in the past literature (see, for example, Arthur, 2008; Frijda, 1997; Micalizzi, 2012; Recumber, 2012; Wang, 2008). The following comments are part of different discussions extracted from the talk page of the “September 11 attacks” article during the fifth anniversary, in September 2006, and show particularly the socio-affective and memorative functions of collective memory:

Memorial

Is there any plans that any of the Wikipedia Administrators would make a memorial page for the events of that tragic day? Also will this be able to be a permanent memorial online?—82.47.145.146 21:39, 4 September 2006 (UTC)

There already is one, <http://sep11.wikipedia.org> but it's in constant danger of being removed.—Golbez 19:44, 7 September 2006 (UTC)

I find it extremely upsetting and unfortunate that there were so many unnecessary deaths involved in the September 11 “attacks.” [...]

I cannot convey enough how tragic it really is to know there are so many lives that are lost today because of the American government's attempt to control its citizens through fear and prejudice against another society. To me, it is far worse for the families of victims of 9/11 than for families of soldiers (although I still sympathize and feel for the families, but hear me out) because in war, we all understand that there are casualties. We understand, however difficult that may be, that there will be many circumstances in which lives are lost no matter how prepared and well-trained the individuals may be.

But what makes 9/11 far worse beyond any comprehension I have been able to gather, is that the people that were killed in the WTC on September 11, 2001 did not die in a time of war. They did not die knowing that they were in a dangerous situation, serving their country against a powerful threat to their existence and freedom. Yes, there were many rescue personnel on site (nearly 400 fire fighters lost their lives), but they also were not sent into a war zone at the time. They were sent in because they thought there would be a way to rescue those trapped in the buildings. They were not given the forewarning that the buildings were planned to collapse.

[...] these are just the thoughts of one extremely infuriated individual. Take a second and think about it: Does it not make you angry and bewildered beyond belief that nearly 400 rescue workers died saving the lives of others while members of municipal government were safely tucked away with prior knowledge of the collapse?

I did not know any of the people whose lives were lost in 9/11 yet I feel the urge to convey just how hard this hits me still. I'm not talking about the attacks. I'm not talking about the sudden feeling of lost national security. That is not what scares and angers me. These lives were viewed as just a means to an end for the government. They did not think twice about sending in people with families, children, mothers, fathers, cousins, friends, etc. They saw them as a tragic loss caused by malicious terrorists who the American government will make sure to seek revenge on. [...]

My heart goes out to the families, friends and loved ones of anyone who lost their life in the 9/11 attacks. [...]

Please, do your part in uncovering the truth as I have begun to do. [...]—207.210.23.114 16:00, 10 September 2006

5 Year Anniversary

Tonight in Australia is the 5 Year anniversary of the Sep 11 attacks. I lost my mum a few months before Sep 11 to cancer, and I know what grief is like. My prayers are with those who are related/friends with the

dead of Sept 11. May the terrorists be defeated and brought to justice! May God bring about His justice on Earth! Geelin 13:34, 11 September 2006 (UTC)

Anything for the families?

[...] I see no reference in the article to the effects on the families of those who have died, etc.

[...] I'm suggesting that a section about the effects on families and the grief perhaps be added. [...] KBecks 19:16, 10 September 2006 (UTC)

Bereavement is universal; we don't have a section for that on every war and disaster since what people feel is pretty much the same in every case, and we already have a general article for that. [...]—cloviz 01:08, 11 September 2006 (UTC)

Maybe we can add something about the 36 children whose fathers died that day, even as they (the kids) were still in their mothers' wombs. Cerebral Warrior 11:09, 11 September 2006 (UTC)

Terrorist attacks

I am going to make it plain and simple. Do not add "terrorist" to the lead back. It will only be removed.—Cat out 09:40, 11 September 2006 (UTC)

There is not better description of the action. Their actions were ones of terrorism.—MONGO 09:48, 11 September 2006 (UTC)

[...] The term, "terrorism" is appropriate in this case. [...] There is wide agreement among countless reliable sources that 9/11 was an act of terrorism. This has been discussed before, with consensus to leave the word terrorism in the intro.—Aude (talk contribs as tagcloud) 10:02, 11 September 2006 (UTC)

[...] I don't understand how the murder of 3000 innocent people can NOT be called "terrorist." Please, today is 9/11. Let us pray for the souls of the deceased instead of insulting their memory by not terming those who so cruelly killed thousands of fathers, mothers, brothers, sisters, friends, as terrorists. Cerebral Warrior 11:08, 11 September 2006 (UTC)

