

Centenary (Internet)

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The centenary events surrounding the First World War have produced a significant amount of digital content in various forms, and thus has set a precedent for how large scale post-war memorisation can be undertaken. Looking towards future centenaries, which we can assume will produce a similar volume of digital content, there is a need for project leadership to invest in the digital legacy from the very outset of projects to ensure sustainability.

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Introduction

The centenaries of the First World War have been commemorated by a series of major events and activities around the world, and digital technology combined with digital heritage has been used in innovative ways to address many aspects of the events of the periods up to, during, and after the First World War. This activity has generated a significant volume of digital content, adding digital archives, collections and resources to our cultural heritage landscape. These digital outputs have been created both in response to the need to fill gaps in the available digital historical record, and as a result of commemorative activities at a local, national, or transnational level.

The UK Government's Digital, Culture, Media, and Sport (DCMS) Committee reported on the impact of the [centenary commemorations in the UK](#) and noted that, "The First World War is now the most digitally documented period in history." This is largely because the centenary of the First World War was the first major commemoration of the digital age, resulting in the development of an unprecedented quantity of digital content, much created via engagement with the public and community led activities.^[1] The topic resonates strongly as a seismic historical event with a lasting impact on many aspects of nationhood and society, and on all aspects of life during the period. Sources that illustrate the impact of war on individuals or communities been previously been relegated to category of "local", or genealogical, interest. However, they can be viewed alongside 'official histories' to allow us to envisage many aspects of society in the years immediately before and during the War. An analysis of the digital legacy of the First World War Centenary reveals not just the emergence of a digital commons for the study of history, but a source of data that could potentially be useful for digitally enabled and data-driven scholarship across disciplines.

This article has two primary objectives: firstly, to survey this emerging international corpus of digital association and relation to the period of the First World War, and secondly, to discuss its

development and use in the context of [commemoration](#). The two main forms of digital content discussed here are content that was created for the centenary, such as educational or research resources, and content produced through the development of centenary activities which have left some sort of digital output (for example, the commemorative and participatory artworks commissioned by the UK Government's *14-18 NOW* programme that have been documented in a digital form, or websites dedicated to community-based commemoration activities). It is beyond the remit of this article to include the significant development of digital research and engagement based on the use of [social media](#) during the centenary. While social media has become a dominant form of online communication and interaction, with a particularly appealing potential to allow input of historically underrepresented communities and to provide platforms to contest dominant and previously authoritative narratives and interpretations, as Maggie Andrews has noted, controversies and diverse opinions have always been an intrinsic element of media remembrance, whether in the letters pages of uncensored local newspapers during the period of the conflict, or on social media forums.^[2] Nonetheless, enquiries via digital and social media have been a fundamental form of public engagement with centenary content, not least in its capability to spark online searches. Indeed, what is significant about social media platforms facilitated by Web 2.0 technologies is that they are frequently a default host for user generated content, especially project websites and blogs, and social media like Facebook. This raises concerns about the legacy of digital outputs of the centenary, noted in a report by the UK's AHRC-funded *Reflections on the Centenary* project, which pointed to the significant risk of many digital outputs generated throughout the centenary disappearing: "digital legacies can be ephemeral, so understanding what is currently available, what is useful for scholarship, and what is at risk of loss over the long term is fundamental."^[3]

This article is predominantly concerned with examples of digital content produced for the centenary consisting of digitised historical material and born-digital content. Generally, this content has been directly or indirectly publicly funded and created by some form of [memory](#) institution, be it archives, [libraries](#) or [museums](#); created by community or special interest groups that have developed around a topic or area; or by individuals contributing expertise or data to a shared initiative, using crowdsourcing or other methods. A great deal of digital World War One content was created before the centenary. However, re-use of this large corpus of material for research or scholarship has not been widely noted, and there has been remarkably digitally-driven scholarship (i.e., research that relies on digital tools, such as data mining, text analysis, or qualitative or quantitative analysis of data). Nor is the digital content that has been created evenly distributed amongst combatant nations or their successors. Indeed, the gaps are as telling as the content.

Types of First World War digital projects

Digital content created to commemorate the First World War falls into several categories, all of which are reasonably well-established digital project formats developed as part of the digital turn in the humanities, and by investment in digital collections by memory institutions and their funders. They are described below, with reference to specific examples of how these formats have been used to

showcase and develop digital content about the First World War. At the core of many of these initiatives are either the process of digitisation – of converting analogue source materials into digital – or of generating with born digital material, such as community generated (or “crowdsourced”) content. And in some cases, the digital “resource” created is merely a secondary output of traditional research or scholarship.

Digital archives

The advent of technologies for mass digitisation, and the ubiquity of internet access to information has led to a sea change in the way that primary source materials are made available by libraries and archives. There is now a critical mass of highly multimedia digital source materials for arts and humanities scholarship, surrogates of the varied and complex information formats of primary sources – text in all its substrates; [images](#); [moving image](#) and audio, as well as 3D objects.^[4] The potential for these digital collections to transform research in the arts and humanities was articulated comprehensively in the ACLS report, “Cyberinfrastructure and the Humanities: Our Cultural Commonwealth, which encouraged the academic community to seize the opportunities of digital collections and integrated research infrastructures for academic research.

The potential for digital collections to create enriched access to source materials, to new and distributed audiences, and to re-unify disparate and fragmented collections, was well established by the start of the First World War Centenary, so it was logical that efforts would be made to develop large scale digital archives for academic and public use. As the 100th anniversary of the beginning of World War One approached, and the focus on commemoration, [teaching](#), and research that the centenary would attract was identified, the significant potential for digital collections to make previously inaccessible primary sources for research into the First World War widely available for broadest use became manifest.

