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**Placing the archive online: a WebGIS approach to sharing library collections.**

*Keywords:* GIS; Libraries; Archives; Digitisation; Cartography

**Summary:** Digital practices have transformed the ways in which we engage with, represent and scrutinise our collective social and cultural heritage. One strand of this is centred on online open access of library collections and archives. Typically, collections are offered as static images and associated text, but by incorporating spatial technologies we can offer greater interactivity to the user. This paper sets out one methodology by which an object, held in a university special collections archive, is made available to the wider public and scholarly communities. The authors argue that access to material cultural heritage is improved via the application of interactive digital and spatial approaches and collaboration between librarians and academics.

**Introduction**

Online open access is essential if we are to successfully and objectively share our social and cultural heritage. The ‘digital turn’ towards the end of the twentieth century fuelled the feasibility of increased accessibility and for academics transformed the ways in which they may engage with, represent and scrutinise collective heritage. Increasingly libraries and archives are also taking advantage of new tools and technologies originating from the digital revolution by making their collections available online through what Clough (2013: 10) terms a “Golden age of opportunity”. This provides a freedom for institutions to showcase collections, for scholars to disseminate research, and, perhaps most importantly, it affords a crucial freedom and flexibility for the public and scholars to access collections previously restricted to them geographically and financially.

Digitisation efforts have been of particular value to special collections within libraries (Michel 2005) as well as within specialised subject libraries. In particular, digitisation has facilitated these specialised collections in overcoming some of the challenges to providing access whilst preserving the fragile print sources (Harris and Weller 2012). Bidney and Piekielek (2018) define digitisation efforts of maps and records beginning in the 1990s as one of three major trends in the development of Geography and Map libraries. Incorporating digital practice enables bodies with these specialised holdings to share discreet collections with both popular and research appeal.

Libraries have at their heart accessibility. Currently a wide variety of technological options are in use by libraries, but regardless of the software and tools employed the common aim continues to be increasing access to the collections (Bidney and Piekielek 2018). Nevertheless, physical accessibility is a challenge if libraries wish to share their collections beyond the ‘local’ - indeed research has shown distance to be the greatest determining factor for library use (Park 2012). By choosing to disseminate collection material digitally and online they are increasingly moving the accessibility boundaries to country and global audiences.

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Online curation and dissemination of archives has been popularised by libraries and archives across the world with increasingly diverse interests and scope. The British Library (BL) is one of the United Kingdom’s (UK) leaders in serving collections online and more recently moved to provide additional support and functionality such as for the International Image Interoperability Framework (IIIF) permitting the sharing of collection imagery. Similarly, The National Archives (TNA) in London have moved their provision of online collections from a viewing platform to include options to download and ‘own’ objects in their archive. In Ireland, the National Library Ireland (NLI) and most local county libraries also provide searchable online access to their catalogue, databases and collections. The same is true of university libraries who have greatly advanced their digital and online accessibility, something that was further propelled by the requirement to access material online during the COVID-19 pandemic.

Discreet digital projects have also emerged, perhaps most notably, Beyond 2022, an all-island virtual reconstruction of the Public Records Office of Ireland. This has set a new bar for large digitisation projects in the country and heralds a change in the means by which we can access records from the past. More broadly, the Digital Repository Ireland (DRI), the island’s national digital repository for Ireland humanities, social science and cultural heritage data, specialises in the preservation of and access to digitised source material and data from libraries, archives and projects across the island and beyond. We also see similar digital moves in archive related publications, the Royal Irish Academy’s (RIA) Irish Historic Towns Atlas (IHTA), a constituent of the International Commission of the History of Towns, having in recent years moved from the traditional paper volumes to adopting digital means of dissemination (Chodějovská et al 2015).

**Spatialising collections**

Teamed with the expansion of digital access to archives, the role of spatial technologies and specifically Geographic Information Systems (GIS), noted as influential in the ‘spatial turn’ (Warf and Arias 2009; Withers 2009; Bodenhamer 2013), is growing in use in libraries and archives (Bishop and Mandel 2010; Park 2012). The role of GIS in libraries was influenced in part by the partnership between the Environmental Systems Research Institute (ESRI), the industry leader in GIS software, and the Association for Research Libraries (ARL) begun in 1992 (Plassche 2021). This partnership, known as the ARL Geographic Information Systems Literacy project, was instrumental in establishing GIS within academic libraries in the United States and Canada, and in promoting the use of ArcGIS™ software within institutions (Bidy and Piekielek 2018). Within a decade, 2,500 academic libraries were using ESRI products (Holstein 2015).