[...] Look at it this way—if today was Holocaust Memorial Day, would you guys be insisting that a Holocaust denial theory proposed by some Moslem dictator be included in the article about the Holocaust? No, you wouldn't because that would be an insult to the 7 million people who died in Nazi gas chambers. Well, today is a day when we remember the 3000 innocent men, women and children whose lives were snuffed out by a new breed of fascists-Islamofascists. Referring to their murders as anything other than "terrorists" would be an insult to the deceased, who do not deserve to be mocked simply because they were Americans. If you are an anti-American, that's your wish, but please don't insult the departed. Cerebral Warrior 13:43, 11 September 2006 (UTC)

[...] my sympathy and prayers to those who mourn this day.—Doc 14:08, 11 September 2006 (UTC)

[...] I am saddened by the fact that Wikipedia is not doing enough to mourn this day—including not even mentioning the fifth anniversary on the mainpage. Cerebral Warrior 14:36, 11 September 2006 (UTC)

[...] Spare a thought for those whose lives were torn apart that day. Cerebral Warrior 14:39, 11 September 2006 (UTC)

[...] Please don't inflame the situation. This is a sensitive topic, especially on the fifth anniversary of the event. [...]—Guinnog 14:55, 11 September 2006 (UTC)

The comments reported above were made on the talk page of the article about the September 11 attacks during the days surrounding its fifth anniversary and are the expression of different functions of collective memory practices. First, they convey users' feelings of anger, frustration, fear, and loss of security, as it happened in the September 11 Digital Archive and the Hurricane Digital Memory Bank analyzed by Recumber (2012). Similar to these digital archives and to the Facebook groups dedicated to the earthquake in Abruzzi studied by Micalizzi (2012), in the Wikipedia talk page about the September 11 attacks, some users prayed for the victims and their families, remembered a dead relative, asked for justice and for respect during the anniversary day, thus accomplishing a memorative function. The verbalization and externalization of personal feelings and experiences is typical of commemoration, and it has been found to have a therapeutic effect, helping people to get over the trauma and to cope with it (Arthur, 2008; Micalizzi, 2012; Recumber, 2012; Wang, 2008). In this regard, it is important to note that, according to Wikipedia guidelines, the purpose of Wikipedia is to build an encyclopedia, and for this reason, talk pages should be used to discuss improvements to the related article page. Nevertheless, on pages about traumatic events, it is possible to find signs of emotional participation related to commemoration occurring around the anniversaries.

Second, the heated discussion (available in its entirety in the talk pages' archives and revision history) that took place during the fifth anniversary about the possibility to add the word "Terrorist" to the title of the main article refers to the periodical re-appropriation of the past highlighted by different authors (see, for example, Frijda, 1997; Irwin-Zarecka, 1994; Zerubavel, 1995). Indeed, commemoration offers the occasion not only to reaffirm the collective memory of an event but also to negotiate highly different opinions about it and new interpretations of the past.

Another motivation for engaging in sensemaking activities and creating public narratives about traumatic events is connected to the directive function of memory analyzed by Frijda (1997) and Wang (2008). The following comments are part of a discussion that took place on the talk page of the Virginia Tech massacre article during its first anniversary, related to the possibility to nominate it as a candidate to be a "Featured article." Featured articles are considered to be the best articles in Wikipedia, following strict criteria of accuracy, neutrality, completeness, and style (Wikipedia: The Free Encyclopedia, 2010a). The discussion shows that users are aware of the directive function of their memory building activities, arguing that one motivation for writing a good article about the shooting is to "educate people," in order to "prevent" tragedies like this to happen again:

Featured Article

Has anyone else brought up the idea that MAYBE it might be a bad idea to list this as a featured article? I wonder how many other mentally disturbed people like that man might think "Wow, I might even get a featured article out of doing something like this!" [...] The uber massive media saturation of Columbine potentially caused copycats [...]. Cs302b (talk) 03:33, 16 April 2008 (UTC)

So we should be quiet and pretend it never happened. Just like slavery, genocide and the Holocaust. All we're doing is making people want to be on Wikipedia and be on the news so we should burn all the books that mention these bad things so they never get these ideas. 128.227.104.129 (talk) 03:40, 16 April 2008 (UTC)