A digital archive project that was developed to address this need was *Rhyfel Byd 1914-1918 a'r profiad Cymreig / Welsh experience of the First World War 1914-1918* (cymruww1.llgc.org.uk), led by the National Library of Wales (NLW) and funded by the UK's Joint Information Systems Committee (JISC) from February 2012-October 2013. The project digitised archives, manuscripts, [photographs](#), [art works](#), and oral histories held by the NLW, Bangor University, Cardiff University, Aberystwyth University, Swansea University, the University of Wales Trinity Saint David's, local archives in the Archives and Records Council, Wales (ARCW), and the archive of BBC Cymru Wales. The content included over 200,000 pages of archival materials (including photographs, manuscripts, artworks, and [newspapers](#)); 30 hours of audio and 12 hours of [audio-visual material](#). Approximately 30 percent of the content is in Welsh. In their analogue originals, these source materials are fragmented, frequently inaccessible, and difficult to access, yet collectively they form a unique resource of vital interest to researchers, students, and the public of Welsh life, language and culture. The project builds a “national” digital resource to support analysis, interpretation and reappraisal of the impact of “The Great War” in a small country with a distinct cultural and linguistic

identity that was nonetheless overshadowed by the English language and culture “official narrative” of the war. Collectively, the material offers an exemplar of a national, bilingual digital archive. Subsequent research to assess its impact found that it was highly rated as a valuable resource by a small but active community of users.^[5]

More advanced approaches to digitisation, include some initiatives that have used 3D scanning methods to represent objects in a greater degree of detail. As an example of this approach, a team at Queen’s University Belfast have digitised six First World War Uniforms.^[6] In a similar vein the University of Oxford’s *Remembering the First World War in 10 Objects* project includes a collection of six 3D objects gathered during the ‘**Europeana 1914-1918**’ roadshows.^[7]

More ambitious, in scale at least, has been the VAST project^[8] that has created 3D models of sites, monuments and artefacts in the **Trentino** region of Northern **Italy**, a **key battleground** between **Italian** and **Austro-Hungarian forces**. Pushing the technological boundaries even further, a team from Virginia Tech have created a VR model of the Vauquois tunnel complex in **France**.^[9]

Community generated content projects

Since the advent of Web 2.0, the potential of community generated content has been embraced by memory organisations, specifically using approaches known as “crowdsourcing”. Crowdsourcing uses social engagement methods to help achieve a focussed, shared and large goal that would not be achievable without a collective approach.^[10] The type of crowdsourcing approaches tried in archives, libraries and memory organisations include asking members of the public to carry out tasks relating to correction and transcription; contextualisation, i.e., adding further information about the context of a resource; adding to a collection; classification, or co-curation.^[11]

Crowdsourcing methods were used to develop some content for *The Welsh Experience of the First World War*. The project developed a community engagement component in the form of five events around Wales, requesting materials from members of the public to complement and enrich the developing digital resources.^[12] Community content generation in First World War projects was pioneered by the Oxford-based *Great War Archive* project^[13], and has also been used by *Europeana 1914-18*^[14] as a distributed approach to gathering content.^[15] A Welsh project funded by JISC, *Welsh Voices of the Great War Online*,^[16] ran from the summer of 2010 to early 2011, gathering material from the Welsh public relating to the First World War. Content gathered from this project was extremely diverse and included contemporary **letters** and diaries; visual material, such as photographs and sketches; and physical memorabilia, from decorated items brought home from places such as Mesopotamia to German **weapons** picked up on the field of battle. This material was catalogued and made available via People’s Collection Wales, a successful initiative funded by the Welsh Government to build an online “People’s Museum of Wales” from community generated content, and to promote digitisation skills and information literacy around the country.^[17]

Crowdsourcing methods have also been used to “personalise” and memorialise in greater depth individual stories of the First World War. These projects have generated significant interest, and the most successful of these is The Imperial War Museum’s *Lives of the First World War*. This project has digitally collected 7.7 million individual stories of those who helped the British War effort, via a free online platform that brought together materials from museums, libraries, archives and family collections from across the world all together in one place, inspiring people of all ages to explore, reveal and share the life stories of those who served in uniform and the home front. The project ran from 2014-19, and is now archived by IWM as a resource for re-use.

Local history and heritage projects

One of the most interesting aspects of the digital landscape of resources related to the First World War is the proliferation of community-based projects, often addressing local histories and profiles of the impact of the War on a specific area. In the UK, much of this activity was funded by the Heritage Lottery Fund, an organisation which, from April 2010 to 1 March 2018, awarded over £94 million to more than 1,900 projects, including 1,400 projects funded through the First World War: Then and Now programme.^[18] Typical of these projects are initiatives like the Tynemouth Commemoration Project, which has digitally recorded the employment, military service and burial details of local casualties. Many similar projects have uncovered hidden and unknown histories, creating digital outputs that have been archived in a variety of ways. The challenge to working with this material, however, is that it is fragmented, and difficult to link or use in a cohesive way. Lorna Hughes has developed research to look at digital resources relating to [Belgian refugees](#) in the First World War. Her work has concluded that while a good deal of material has been made available digitally, it is locked in local silos with few opportunities to connect resources.^[19]