The foundation of GIS is in the analysis and visualisation of space and place. It facilitates the layering of datasets from different places and periods to support varied means of temporal and spatial investigation. Almost all objects contained within library and archival collections include metadata on time and space and are as such readymade ‘layers’ ripe for inclusion in spatial projects. As Knutzen (2013: 22) notes “A gazetteer, once built and sufficiently populated, would become a framework through which other historical data sets… could be spatially and temporally organized and validated against historical maps”. In research by Dörter and Davis (2013), they found GIS advantageous for collection management, display and visualisation, and more broadly, cooperation within and between institutions. It is thus unsurprising that researchers from across the disciplines adopt spatial technologies and consequently the need for support continues to grow (Holstein 2015; Slayton and Benner 2020a). As we move forward into the second quarter of the twenty-first century “academic libraries… are poised to take a major role in expanding GIS access across [university
and college] campuses” (Cowen 2021: 190). Indeed, many academic libraries sited on university campuses are the main providers of GIS services in part because of their central position within the institution (Slayton and Benner 2020b). These services include administering the system and providing relevant training and access to related data (and library collections) for university staff and students.

The greatest potential for libraries employing digital and spatial technologies lies in the interactivity it brings to the online user experience. Through GIS, once static images shared through library catalogues are expanded to include interactive WebGIS and so grant users a more customised approach to explore an object and additional linked material. This is particularly true of cartographic collections. As LeBlanc and Lipton (2020: 272) state “…the ability to zoom in and out on a web map means it can store [and present] a massive amount of information that a single sheet of print map cannot do, it is interactive and engaging, and could be useful for communicating an engaging message”. Libraries and institutions are therefore no longer focused solely on the digitisation of their collections, but also on the development of online systems that incorporate spatially focused user interactivity (Kowal 2002; Holmberg et al. 2008; Kong et al. 2014; Kong et al. 2015). Existing resources such as the much lauded David Rumsey Map Collection (Rumsey, n.d.), which provides a vast map library under the Creative Commons License, permits registered users to search, download (free of charge), use interactive globes, embed map images, georeference, overlay and compare cartography across time and space. The mapping agencies in the UK and Ireland (Ordnance Survey of Great Britain (OSGB n.d.), Northern Ireland (OSNI n.d.) and Ireland (OSI n.d.)), each provide different levels of access to a selection of their (historic) map collections in various flavours where users can view, download, search, zoom and pan for place-based information. Where mapping agencies (and their associated spatial skills) team with libraries such as in the case of the National Library of Scotland (NLS) we find one of the most advanced uses of online spatial technologies for map history, providing various options to explore and visualise cartographic collections temporally and spatially (Fleet and Pridal 2012; Fleet 2019). Similarly, the Public Records Office Northern Ireland (PRONI), Northern Ireland’s largest archive, provide access to the various versions of Ordnance Survey mapping for the region (PRONI n.d.) from the early nineteenth century to present.

There are however a myriad of challenges and barriers for any library or archive wishing to employ spatial technologies in their collection outreach, arguably the greatest of which is the real and perceived financial cost to both the provider and the consumer. Libraries require specialist staff to create and maintain the digital infrastructure, and whilst some offer free access, others charge end users. Dodsworth (2018) describes the evolution of libraries and archives, moving toward incorporating spatial technology in 340 libraries and institutions in the United States (U.S.) and Canada, but fails to highlight the requirement to upskill library staff in the use of spatial technologies. Contrary to this, Belton’s (2019) 2015 survey of North American archivists and a subsequent survey of historians (Belton 2018) records a strong interest in using spatial technologies to access and visualise collections and associated research, but that an absence of technical knowledge is a major hurdle, a sentiment more recently echoed by Plassche (2021) in their analysis of the training received by today’s map librarians.