Slavery, Genocide, and the Holocaust all weren't done by one single person who could do that horror on a day's notice. Report on shootings, yes. Have an article dedicated to the event, yes. [...] Cs302b (talk) 03:53, 16 April 2008 (UTC)

As the WP:FAC and WP:TFA nominator [...] I can assure you that the intention of placing the article on the front page was to serve the public good. I believe the only way we can prevent another tragedy like this is by educating ourselves about what went wrong. This article does an outstanding job of doing exactly

that. This article describes how a mom intervened when she saw troubling signs in her son and may have prevented a similar situation. I have no idea if she consulted this article or not, but I like to think that if she had she might have found some useful information. Ronnotel (talk) 04:06, 16 April 2008 (UTC)

[...] How does this article REALLY prevent another school shooting? Featuring it is an example of what this kid was going for. [...] He wanted EXPOSURE to instill FEAR. Featuring this article at best only further adds to that culture of fear and at worst reminds one lone madman that a shooting that was several months ago won't be forgotten by our media. He'll get annual memorial services reminding people of what he did and wikipedia pages (maybe even featured) ... and FAME. [...] Cs302b (talk) 04:32, 16 April 2008 (UTC)

Since when is it Wikipedia's responsibility to prevent shootings? 128.227.104.129 (talk) 04:36, 16 April 2008 (UTC)

[...] I can think of no greater pursuit on Wikipedia than to create the most accurate, informative, and unbiased articles possible on topics such as these. As Rononotel pointed out above, education is the most important weapon in combating the depravity that too often beleaguers us. There's no stretch to Raul's point; the real stretch is actually believing that by eschewing the issue we can be more secure in our lives. That route entails complacency, and to argue that we shouldn't make this article prominent because it's giving him "what [he] was going for" is to completely oversimplify both his motivation and the circumstances of the tragedy. I have nothing but gratitude for those that worked to make this a fine demonstration of informativeness. Nufy8 (talk) 04:52, 16 April 2008 (UTC)

It is a good article. [...] I just think that yearly massively public remembrances of something that one single person can pull off in a couple hours time should be reconsidered as there is no doubt (evidenced by his video) that he wanted to have massive public exposure.Cs302b (talk) 05:00, 16 April 2008 (UTC)

Extending this logic of complacent or passive inducement, we shouldn't feature articles about countries because it might make cause exoduses, foods because it would cause obesity, or actors because it would make people watch movies. Wikipedia articles—like movies, music, games, and other alleged depraved scourges of modern culture—don't cause people to commit crimes. Encyclopedias educate people. Educated people resist ignorance and hate. Ignorance and hate beget injustice and violence. Madcoverboy (talk) 05:06, 16 April 2008 (UTC)

Obesity, chronic movie watching (is that a major issue in the U.S.?), and exoduses are all completely off topic. And Movies, Music, Games and those other depraved scourges of modern culture are only barely closer to the topic. I'm talking about mass media's commemorative yearly remembrances of something that ONE SINGLE PERSON can do in a short period of time with little effort.Cs302b (talk) 05:34, 16 April 2008 (UTC)

In Wikipedia pages about traumatic events, the commemoration patterns observed in users' edit activity and the emergence of collective memory functions in the talk pages during anniversaries are only two characteristic allowing to interpret the online encyclopedia as a global memory place. The third is the presence of a collective and collaborative dimension in articles' editing processes. Contrary to the individual character of many digital archives expressly devoted to commemoration (Arthur, 2008; Micalizzi, 2012; Recumber, 2012), Wikipedia is not a fragmentary collection of disconnected pieces of information. Different stories, sources, interpretations, and points of view are selected and organized into coherent narratives. The dynamic process of selection of significant elements and order into a meaningful representation is indeed essential to collective memory processes (Jedlowski, 2001; Micalizzi, 2012; Pentzold, 2009).