Visualisation

Visualisation tools can make sense of large amounts of digital data and are used in the humanities to turn qualitative data into graphs, infographics, and other visual representations that can make ideas and concepts easier to understand. These tools also, detect patterns in data like census materials, language data, and geographic data. Thus, this “visualization provides a novel perspective on cultural heritage data triggering unfamiliar thought processes”,^[20] and can show the ways that ideas and events can be represented temporally and spatially. A number of projects have used visualisation to represent structured data in new and innovative ways. The *Geographies of Service Death* project^[21] is one of nine interactive mapping projects that are part of the *Living Legacies 1914-1918* programme. It combines data from the 1911 census and records of the deaths of soldiers in the First World War and visualises these on a map of the city of Belfast based on their place of residence. A technically more sophisticated approach can be found in the *4dSomme* project, which maps the actions of Irish Divisions in the great offensive of 1916.^[22]

Professor [Richard Grayson's](#) (Goldsmith's, University of London) has created an interactive walking tour^[23] aimed at revisiting and reinterpreting the Belfast experience of the First World War. This used digital technologies to plot the addresses of around 12 men from the Shankill and Falls Road areas of West Belfast who were members of the UVF and went on to serve in the British army during the war. Another important resource that demonstrates the power of visualisation of data is James Morley's project, *A Street Near You* which links data sources to map local histories of those involved in the War.^[24]

Themes

A number of themes emerge from the digital content created to commemorate World War One. Not all of these themes are found in all resources, but they are sufficiently common to enable us to make some general comments about World War One Centenary digital content. Immediately prior to the centenary a marked shift in the [historiography](#) of the war had been observed, with [Heather Jones](#) noting new approaches to perennial questions on the war, new themes emerging and neglected areas remaining.^[25] Since centenary activities commenced there has been a growth in literature analysing and interpreting multiple acts of commemoration at trans-national, national and local level and across multiple countries.^{[26][27]} These analyses have noted how digital resources have contributed to the decentralisation and democratisation of commemoration with weak national narratives in western European countries.^[28] In a similar vein Bruce Scates suggests how new digital resources might challenge celebratory memories of war.^[29] Tom Sear provides an insightful post-digital interpretation of commemoration of the Gallipoli campaign.^[30] This emphasises the personal and emotional connection digital content generates with audiences, what Sear terms the “uncanny valley”, a feature noted in a number of resources below. What has received less attention is a broader survey of the digital projects and content that have been created as part of commemoration activities.

There are three ways in which the nature of digital World War One Centenary content can be revealing. The first is the nature and scope of the material digitised – the what, where and by whom, the second is the way in which that material is described, catalogued and organised and the third is any interpretation, context or narrative that is added. The sections below provide a sense of this on a country-by-country basis, but it is also possible to make some generalisations about themes in digital centenary content.

There is little evidence of digital resources directly or systematically addressing long-standing questions such as the [causes of the war](#), [trench warfare tactics](#) or military leadership. The role of [civic society](#) is more in evidence, as the Home Front is a common theme in digital resources. Here we can find attention being paid to issues such as the role of [women](#), refugees and [occupation](#). Indeed, in the case of *Cymru1914.org*, one of the key aims of the project was to explore “Welsh life, language and culture...revealing the often hidden history of the impact of the War”.^[31]

One of the most obvious characteristics of digital centenary resources is the emphasis on the individual or family experience, whether soldier or civilian. The individual experience, particularly when expressed through their own words in [diaries and letters](#), can provoke a powerful emotional engagement. This is a noteworthy feature of projects such as the UK's Imperial War Museum's *Lives of the First World War* project, which invited members of the public to contribute to the development of biographies about 7.7 million UK and Commonwealth service personnel,^[32] or the *Family Ties* site of the United States WWI Centennial Commission which features prominently "Stories of Service". Given the often decontextualized and disintermediated way single pieces of digital content are often encountered, this can be a particularly effective means to engage users. As the generations that fought in or experienced World War One have died, and with them first-hand testimony, these individual stories are even more powerful.

What is lost is the broader narrative sweep of the conflict and its consequences that is, the mass slaughter, the advent of modern mechanised warfare, [economic](#) and [social dislocation](#), political extremism and [revolution](#) or the role of [empire](#). This is not to say context, interpretation and analysis are absent. Rather, that where they do appear, they do so as micro-histories, focusing on one particular aspect often in small geographic areas. This is most evident in content produced in [Belgium](#), where there are sites devoted to [Brussels](#), Antwerp, Liege, [Mons](#) and Limburg. The Brussels site also provides a good example of home front orientated micro-histories, with nine themes under "everyday life" including [food](#), [women](#) and [children](#), leisure and [resistance](#). In this we can see both the localisation that Helen McCartney and David Morgan-Owen identify and some of the new historiographical themes identified by Jones.

Digital Scholarship

Given the huge volume of primary source material generated during the centenary of the First World, we would expect to see a significant increase in digitally enabled scholarship about the war, as scholars engage with resources and data. It may be that it is too soon to tell the impact of these resources, but at the time of writing we have yet to see any significant increase in digitally enabled scholarship on the First World War. However, there are two reasons to explain why it is not obvious if recent scholarship has used the corpus of digital materials: the first is that the impact of digital resources accrues over time, and the second is that digital resources are seldom cited by scholars, who publish results based on research using digital collections but then cite the analogue originals.^[33] A comprehensive bibliometric analysis of references to First World War digital data is needed at some point in the future.