The clearest choices for libraries point to the employment of new staff with spatial knowledge, an understandably expensive option, or the upskilling of existing staff, which although not necessarily the preferred choice would reduce start-up costs. A third and possibly more preferable means in the short term, at least in university libraries, is through closer collaboration of diverse people and skillsets across the institution, especially between librarians and geography researchers. This
mutually beneficial relationship between the librarian and the academic researcher could herald the starting point for an initial exploration of the benefits of spatialising library collections. Harnessing the existing spatial skills of researchers and their willingness to help focus library efforts in terms of the GIS services would be particularly beneficial. They can also offer in-house training for librarians to expand their knowledge repertoire. Librarians in turn, provide researchers with their collection expertise and a broader context and knowledge of the spatial content of the archive beyond the researcher’s own interest, and eventually, as the relationship progresses, the library might provide a central home to administer GIS on campus (Larsgaard 1998; Harris and Weller 2012; Benner and Slayton 2020).

The foundation of Glucksman Library’s (University of Limerick) ethos is that the development of the collections generally, but especially historic visual materials, present a huge opportunity that should be fully exploited. Part of this is the ongoing development of a new UL Digital Library – a free, online repository of digital cultural heritage material that aims to preserve historic material and to reach new and wider audiences. The strategy of Special Collections and Archives housed within the library focuses on the value added activities of promotion, exhibition, digitisation, outreach and publication so that the collections might become more accessible and therefore more valuable to researchers. They therefore plan to harness digital approaches, with online and open access at the core of their Collection and Development Management programme.

In 2021, Glucksman Library staff met with academics from the University of Limerick’s Geography Department to discuss ‘spatialising’ the library’s collections. As a new discipline at the university, prior to this there had been no working relationship between the library and Geography. Here, by drawing together the expertise of archivists, librarians, and academic specialists in geography and spatial technologies, a new cross-disciplinary collaborative partnership emerged, the goal of which is to enhance the sharing of the library collections (primarily accessibility and interactivity) and to facilitate the research interests of academics. To enable this research, funding was awarded via an internal competitive application to the Faculty of Arts, Humanities and Social Sciences, University of Limerick.

This paper details the story of Glucksman Library’s first use of spatial technologies to spatialise their collections. The project aimed to present a free, open access mapping application serving one key nineteenth century map of County Tipperary online for academics and the public. Further to this, the resource introduces an element of spatial interactivity by providing a searchable interface of the county’s cultural heritage hinged on the toponyms contained on the map. Importantly it also acts as a proof-of-concept model for incorporating the spatial into archives for future projects at Glucksman Library and beyond.

Background to the case study map(s)

In 2013, a private collection of archival material was donated to the University of Limerick. Now expertly catalogued and extant in the Special Collections and Archives, Glucksman Library, The Timothy Looney Papers (Glucksman Library IS 2135 P43) are rich with historic photographs, books, documents, and cartography of the Counties Tipperary and Cork, Ireland. Among the

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1 Local historian Mr Timothy Looney salvaged the collection from the demolition of Shanbally Castle in March 1960. It remained in his private collection until 2013 when after his death his family donated it to the University of Limerick. More about the history of the collection (Brannigan, N.D.) can be read here: https://specialcollections.ul.ie/shanbally-castle-papers/
archive is an intriguing corpus of nine linen-backed manuscript maps illustrating County Tipperary, and collectively named, ‘The Looney Map’ (P43_525) after the original owner of the archive. Whilst the provenance of the map is uncertain, it is dated c.1800-1815 by Glucksman Library, and is of paramount significance to Irish cultural and social history; as Arnold Horner (2008) reminds us, County Tipperary never had a printed Grand Jury map.²

Through this discretely coloured cartography, we are witness to a delicately constructed picture of the late eighteenth century Tipperary landscape. This unique tangible evidence illustrates local cultural heritage through the human and natural boundaries and features and is all the more significant because it depicts the county prior to the first Ordnance Survey when a detailed triangulation was completed for the whole island.³ The map depicts the key administrative boundaries of the county (baronies, parishes and townlands), road networks from the time, marks notable castles, ecclesiastical sites, ‘big houses’ and settlements with miniature drawings, and includes information on the natural environment such as the fluvial network, the location of bogs and woodlands, and other meaningful indicators of landscape change over time. Further to this, the wider Timothy Looney Papers connect this cartographic representation of the county with rentals (including tenancy detail), account books, correspondence, and largescale maps at townland level.⁴

The Looney Map therefore encompasses many facets of the histories of the county, which is geographically adjacent to County Limerick where the Glucksman Library is located. The map is a valuable resource for researchers and the public interested in history, cartography, archaeology, environment and genealogy as well as students of the University many of whom are familiar with the local geographies. It is also a vital pictorial record of landscape change and alteration to the built heritage in the county during this period, but given the cartography was in a private collection until 2013, the map is yet unstudied. What confidences the map might reveal remains to be ascertained but it points to the need for further research and the necessity to share the map more widely hence its inclusion in this proof-of-concept project.

