



TOWARDS
A NATIONAL
COLLECTION



Arts and
Humanities
Research Council

FINAL REPORT

FOUNDATION PROJECTS

**Practical applications
of IIF as a building
block towards a digital
National Collection**

PI: Joseph Padfield, The National Gallery

The National Gallery | University of Edinburgh

The British Library | The National Portrait Gallery

Royal Botanic Garden Edinburgh | Stanford University Libraries

Science Museum Group | Digirati

Victoria and Albert Museum | IIF Consortium

July 2022

Table of Contents

Abstract	1
Executive Summary	2
Aims and Objectives	5
Partnership Structure	7
Co-Investigators (Co-Is)	7
Project Partners	8
Staffing Structure	10
Covid-19 Impacts.....	11
Revised overall programme.....	12
Events and Consultations	14
Events	14
Surveys	17
Events and Consultation Impact Summary.....	17
Research Approach	18
Research Outputs and Results	20
Surveys	20
Seminars and Webinars.....	21
Demonstrators	23
Recommendations for the Programme and Discussion.....	30
Contacts	36
Appendices	37
Appendix A: Demonstrator Screenshots & Discussions	37
Appendix B – Understanding User Needs and IIIF Adoption (S2)	58
Appendix C - IIIF implementation (S3).....	75
Appendix D - Rights and Licencing (S3)	93

Appendix E – Preliminary analysis of the results of the manifest editor survey (S4)	117
Appendix F - IIF Manifest Editor - Usability test and recommendations..	126
Appendix G – How IIF can support a National Collection	135
Appendix H – Additional links and related documents	139
Appendix I – Summary of accessibility of resources	140

Authors

Joseph Padfield (PI) (The National Gallery)

<https://orcid.org/0000-0002-2572-6428>

Dr Charlotte Bolland (Co-I) (The National Portrait Gallery)

<https://orcid.org/0000-0002-2698-0401>

Neil Fitzgerald (Co-I) (British Library)

<https://orcid.org/0000-0002-0602-9993>

Dr Anne McLaughlin (Senior Project Researcher) (The National Gallery)

<https://orcid.org/0000-0002-3770-7478>

Glen Robson (Project Partner) (IIF Consortium)

<https://orcid.org/0000-0003-2008-5243>

Professor Melissa Terras (Co-I) (Edinburgh University)

<https://orcid.org/0000-0001-6496-3197>

Abstract

Although a vast amount of digitised content has been created relating to our world-leading cultural heritage collections, digital resources often languish in institutional silos without the ability to combine or cross-reference them. The ‘Practical Applications of IIF as a Building Block Towards a National Collection’ project has highlighted and demonstrated the opportunities and benefits the International Image Interoperability Framework (IIIF) open standard can offer to institutions, researchers, scholars, and students to open up these silos and to describe, present and re-use digital resources at scale. The project has explored how IIIF can virtually connect digitised collections from different organisations and how these digital resources can be used as the foundations for further research. It has experimented with presenting IIIF resources for utilisation by diverse audiences and considered ways in which IIIF can be used to lower barriers to uptake as well as create new opportunities for digital re-interpretation and presentation. Efficient methods of using IIIF to build collaborative online resources have also been explored to begin to demonstrate the potential for dynamic, cross collection searching. As the organisation, presentation and re-use of digital resources would be a fundamental element of a digital National Collection, the project sought to highlight how the consistent advocacy for, use and ongoing support of this type of established and mature set of interoperable open standards is the only realistic way of connecting, at a national level, hundreds if not thousands of collections and sources of digital resources together in an economically feasible and sustainable manner.

Executive Summary

The digitisation of cultural heritage has become a standard activity across the Gallery, Library, Archive and Museum sector in the UK since the mid 1990s. Vast repositories of digital content – mostly digital images – exist of our world-leading collections. However, these digitised collections often exist in institutional silos without an interoperable mechanism by which they can be searched, shared, annotated, deployed, and combined, and there are concerns about how best to do so while maintaining control over image quality, ownership, and licensing. The ‘Practical Applications of IIF as a Building Block towards a Digital National Collection’ project sought to examine the way in which an existing technical standard – the International Image Interoperability Framework (IIIF),¹ might be integrated and adapted to work across collections and mediums, showing its benefits as an underpinning standard for the eventual development of a larger National Collection.

Working across ten different institutions and organisations, each with discrete collections, needs and user requirements, The ‘Practical Applications of IIIF as a Building Block towards a Digital National Collection’ project had five aims: demonstrating the benefit of IIIF to institutions, researchers, scholars and students; exploring the possibilities for cross collection discovery; building collaborative online resources designed to facilitate working with large datasets; lowering the barriers for participation, especially for smaller institutions and individuals; and examining the opportunities afforded in collating collections and research resources. These aims can be seen as directly reflective of the potential of a National Collection, the way in which such a collection may be structured, the way in which it may be utilised by its stakeholders, and how adopting a mature and established standard can provide an easy road to interoperability, future-proofing use, and usability.

The project assessed the current use of IIIF systems across the sector and gathered the related requirements and ambitions of the project partners, documenting opportunities for and barriers to uptake, whether perceived or technical. In addition, the project explored what new IIIF tools/services might be needed by the sector and how they might be created, used, and maintained. Finally, user analysis and user studies were carried out to ensure that IIIF adoption meets the needs of different user constituencies, including the research community and the general public, in order to best understand how to implement this technology at a national scale.