Nonetheless, some research has been carried out that reflects use and re-use of digital First World War resources. Lorna Hughes has used the Welsh Experience of the First World War to carry out both a close reading of archival sources related to the lives of Belgian refugees in the First World War, as well as using visualization tools to carry out a macroscopic analysis of the Welsh newspaper data in the digital archive to model the references to "Belgian refugees" in Welsh

newspapers from 1914-19.^[34] Richard Grayson has worked with crowdsourced transcriptions created by *Operation War Diary*, a project developed by the UK National Archives, The Imperial War Museum, and Zooniverse^[35] where volunteers transcribed and annotated field notes from the [Western Front](#). His research – published in the article “A Life in the Trenches? The use of *Operation War Diary* and crowdsourcing methods to provide an understanding of the [British Army’s](#) day-to-day life on the Western Front” (2016) focused on the first six infantry and one [cavalry](#) divisions to arrive on the Western Front, using the new data generated by the members of the public transcribing the war diaries to form a new historical argument: there was a radical change in the amount of data that was now available to him. In his own words, the sheer amount of data that was available to him was “revolutionary.”^[36]

Academics have used digital resources to present narratives about the war in new and appealing ways, especially in developing locally focussed projects. The digital exhibition *Éischte Weltkrich: Remembering the Great War in Luxembourg*, described below, is a project of this type. Another is the online exhibition, *The Great War and the Valleys Merthyr Tydfil and the Cynon Valley*,^[37] developed by Paul O’Leary of Aberystwyth University History Department. The content for the online exhibition was selected from two Welsh digital resources: *The Welsh Experience of the First World War*, and the *People’s Collection, Wales*, a website with content about the history and heritage of Wales and its people, including community-generated content.^[38] The digital exhibition was developed by the National Library of Wales Research Programme in Digital Collections, and the Humanities Research Institute at Sheffield University. The site was built using Omeka,^[39] the open-source web-publishing platform developed by the Roy Rosenzweig Center for History and New Media^[40] at George Mason University.^[41] The project draws together a new narrative about how the First World War was the first modern war to harness the full power of industry, illustrating how large parts of the economy at home had to be geared to provide guns, ammunition, [ships](#), food and other [resources](#) to support this new type of “total war”. The project shows how civilians as well as soldiers and seamen were involved in the war effort, focussing on the industrial valleys of south Wales, especially the town of Merthyr Tydfil and the Cynon Valley at the heart of the south Wales coalfield. It explores attitudes towards the War and how a variety of groups and individuals responded in their different ways to the conflict.

Another area of digital scholarship worth noting is learning and teaching, in particular the creation and use of WWI Centenary MOOCs. FutureLearn’s *One Hundred Stories*^[42] project is a prime example of the pros and cons of the approach. The courses attracted a global audience in the tens of thousands and is an ideal platform to overcome the disintermediation of online digital content through scholarly contextualisation. With the close of the centenary, however, the course is no longer offered, although some of this particular MOOC’s content has migrated to the 100 Stories site hosted by the Australian National University.

Digital First World War resources: Scope

Transnational

Much of the digital content for the World War One centenary is hosted by the main combatant nations. These are represented in a visualisation developed by The National Archives (UK) *First World War: A Global View*.^[43] Part of The National Archives First World War 100 programme it is notable not only for its interactivity but its global reach, a rare trend in commemorative digital content.

Another project with significant global reach, and the broadest existing digital First World War resource in its geographic scope is *Europeana 1914-1918*.^[44] This is one of Europeana's 12 themed collections, with over 370,000 items from 27 countries comprising:

- 198,641 texts
- 172,635 images
- 3,054 videos
- 320 3D objects
- 65 Sound recordings

The origins of *Europeana 1914-1918* lay in the 2011 pilot project *Erster Weltkrieg in Alltagsdokumenten* which ran workshops to digitise community held collections in nine German cities in close cooperation with the University of Oxford and Berlin's historical research institute Facts & Files. *Europeana 1914-1918* then deployed the crowdsourcing methodology and model developed by the Oxford University *Great War Archive* project^[45] to build a significant community digitisation effort. The *Europeana 1914-1918 Centenary Tour*,^[46] subsequently organised 200 events in over 20 countries to transcribe over 14,000 handwritten documents, letters, postcards and diaries material in the *Europeana 1914-1918* collection via a significant pan-generational initiative.

What is most notable about *Europeana 1914-1918* is its geographic scope. As we shall see later, there are considerable gaps in digital content, especially amongst the Central Powers. Although the volume of content is small, it is here that digital evidence of World War One from countries such as [Bulgaria](#), [Czechia](#) and [Slovakia](#) can be found. It is also within *Europeana 1914-1918* that we can also find content related to many of the other smaller participants such as [Portugal](#), [Lithuania and Finland](#). There remain significant gaps, however. There is no content from Bosnia and Herzegovina, [Turkey](#) or [Russia](#). Unsurprisingly, nor is their content from outside the European theatre of war, except for some material from the [USA](#).

EFG1914^[47] is a spin-off project of the European Film Gateway, funded by the European Union. The project commenced in February 2013 and since then it has been providing access to a considerable number of films relating to the Great War. In the context of *EFG1914*, the European film archives contributing to EFG digitised a large part of their collections on the Great War.

In terms of academic digital resources with a global reach, the website of the International Society for First World War Studies is establishing a major bibliography of research on the War.^[48]

Australia

Australia invested heavily in the Australian and New Zealand Army Corps (ANZAC) Centenary commemoration, with both a national programme and activities organised by state, territory and local governments, as well as business and community organisations.^[49] The investment has generated a wealth of digital materials, comprising both archival and community-generated content. This built on the decades long collaboration between National Archives Australia and Archives New Zealand on the *Discovering Anzacs*^[50] project that digitised WWI service records and the range of resources available from the Anzac Portal.^[51] During the centenary this collection was expanded with materials from community contributions and partnerships with other organisations.^[52]

Reflecting the increased emphasis on the home front was the digitisation of Australian repatriation records, the largest single WWI archive in the country, by the National Archives of Australia. In 2012, the National Archives undertook to digitise the repatriation records of the first contingent of the Australian Imperial Force sent overseas (some 5,000 separate files). Funding from the Department of Veterans Affairs secured this pilot project but fell well short of digitising some 600,000 repatriation records held in Australia.^[53] Even so, these records provide a valuable insight into issues such as physical and mental health, rehabilitation, retraining, employment and pensions. Access to the records were enhanced by video guides^[54] and classroom resources.^[55] Some New Zealand repatriation records can also be accessed online. Unfortunately these holdings are not as extensive as comparable records in Australia.