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² Grand Juries were local authorities who managed taxation and other aspects of life in counties across Ireland. It was therefore essential for planning to have in their possession accurate cartographic depictions of the landscape, several of which were commissioned during the eighteenth and nineteenth centuries. Research by Horner (2009) suggests The Looney Map to be slightly earlier than dated by Glucksman Library and the work of one Neville Bath who, in the hope of attracting funding from the Grand Juries, surveyed great tracts of the southern counties of Ireland in the closing decade of the eighteenth century.

³ The first Ordnance Survey (OS) of Ireland was the first of its kind globally to map a whole country to the scale of 6 inches to the mile. County Tipperary was surveyed by the OS between 1839 and 1841, an estimated 25-40 years after The Looney Map was created.

⁴ In the future the project team aim to extend this pilot to include other objects in The Timothy Looney Papers archive.
Figure 1: The Looney Map of Tipperary (P43_525_FullMap, Glucksman Library)
Methodology

The project employed a mixed-method approach combining traditional archival methods with digital technologies to digitise and serve The Looney Map online. ESRI ArcGIS (ESRI 2022) acted as the core digital architecture for the project enabling georeferencing and georectification, digitisation, and the online sharing of the map and associated spatial data. Library staff scanned the map sheets as high resolution images, and, following this, Geography staff georeferenced and georectified the nine map sheets within a GIS to reconstruct, for the first time, one semi-seamless map of County Tipperary as originally intended by its author. Once referenced and rectified, the feature content of the map was digitised as vector data within the GIS and a searchable online resource was created to share the map and digitised content.

Scanning, georeferencing and georectifying the map(s)

Using a PhaseOne camera library staff imaged (digitised) for research and preservation purposes the nine individual map sheets of The Looney Map. The resolution of the images is important for research and preservation but also key if imagery is to be used within a GIS – when zooming into a map to read detail, low resolution images are subject to pixilation that can cause files to be unreadable. The high resolution images were therefore scanned at 551 dpi at 24-bit depth to produce images of the highest clarity.

The nine high resolution map images were imported into ArcGIS Pro (ESRI 2022) as map tiles and layered on top of the 1st Edition 6-inch Ordnance Survey map tiles that acted as a basemap and to facilitate the georeferencing and georectification processes. The historic OS maps were chosen for this purpose rather than a ‘modern’ map (Google Maps, Open Street Map, etc.) based on their detail and known accuracy. Information from the first Ordnance Survey of the island is still in use today to situate and inform ‘place’ in Ireland such as through toponyms and administrative boundaries. The OS maps therefore provide an essential connection between the historic and modern acting as a near temporal reference to relate The Looney Map with the past and present.

The georeferencing involved rescaling and reorientating the nine Looney map sheets into a position to match the OS base maps. Further to this, a small amount of georectification was required to improve the ‘fit’ of The Looney Map sheets to the OS base layer. This involved locating a known place of origin on The Looney Map, for example, a ‘big house’ or a road junction which is also clearly marked on the OS maps and matching the geographies of the two cartographies using control points (CPs). This process understandably introduced some warping to the original historic maps, but this was kept to a minimum by monitoring the RMS error as each CP was added. Primarily the goal was to have within the GIS a digital copy of the historic map with the correct spatial attribution and the least amount of warping. The final constructed Looney Map can be viewed in Figure 2.

A common concern when working with early cartography is dealing with the unknown effect of time on an often fragile object. In this case, the linen backed maps had historically been folded; these folds were clearly visible in the digital images. Other factors that typically lead to changes in the original map include the application of the linen backing, its use over time, and environmental

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5 Georeferencing applies a spatial coordinate system to an image; georectifying involves some form of spatial adjustment that might warp an image to ‘fit’ with existing spatially referenced data based on common points of reference.