In this article, we showed that Wikipedia pages about traumatic events receive more contributions during anniversaries. The examples of discussions reported above, occurred on talk pages of traumatic events during their anniversaries, highlight the emergence of the typical functions of

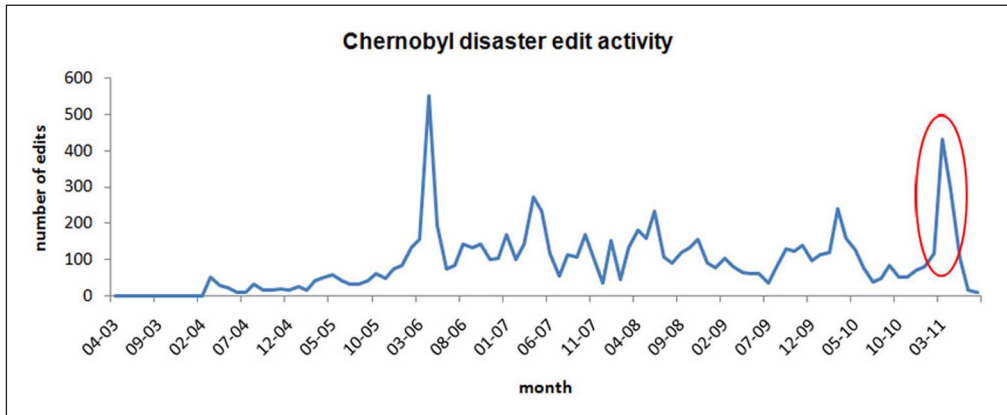


Figure 2. Number of edits per month over time to the article on the Chernobyl disaster.

collective memory in Wikipedia, suggesting that collective memory processes indeed take place in the online encyclopedia. However, there may be also other reasons behind these spikes of activity. For example, it seems likely that the increased media coverage of traumatic events around anniversaries can bring Wikipedia users' attention to the corresponding pages. Mass media surely play a key role in driving users' attention to specific arguments even outside anniversaries of traumatic events. For instance, a noticeable increase of edit activity (with 433 contributions) can be observed for the article about the Chernobyl disaster in March 2011 and specifically during the days in which Japan was shocked by an earthquake and tsunami with disastrous consequences, among which the incident at the nuclear plant in Fukushima Daiichi. Figure 2, which is an updated version of Figure 1, shows the edit activity to the article "Chernobyl disaster" until May 2011 and allows to appreciate a large spike in March 2011, which seems to be caused by the related event in Japan, which received a massive media coverage.

Summarizing, the quantitative analysis presented in this article, together with the analysis of the content of users' comments in the talk pages during anniversaries, supports the hypothesis of the presence of commemoration practices in Wikipedia pages about traumatic events. As in the case of the article related to the Chernobyl disaster reported earlier, some of the peaks in the edit activity may be also due to the increased attention drawn to certain events by the mass media. However, in this regard, it is essential to observe that mass media and collective memory formation are closely intertwined. Contemporary collective memory of traumatic events has also been built with the intervention of the press, television, radio, cinema, and new media. One example are the images of the airplanes crashing into the World Trade Center on 11 September 2001, which at the time were broadcast live by the mass media and are now reported in the associated Wikipedia article, as well as engraved in people's minds.

However, the quantitative analysis of edit activity patterns is only a first step toward the study of collective memory processes in Wikipedia. To better comprehend how traumatic events are represented in the online encyclopedia, and the psychological processes underlying the initial formation of their memories, it is necessary to look more deeply into the content of users' edits and comments. In this regard, automated content analysis tools can be implemented to study from a quantitative point of view the active processes of sensemaking and negotiation taking place in Wikipedia, by analyzing the patterns of language used in pages related to traumatic events. For example, Ferron and Massa (2012), using the text-analysis program Linguistic Inquiry Word Count

(LIWC; see Pennebaker et al., 2001), compared Wikipedia articles about human-made and natural disasters, finding different levels of language related to affective, cognitive, and social processes, suggesting significant differences in users' sensemaking activities and in the collective memory formation of these types of events.

In this direction, our future work will be focused on investigating not only the edit patterns but also the actual content of Wikipedia pages using natural language processing techniques, for example, by analyzing the presence of emotional content throughout the history of Wikipedia pages related to traumatic events.

We believe that the results and considerations presented in this article show that collective memory building activities concerning traumatic events are taking place in Wikipedia, opening the way for quantitative research on collective memory processes on a large scale.

Funding

This work has been realized also thanks to the support from the Provincia autonoma di Trento and the Fondazione Cassa di Risparmio di Trento e Rovereto, in the frame of the project "Active Digital Memories of Collective Life."

Note

1. Wikipedia datasets are available at <http://dumps.wikimedia.org>. The datasets on which the logistic regression analysis has been run, along with the scripts used for extracting them, are available at <http://sonetlab.fbk.eu/data/>.

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