The Australian War Memorial (AWM) commemorated the centenary of the First World War through several projects that ran during the 2014-2018 period. Among those, *Anzac Connections*^[56] was an effort to communicate digitised historic documents from the AWM to the Australian population within and beyond Australia. Originally created to mark the 2015 centenary of the Gallipoli campaign, *Anzac Connections* has since expanded to include collections relating to the Western Front and Sinai/Palestine.^[57] The collection features 258 records of Australian service people, complete with metadata, descriptions, timeline and digitised collection items.

The *Joint Historical and Archaeological Survey* (JHAS)^[58] was a five-year project (2010–2014) that was funded by the Department of Veterans' Affairs (Canberra), and formed to address the recommendations of an Australian Senate committee report, *Matters Relating to the Gallipoli Peninsula*, for a “multidisciplinary project to identify and record sites of historical significance.” Led by Professors Antonio Sagona and Chris Mackie at the University of Melbourne, JHAS comprised a team of Australian, New Zealand and Turkish researchers and was the first to “receive permission to do non-intrusive archaeological research within the Anzac area, since Charles Bean's (1879-1968)

team in 1919.”

The primary data collected and processed by JHAS have been made available via the Anzac Gallipoli Archaeology Database (AGAD) – an online resource that includes over 2000 of precisely documented archaeological records from both Turkish and Allied (Anzac) areas of the Gallipoli Battlefield.^[59]

Austria

Several sites mark Austria's commemoration of the First World War. The Austrian Media Centre^[60] includes a timeline of thematic histories, providing context and analysis provided for its digitised content which includes a large proportion of audio recordings and images. There is a thread of military and political history running through each year but as much attention is paid to the home front, with themes such as the role of women, culture, art and [science](#) and [propaganda](#).

The First World War site from *The World of the Habsburgs*^[61] provides a comprehensive and sophisticated picture of Austria during WWI. With a sophisticated timeline interface the site provides 60 stories and over 1,000 media items. Even more so than the Austrian Media Centre, particular attention is paid to the personal, social and domestic aspects of the conflict. The stories provide a very diverse picture, covering topics such as [masculinity](#), [anti-Semitism](#), [finance](#) and inflation, technology and myths. It is also noteworthy for providing perspectives of the constituent [ethnic groups of the Austro-Hungarian Empire](#). So, it is here you can find accounts of the Czechs, [Romanians](#), Slovaks and Ruthenians for example. Each story is broken down into multiple chapters. For example, “Women in the War” contains seven chapters.^[62] As well as the stories and timeline, maps, memories and media provide further access points.

As part of the *Europeana 1914-1918* project, the National Library of Austria has digitised the photographic collection of the Austro-Hungarian army that includes valuable material from the [Russian](#), Italian and [Serbian](#) fronts.^[63] In contrast to the previous two projects, this is a far more traditional digitisation and cataloguing project, without any additional context or interpretation.

The Austrian National Archive has also produced a comprehensive site to commemorate the war, based on the digitisation of its War Archive collection.^[64] The presentation is less sophisticated than the World of the Habsburgs project but follows a similar format, with timeline access and 23 topics, covering themes such as war funding, [prisoners](#) and [refugees](#), women in war and [everyday life](#). The comprehensive textual introduction to the site is unusual in emphasising so strongly the industrialised mass destruction of the conflict. Again, each topic is broken down into sub-sections with text-based context and interpretation to the vast range of source material.

Belgium

Belgian digital content to commemorate World War One highlights several features and problems that also occur in other digital resources. The main portal site for [commemoration](#)^[65] is hosted by the Belgian government and its main function is to provide links to commemorative events, both national and regional. There are, however, sections on historical information that provide a narrative of the conflict in Belgium with illustrative images, video and documents. There are already a number of links from the site that are dead, such as www.ieper100.org; that commemorates the first use of [chemical weapons](#). This reflects the temporary nature of events and their related digital content and the reality that at least some digital content on has already been lost. A more creative use of digital content is the *becarto14-18* site^[66] that provides an interactive map of sites and commemoration events as well as a timeline feature.

The emphasis on the impact of the conflict away from the front-line can be seen in the State Archives of Belgium site on the civilian experience.^[67] The recognition of the regional aspects of war is also reflected in Belgium with digital content and websites produced relating to Antwerp,^[68] Liege,^[69] Brussels,^[70] Mons,^[71] and Limburg.^[72]

The Belgian broadcaster RTBF has also produced a comprehensive site devoted to World War One,^[73] focused on French speaking Wallonia. Over 100 articles are organised by 10 topics, only one of these directly relates to “military aspects” and the rest cover topics such as the economy, food, families and [medicine](#). As an occupied country with the remnants of the [Belgian army](#) confined to a parcel of land in the northwest of the country, this emphasis on the daily life aspects of the conflict is perhaps more understandable, but it is also a feature of a number of other digital resources in other countries.

The RTBF site is also noteworthy for direct community input into a digital resource. The project was led by historians from Belgian universities who toured the region in the “14-18 Bus” collecting stories and primary sources, with more than 320 contributors.