6 The georectified 1st edition OS maps were made available to the project team via the Ordnance Survey Ireland National Mapping Agreement (NMA), Agreement reference number: 2019/OSi_NMA_280.
degradation, all of which in this case are vague given the unknown provenance of the map. The map folds, replicated in the digital imagery, made it especially challenging to form neat seam lines between the nine map sheets during the georectification process. As the project team were keen to preserve the shape and size of the map images and not to introduce further warping or error, it necessitated the remainder of some small gaps between the map sheet images in the final ‘full’ map (Figure 3). Some of the uneven seams are also the result of the georectifying process as detailed above. This part of the processing also results in an uneven seam to the exterior of the map with some overhangs where map sheet edges do not completely agree. Each of these choices is justified in providing a true digital depiction of the full historic map whilst matching the geographies with the underlying OS base map.

Figure 2: The georectified map sheets showing the full extent of The Looney Map

\[\text{In real terms these gaps can be quantified as between 17 metres and 0.65 kilometres in distance.}\]
Important to this proof-of-concept research is to expose, highlight and share the wealth of information recorded on The Looney Map. This includes key features from the built and natural environment and helps to situate the map in terms of its historic and cultural heritage. Having the information on the map digitised is also crucial to the interactive functionality of the online application enabling users to explore the map and search its contents based on modern geography and to retrieve related historical information from the source map.

ArcGIS Pro was used to digitise all features and toponyms on the historic map as a vector point layer. Once fully digitised, just less than 3,800 unique place points were recorded from the map (Figure 4). In the cases where toponyms were not defined with clear boundaries, a point was added to the middle of the corresponding text of each place name. Each feature was categorised using the typology established by the historic map. These include ‘Administrative Area’ units (1,908 instances), ‘Geography’ (57 instances), ‘Structure’ (1,499 instances), ‘Settlement’ (36 instances) and ‘Topography’ (266 instances). Several (19) were also marked as ‘Unclassified’ largely because they were unidentifiable with a modern equivalent or it was unclear what form of feature the text or icon represented.

The categories recorded for each point provide some means of sorting and understanding the map content, and this was further refined through the grouping of the above toponym types into a finer categorisation. For instance, ‘Administrative Area’ was divided into subtypes such as ‘Townland’, ‘Parish’ and ‘Barony’. For type ‘Structure’, subtypes included features from the built environment.
such as ‘House’, ‘Castle’, ‘Mill’, ‘Chapel’, ‘Abbey’ and ‘Church’. Many built environment features are marked by an icon or image on the map. This includes substantial private dwellings, which, while mostly unnamed on the historic map, tend to correspond with large houses marked on the 1st Edition OS map. Further to this, ‘Topography’ was broken down into subtype features of the natural environment such as ‘River’, ‘Wood’, ‘Mountain / Hill’ and ‘Bog’.

Figure 4: The place feature ‘types’ digitised as points in ArcGISPro. Baronies as shown on the historic map are also digitised and overlaid on a modern basemap.
The name of each feature (e.g. a place name) as it appears on the historic map was added to a corresponding attribute table, further linking the visual depiction of place with the textual information on the map. Where possible, features were also identified on the 1st Edition OS map and the name as it appears on the OS map was recorded with the feature as a separate attribute (Figure 5). Most toponyms are recorded once on The Looney Map, but some are repeated two or three times and several of the duplicated toponyms include alternative spellings of the same place. In all cases of duplication each was recorded using a separate place point. Damage to the historic map has destroyed in places some of the cartographer’s hand. In these cases, the information was recorded as accurately as possible along with a notation to show the portion of the name that could not be read. For most features recorded on the map the mapmaker gives a descriptive label such as ‘ch’ to show the icon represented a church, or ‘cas’ for castles. Some were given unique names whilst others, most notably houses, show a mix between those which are named alongside an icon and those which are unnamed and represented only by an icon. In the case of the latter, in some cases it was possible to identify the name of the place from the 1st Edition OS map. Further to this, the outline of the administrative baronies on The Looney Map were digitised as vector polygons and roads and tracks as vector polylines. Boundaries for parishes and townlands are not marked on the map and therefore were not digitised as vectors, rather they can be located via toponyms on the map.
Figure 5: One example of the place connections between The Looney Map (top) and the Ordnance Survey 1st edition 6" map of Ireland (bottom). This also highlights the slight dislocation between the size, shape, scale and orientation of the historic map that has not been fully rectified in the assembling of The Looney Map sheets.