Canada

The Government of [Canada](#) has come under criticism for a “missed opportunity” to invest in commemoration activities for the centenary of the First World War^{[74][75]}. Although commemoration events were organised, the digital footprint of the Canadian efforts is significantly smaller in scale and extent as compared to other countries. Veteran Affairs Canada^[76] features digital materials relating to the First World War under its Remembrance/World Wars Commemorations web pages. The resource includes historical and educational information on battles and conflicts, details and locations of FWW memorials, a timeline of Canada in the FWW, as well as an audio archive of veterans as they recall their life and times during the war years.

The Canadian Great War Project^[77] hosted by the University of Victoria had its genesis in a far

earlier private project^[78] but the centenary of the war provided an impetus to provide a long-term home for the project and spawn new sites such as *A City Goes to War*.^[79] These sites in turn draw heavily on digitised material from Libraries and Archives Canada.^[80] *The Canadian Great War Project* drew heavily on volunteers to assemble publicly accessible data and later transcribed and normalise it. The migration of this project from private to university hands is a rare example of digital preservation in this field but its benefits can be seen in the reusing and repurposing of the data into new visualisations, such as the interactive mapping of Toronto's war dead by Global News.^[81]

France

A project run by the Heritage, Memory and Archives Directorate of the French Ministry of Defence, "Morts pour la France", acquired its name after the French legal expression which describes the honour bestowed to individuals who fell who during a conflict, usually in the service of the country.^[82]

The resource is divided into seven databases. The first one includes almost 1.5 million individually scanned cards of [soldiers who died](#) during the First World War. The second database includes soldiers and civilians shot under a [military justice](#) decision or summarily executed during the First World War. The third one includes aircrew or ground personnel of the military aeronautics during the Great War, while the fourth database pertains to digitised images, logs of marches and operations, field accounting books and logbooks and navigation logs of all military units engaged during the war. The fifth and sixth databases present collections of regimental histories of military units, as well as the 107 volumes of the *French Armies in the Great War* (AFGG). The seventh and final database includes Prime Minister of France during the First World War [Georges Clemenceau's \(1841-1929\)](#) cabinet archives and proceedings against French militant anarchist [Emile Cottin \(1896-1936\)](#).

The project commenced in 2014 and ran until 2018 and invited users to annotate the index cards of the database in order to enrich already existing indexes (name, first names, date of birth, military unit, country of birth) and thus to allow for more detailed searches among the 1.4 million names in the database: for example, to search by place of birth or death, by date of death, by unit, grade or class and recruitment office. As of May 2019, 1,824,996 annotations had been recorded.

The French Service *historique de la Défense*^[83] worked to digitise 18,000 *journaux des marches et opérations*^[84] from the GR 26 N series, which accounts for about 1.5 million pages that have been made available.

Germany

The *Bundesarchiv* (German Federal Archives) has digitized over 700,000 documents and photos on numerous topics relating to the First World War for research and education.^[85] This includes items from collections relating to the civilian and military aspects of the War, including archives of important political and military figures. The permanent collection of the army archive includes subsections such

as the Royal Military Cabinet, the Army Groups of the German Army, the Commanding General of the Air Forces, the war in the colonies, the records of the Reich Chancellery and others.

The Digital Picture Archive of the Federal Archives hold approximately 11 million still pictures, aerial photographs and posters from modern German history. The earliest photographs date from the 1860s. At the time of writing about 245,000 pictures representing the variety of available images in the *Bundesarchiv* are kept in the database. Since November 2008, photos of the Federal Press and Information Office (*Bundespresseamt*) have also been integrated into this database.

Moreover, more than 150 [films](#) from the holdings of the *Bundesarchiv* have been digitised and archived as part of the EU project *EFG1914 (European Film Gateway)*. The digitised films, including both historical drama and propaganda films as well as documentary films and newsreels from the years 1914-1918, are freely accessible to the public, including detailed accessibility information (metadata) via the *EFG1914* online portal, and can be conveniently played over the Internet.

Lastly, individual original tones from the early phase of the First World War have been handed down to the Federal Archives. The speeches of [Wilhelm II, German Emperor \(1859-1941\)](#) and [Paul von Hindenburg \(1847-1934\)](#) still bear witness to an unbroken military self-confidence and firm belief in victory.

Hungary

The Front Line and Hinterland website^[86] developed by the Hungarian Institute of Political History takes a different approach to many other centenary digital initiatives. Rather than concentrating on digitising solely primary sources, the site provides a comprehensive series of articles of varying length that cover almost every aspect of [Hungary's](#) involvement in the conflict. Topics range from agrarian reform to the [Spanish flu](#). There are also a small selection of images in the photo gallery section and perhaps the most comprehensive timeline of the conflict available anywhere. Again, the predominance of multiple, smaller, thematic histories rather than broader analysis of the conflict is evident. Additional material relating to Hungarian involvement can be found on Austrian sites.

Italy

La Grande Guerra +100^[87] is one of a number of [Italian](#) resources dedicated to the First World War and produced during its centenary. Although covering the whole of [Italy](#), with a focus on the Trentino front, the site includes valuable episodes on the Austro-Hungarian Empire, including the often neglected Romanian, Czech, Slovak, Serb, [East African theatres](#) as well as sections on aspects such as civilian life, economy, the [Easter Rising](#) in Ireland, [Russian Revolution](#) and the [Catholic Church](#).

Meanwhile, the Italian government launched a wide range of activities to [commemorate](#) the war.^[88]

This included an interactive map of war sites and memorials^[89] and the Ministry of Cultural Heritage

provided a site^[90] for images and documents of the conflict. The Institute for the History of the Italian Risorgimento also provided a range of online images and films with themed interpretation and context.^[91]

Luxembourg

The digital exhibition *Éischte Weltkrich: Remembering the Great War in Luxembourg*^[92] is a project developed by the C²DH, the Centre for Contemporary and Digital History of the University of Luxembourg, with the objective of addressing a neglected and understudied period in the history of the Grand Duchy and of debunking popular myths about the Great War. *Éischte Weltkrich* commenced in 2016 and will run until 2021 under the support of the Luxembourg Ministry of State; it brings together collections of major Luxembourgish museums, archives and cultural heritage institutions. The project has been enhanced and supported by several side activities to involve a range of stakeholders, including schools, and holders of personal collections. The homepage presents four independent but interconnected modes of navigation (or entry points): The Themes (a thematic, story driven mode), the Collection (an exploration of the individual objects in the digital archive), an interactive geo-referenced Map and an event based chronological exploration represented by the Timeline.

New Zealand

Government agencies in [New Zealand](#) developed a series of print and digital projects to commemorate the Centenary of the First World War, led by The Delivery Group of the Ministry for Culture and Heritage.^[93] The projects were funded by a NZ\$17 million in lottery funding allocated by the Lottery Grants Board, and branded under the shared identity “*WW100*”.^[94] As part of the *WW100* activities, a number of digital projects were delivered from organisations and communities across New Zealand, such as the “Special Collections First World War Centenary” website by The University of Auckland Libraries and Learning Services,^[95] and the “All That Remains”^[96] collections-driven online exhibition by National Services Te Paerangi at Te Papa.

New Zealand History,^[97] a website that features information and resources from the Research and Publishing Group of the New Zealand Ministry for Culture and Heritage, has developed an extensive collection of digital materials and resources to document New Zealand’s experience in the First World War, with the aim to create the “most comprehensive online resource on the world at war, the major campaigns, the soldier’s experience, the main NZEF units, the home front, post-war memorialisation and many other subjects.”^[98] Among articles, photography and historical information, *NZHistory* also features video materials, such as the Great War Stories short films^[99] and an annotated collection of digitised First World War [maps](#). Additional digital material has been made available in conjunction with Australian agencies (see Australia section).

Romania

Romania's main digital centenary project is a collaboration between the University of Bucharest, Historia magazine and the Romanian Historical Archives hosted by the Romanian Tourist Board.^[100] Although the site contains interpretations relating to the Western Front (such as the [Battle of the Somme](#)) the main focus is on the conflict in Central Europe. As such, its emphasis is a series of articles that reflect the changed borders and newly independent nations that emerged from the conflict.

UK

Several significant UK resources (*Lives of the First World War*, *Operation War Diary*, *Cymru1914.org*) have been mentioned elsewhere in this article. However, some noteworthy collections of resources have been created by memory institutions in the UK, and these will be of lasting impact. The Imperial War Museum created the *IWM Centenary* website^[101] to bring together in one place for resources and activities created by 4,159 organisations from 62 countries. The website also contains a number of essays and reference resources about aspects of the War. The British Library also launched a First World War resource,^[102] bringing together resources from the Library with a series of images and historically important explanatory essays by leading historians. The BBC also developed a series of programmes and community facing activities about the War, called *World War One at Home*.^[103] This was a very early centenary activity, and it remains one of the most important aspects of the BBC's coverage of the First World War. The University of Oxford is the home of many innovative digital approaches to the First World War, many developed through the vision of Dr Stuart Lee. Oxford's role in inspiring *Europeana 1914-1918* is described above, and a project carried out under Lee's direction, *The First World War Poetry Digital Archive*^[104] was an early project that explored the use of digital approaches for greater and enhanced access to primary sources.

British dominions (Australia, New Zealand, Canada, [South Africa](#)) are covered elsewhere in this article and often feature prominently in UK online centenary sites. It was, however, the colony of [India](#) that made a greater contribution of servicemen than all the dominions combined. Until relatively recently this contribution has often been overlooked, both in the historiography and online resources. The centenary has been an opportunity to redress the balance somewhat. India and the Great War^[105] is a joint project between the United Service Institution of India and the Ministry of External Affairs. The site provides a small selection of images and videos, overviews of the main theatres of Indian involvement, five themed sections as well sections on medals, postcards and militaria.

Empire, Faith and War^[106] is a site organised by the UK Punjab Heritage Association in conjunction with the Imperial War Museum to commemorate the disproportionate Sikh contribution to the conflict. It is noteworthy for the recruitment of "citizen historians" to research and produce soldier stories and spoken histories as well as the development of learning resources.

It should also be noted that a huge number of First World War projects have been created as personal initiatives by individuals, often working with no funding, to create resources for education and enjoyment. An excellent example of this is Chris Bakers' project, *The Long Long Trail*,^[107] a history of the British Army. The project includes transcriptions of primary sources, digitised maps, and research guides – as well as a very active user forum of over 40,000 members.^[108]

USA

Established in 2013, the U.S. World War I Centennial Commission^[109] was tasked with the planning, development and execution of projects and programmes to commemorate the First World War in the United States. The Commission acted as the lead organiser and coordinating authority for the Centenary activities of individuals, communities and organisations, with its fundamental objectives being to raise awareness and educate US citizens about “the causes, courses and consequences of the war”.

The commission's website also acts as a portal to a collection of educational digital materials from several partners, including the American Battle Monuments Commission, the Gilder Lehrman Institute of American History, the Library of Congress, National Archives, the National World War I Museum & Memorial and others. Alongside a collection of education articles, links to some 100 external curriculum resources are provided.^[110]

Family Ties^[111] represents the commission's genealogy initiative to collect information about FWW veterans and collate it into a database for online publication. The project's aim is to document the stories of service and family relationships of those who served in the First World War through the collection of stories of service, donations of artefacts from individuals and organisations, as well as guides and genealogical research resources to help individuals, families and others to research family history and World War One service.