**Design of the interface and serving the map online**

Fundamental to the project objectives is interactivity; the historic map and feature content should be explorable and searchable through an open source online interface. The team assessed several successful existing designs and concluded to base the interface on the structure employed by NLS where users can explore a historic map alongside another [modern] map for spatial reference. ESRI
ArcGIS (ESRI 2022) software package was again selected due to its myriad of options for sharing spatial data online and more specifically ArcGIS Experience Builder was chosen as the front-end architecture because of the strengths and simplicity it offers in building and deploying web applications online.

Step 1 of the build was to design the basic infrastructure of the web resource. This is composed of a home page including an introduction to the project, and two buttons, one linking to the interactive map resource, and another to details of the project team members. As is best practice, the user is offered clear navigation options between the pages via a Home button to the top left of all screens within the resource.

The second step was to create the interactive Web Application (the explorable map viewer). Two Web Maps were constructed. The first includes the georeferenced and georectified Looney Map and the digitised vector layers (the place point layer, the barony outlines and road data). A second Web Map displaying the 1st Edition OS map tiles was also constructed as the reference layer. These Web Maps were then linked using a Web Application based on the ‘Compare’ or ‘Side by side’ option that supports two linked maps or ‘scenes’ to be viewed in one application (browser) window. The left hand side of the Web Application displays The Looney Map Web Map and the right hand side of the screen the 1st Edition Ordnance Survey Web Map. The Web Application design choice enables the navigation of the two maps in a connected fashion - as the user navigates The Looney Map via standard pan, zoom or search functions, the complementary geography is panned in the second map window containing the 1st Edition OS maps.

Further functionality is included on the map viewer interface to aid user interaction and provide choice. The user can choose to open an Information panel located on the interface that reveals text on how to use the resource. This can be minimised or maximised according to user preference. An Expand button allows users to view either The Looney Map or the OS maps in full screen mode and a Home button returns the user to the full extent of The Looney Map. A search function permits users to manually search a modern gazetteer using the ArcGIS World Geocoding Service and zoom to a place of interest. There is also an expandable legend from which users can view point colour references for each place type.

The final step was to combine the Web Application within ArcGIS Experience Builder (Step 1) by embedding it into the second page of the online resource (Figure 6 and Figure 7). The interactivity of this resource is key and so each of the vector (digital) layers contained on the historic map can be clicked by the user to reveal information on that point (Figure 7), as detailed earlier in the discussion of attribute data. The final application has been released through the Glucksman Library website as part of the new UL Digital Library initiative and has also receive a Digital Object Identifier (DOI).
Figure 6: The Looney Map online resource home page. Users can learn more about the related archive by following the embedded link within the text and choose to ‘Explore The Looney Map’ and ‘Meet the Team’ through the buttons at the base of the interface.

Figure 7: The Looney Map explorer at full scale (top); the Looney Map explorer zoomed to settlement scale (bottom) with one place point selected to reveal the underlying data in a pop up box.
Discussion

This proof-of-concept project is the first at the institution to provide an interactive, open access spatial resource for an object from a key cultural heritage collection. This form of resource plugs an existing gap in the offerings of the Library and acts as an exemplar of what is possible for libraries and archives within a limited timeframe and budget. Often archival material is inaccessible due to geographical and financial limitations, so by serving The Looney Map online it facilitates new connections with a hitherto ‘hidden’ visualisation of the Tipperary landscape from the late eighteenth and early nineteenth centuries.

The purpose of the project was to share a valuable piece of cultural heritage more widely using a bespoke and easily accessible resource. But more than this, it was to create a user experience removed from the more traditional static web pages typical of online archives and to produce a more interactive and fulfilling user experience; through interactivity the user can become more immersed in their object of interest.