The commission supported several partner projects,^[112] which are hosted on its website and provide access to historical information, still photography, digital/digitised maps and databases of service people names predominantly organised around a theme (e.g. US service personnel Missing in Action, US Italian Immigrant soldiers). In addition, the commission endorsed more than 50 commemorative projects – some of which offering digital content – that related to US contribution to the First World War. The goal of these endorsements was to “[increase] the number of people in the United States who were exposed to these educational programs, events, tools, programs, and activities, and broaden their impact.”(footnote?)

Gaps

Although it is hard to write extensively about something that is not there, it is worth noting the gaps in

centenary digital content. By far the largest absence is from Russia. Dismissed as a capitalist and imperial war and overshadowed by both the 1917 Revolution and heroics of the Second World War, it is perhaps not surprising that the First World War has received relatively little attention until now. It was only in 2004 that the “Memorial Park Complex of the Heroes of the First World War” was built on the site of the former World War One cemetery in Moscow, which was demolished in 1932. In 2014, a national memorial to those who had fallen in the First World War was unveiled and in the same year the first museum dedicated to Russia and the war opened near St. Petersburg. There is renewed scholarship on Russia and WWI, most noticeably the large-scale international academic collaboration “*Russia’s Great War*”.^[113]

A comparable increase in digital output has not yet been seen, certainly not related to the centenary, although content related to Russia and the Eastern Front can be found. This is often part of larger, longer running projects, such as Books and Periodicals on the history of the war digitised by the State Historical Public Library of Russia.^[114] The project “*In memory of the heroes of the Great War of 1914-1918*” was made available by the Russian Ministry of Defence, Russian Historical Society and the Federal Archival Agency of Russia (*Rosarchiv*). The database contains more than 2.5 million digitised card files for the calculation of losses at the front.^[115] The Russian Christian Academy for the Humanities, supported by the Russian Humanitarian Scientific Foundation, created their own site in memory of the war^[116] that focused on literature, art and culture. Further material can be found on sites in Germany^[117] or the USA.^[118]

A similarly patchy picture can be found across central and eastern Europe. A crowdsourced project aims to collect information on the Estonians who fought in the war, organised by the Estonian National Archives.^[119] There are also scarce resources on Turkey^[120], Serbia^[121], Slovenia^[122], Romania^[123] and Bulgaria.^[124]

Lastly, there is relatively little material on the war at sea, whether naval or [merchant](#), with the notable exception of the *Royal Navy: First World War – Lives at Sea*.^[125] A collaboration between the UK National Archives, the National Maritime Museum, and the Crew List Index Project, this project has made the online personal and service details for every officer and rating who served during the war available for the first time. Launched in 2016, the project will continue until 2021.

Conclusion

Digital legacies can be ephemeral, meaning that managing users’ and creators’ expectations about a project’s long term digital afterlife is fundamental: but long-term maintenance and preservation of digital resources requires long-term investment and planning, and continued investment as preservation technologies change. To cite the example of the *Europeana 1914-1918*, many participants contributed their material on on the understanding that the platform offered permanency for the digital objects – but long-term maintenance and preservation requires long-term investment

and planning. Indeed, whilst *Europeana* was cited as an appropriate digital infrastructure for some types of content for as long as funded for digital access, it was felt amongst those attending that the UK Government should invest in its own digital portal for centenary activities, as a way of ensuring the continued visibility and access to digital outputs created throughout the centenary, and supporting their sustainability in the short to medium term. Preserving the long term digital legacy of local project findings would require continued investment as preservation technologies change. A co-ordinated umbrella project would do well to record the wide ranging efforts pursued by local radio, newspapers and other media, as a way of granting centenary project findings and legacies future meaning.

The surge of interest in the First World War has created a valuable corpus of significant, if still fragmented, digital resources, largely because of the expectation that digitisation may make resources less fragile and more accessible over the longer term: in an external evaluation of *Europeana 1914- 1918*, participants noted that they felt that their involvement was worthwhile because digitisation and online publication of their family materials would preserve these materials for future generations: long-term use and re-use of the content was a priority 61 percent of users.^[126]

The digital legacy of the centenary, however, remains a challenge: indeed, even amongst “official” digital centenary content there have been a number of sites that have gone offline whilst writing this article, for example the site <http://ieper100.org/> that commemorates the first use of chemical weapons during the conflict. It may well be the case that the First World War is now the most digitally documented period in history, thanks not least to the vast amount of material on the websites of community projects, but it is not clear that this material will be discoverable or usable by anyone in five, let alone 50 or 100 years time. A major recommendation of the DCMS report cited above is that immediate action should be taken to coordinate collection of digital material centrally in order to secure its future. The Imperial War Museum in the UK is developing a portal which will provide access to resources, but it will not provide long term digital access to the data. Likewise the UK Web Archive has a section on the WWI Centenary, but this does not preserve all site interactivity and functionality.^[127] A report based on research for the AHRC Living Legacies project indicates that sustainability options are poor for digital resources created by both community and academic led projects.^[128] To address this, there is a need to develop and promote digital sustainability solutions that can be easily accessed and implemented by communities that generate digital content, especially those that lack the funding and expertise to understand the requirements of/for digital sustainability. There is also a need for new solutions and technologies for digital sustainability, which take into account the requirements and limitations of communities generating digital content.

As we look towards future centenaries, which we can assume will produce a similar volume of digital content, there is a need for leadership by investing in the digital legacy from the very outset of any future programme of this type.

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