Practical concerns for teams wishing to replicate this method

There are, however, several considerations for any team wishing to create a similar resource. This methodology used a paid annual subscription to the ESRI ArcGIS product suite and this cost will no doubt deter some parties from following this specific path. Notably, whilst many universities already subscribe to the ESRI product suite many understandably prefer open source options such as QGIS and Leaflet, the latter requiring knowledge of programming languages. ArcGIS does have a learning curve but is relatively user friendly and depending on the desired output does not require high level programming experience (unless major customisation is required). The team, or an individual within the team, does however require the necessary skills to understand the possibilities and how to enact this within a GIS and associated interface. The skillset of the team is therefore an immediate obstacle in creating these types of spatial online resources. The cost to staff time and of appropriate training is in addition to that of obtaining the software license and each require careful budget considerations before such a project can proceed. Funding is certainly required to ensure the continuation of the required software and for training and retention of relevant staff. In this case study it was possible only because of an existing crossdisciplinary team drawing the multitude of required skills together as part of the new Digital Library. ArcGIS is therefore a strong option for many projects if the software is preexisting within the institution and there is spatial skillset in the wider collaborative team.

As with all online projects and resources, there are also very real preservation and sustainability concerns regarding ongoing maintenance and curation. Where repositories such as Digital Repository Ireland (DRI) offer longevity in housing, maintaining and serving collections, the form of inhouse digital output described in this paper will remain only for the lifetime of the software license and will rely on trained staff to maintain the resource. For the foreseeable, future sustainability of this resource is reliant on the staff within the Geography Department. As part of a broader collaboration between the library and academics, plans are also afoot to provide ArcGIS training to relevant library staff.
The benefits to collaboration

What is clear from this project is that the people involved in designing and creating online spatial infrastructure for collections are core to a successful outcome. In this case, researchers from Geography and their associated spatial methodologies bring increased interest to the library collections and provide an engaging narrative to attract and guide users; the narrative gives direction to the user’s interaction with the collections and demonstrates the value of the collection while encouraging them to consider what other questions the collection might answer. At the same time, librarians bring unique skills, understanding and training to the dissemination of collections. As Vandergrift and Varner (2013) note, librarian training in copyright, fair use, information literacy, archival issues and emerging technologies go beyond the typical skillset of researchers and are an extremely valuable component to digital products and projects. Librarians and archivists also bring valuable metadata support, something that although is best practice in GIS is often lacking (Fortin and Mueller 2013).

Other benefits for the researcher include increased accessibility to the research prior to any related publication, speeding up the dissemination of the funded research (Hughes 2011). In addition, historically researchers who create online resources would receive little credit – resources such as this are typically unmeasurable for citation matrices. However, through the library it is now possible to include a DOI for the resource making it citable and therefore quantifiable in terms of an individual’s h-index that can also be versioned if future edits are applied.8 Building on the 2015 ARL survey on libraries as GIS centres, for the library, projects such as that described here provide feedback in several forms. Firstly, by conversing with geographers, libraries can learn more about the tools required to facilitate spatial research, particularly where it involves a library’s special collections. Secondly, they can gather information on how the ESRI software suite can facilitate engagement with special collections, essential if a library is to expand on the usage of GIS using this product. And lastly, it can assist libraries in determining which other collections and objects might be suitable for sharing spatially (Harris and Weller 2012).

Future research

The functionality of ArcGIS also creates an open ended product that can be expanded as a project develops. Specifically, The Timothy Looney Papers (Glucksman Library IS 2135 P43) contain a wealth of associated maps and documents that the team plan to make available as an extension of this case study resource. Future work will look to create a Historical Geographic Information System (HGIS) from the related archival material that includes correspondence, account books and smaller scale administrative maps of the county. Further to this, the authors plan to use the data collected and collated as part of this project to further investigate the provenance of The Looney Map. Primarily this will help to pinpoint the dating of the cartography and draw out detail on landscape change and survey practice in line with the teams’ existing research interests and strengths (Lilley and Porter 2013; Porter et al. 2019; Porter et al. 2020; Porter 2021).

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8 Glucksman Library is a Datacite member. The DOI for The Looney Map and associated resource is: https://doi.org/10.34966/yv46-a986
Conclusion

Through this project, The Looney Map, so essential to further understanding our local and national heritage will for the first time since its creation be made available to the public and researchers alike. Overall, the project illustrates the importance of combining the varied skillsets of faculty, library studies and archival expertise. It is only in this combination of cross and inter-disciplinary staff that such a project is possible. In addition it meets an objective core to the ethos of the project team in the interactive sharing of archives (open access and online) so researchers and public across the world can access and explore the information contained in them.

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