In addition to engaging with our core communities via surveys and interviews, a series of seminars and webinars were also hosted, that respectively explored single topics or sought to engage with specific areas of interest to the project. This series of online events was not only to disseminate information regarding current implementations, tools, services, and work with IIIF, but also to foster discussion and create a forum in which the GLAM² sector was able to openly participate in the work of the project. Additionally, responding to identified needs within the sector, along with current developments in IIIF, the project designed and developed five live, working IIIF technology demonstrators in response to specific user and institutional needs.

¹ <https://iiif.io>

² GLAM is an acronym for "galleries, libraries, archives, and museums"
[https://en.wikipedia.org/wiki/GLAM_\(cultural_heritage\)](https://en.wikipedia.org/wiki/GLAM_(cultural_heritage))

The project findings show that IIIF is a mature, established ecosystem, and operates beyond a purely presentational layer. Adoption of this shared standard will ultimately drive down delivery costs while providing a standardised base for a user experience, that has the opportunity and potential to be built upon by various initiatives (as shown with the project demonstrators).

However, uptake of IIIF is currently patchy, with most implementation in large-scale organisations. Across the sector, there is some confusion about what ‘using IIIF’ actually means, or what benefits it would bring. From those in the IIIF community, there is concern that the lack of IIIF implementation in smaller institutions is contributing to a ‘digital divide’ in which their collections are under-represented when looking at the GLAM sector as a whole, or the future potential for involving institutions in a shared National Collection.

To support the further uptake of IIIF, there is a clear role for advocacy of the standard and its affordances, and there would be value in creating step-by-step implementation guidance, as well as initiatives which could support the community, and the onboarding of institutions. The National Collection could play a key role in supporting this shared, interoperable infrastructure.

- [R1] We strongly recommend that the use of IIIF should be formally adopted as part of the future related research projects and activities of the National Collection programme. The exploitation of this single open standard for UK institutions to host, and deliver their high-resolution digital (images, audio, video, maps, 3D) resources would provide efficiency and future-proof a National Collection, which would need to form connections to and between hundreds if not thousands of collections. This consideration could also be extended to other open standards and approaches, related to linking and connecting collection information.
- [R2] We strongly recommend that the National Collection programme and UKRI support the development and use of a UK IIIF infrastructure – including issues of storage, hosting management and sustainability.
- [R3] We recommend that the National Collection programme join the IIIF Consortium to support the development of the open standard – but also to ensure that the needs of the programme can continue to be directly promoted within the IIIF community, to the benefit of the ongoing Discovery Projects.
- [R4] As part of the development and planning work for the National Collection it is recommended that the programme develop a UK index of IIIF use within the GLAM and related communities. This work could also include the promotion of recommended and required usages of IIIF and the development of worked examples of best practice based on clearly defined applications.
- [R5] We urge the National Collection programme to look carefully at the needs for shared infrastructure, for IIIF and beyond, that will underpin our future shared digital cultural heritage environment and do what it can to support equitable access to these standards and their implementation.
- [R6] We strongly recommend the support and development of a “knowledge infrastructure”, connecting and promoting hubs of excellence, and facilitating strong communication and networking opportunities across the UK, in relation to key digital technologies that would support the National Collection, such as IIIF. This will ensure the experience and opportunities developed within research projects continue to be

disseminated and exploited across UK collections, with a particular focus on ensuring that smaller institutions are not being left behind, and avoiding a digital divide between well-funded/nationals and smaller organisations.

- [R7] We strongly recommend that, as the National Collection programme develops, detailed user studies and evaluation work is carried out, in collaboration with the IIF community, to determine what tools and functionality users will need from a digital National Collection and how best to sustainably meet these needs with open standards such as the IIF. This will also allow the impact of IIF implementation to be tracked and reported, demonstrating its usefulness as a backbone for a shared National Collection infrastructure.

Aims and Objectives

Access to high quality, well-documented digital images is key to modern research, the dissemination of cultural knowledge, and engagement with heritage collections and sites. Although digitisation has become standard in GLAM institutions since the mid to late 1990s, with many millions of images created of objects held within our world-class institutions,³ it is not yet easy to search, share, annotate, crosswalk, or even access high quality, quality-controlled, canonical digital images of our institutional treasures. The IIF was developed to facilitate the exchange of metadata and image resources via a shared set of APIs⁴ alongside open-source software and hardware solutions.⁵

The 'Practical Applications of IIF as a Building Block Towards a Digital National Collection' Foundation Project, part of the AHRC⁶ funded 'Towards a National Collection' (TaNC) programme, aimed to:

- Highlight and demonstrate the opportunities and benefits IIF can offer to institutions, researchers, scholars and students.
- Explore the ways in which IIF may virtually connect collections at different organisations, thereby allowing users to interact with images and related resources from different collections simultaneously while exploring the ways in which these resources can be used as foundation for further research, and the manner in which they can be presented to diverse audiences.
- Examined efficient methods of using IIF via the development of collaborative online resources, which involved large, complex image resources, to consider the way in which a digital National Collection may begin to be constructed.
- Examine the way in which IIF may lower the barriers for participation, especially in the case of smaller institutions.
- Provide opportunities for collating collections research, accessing conservation data, managing multi-format collections, and facilitating audience engagement.

The project brought together expertise from Independent Research Organisations (IROs) and Higher Education Institutions (HEIs), as well as commercial technological providers, and independent GLAM institutions, to collaboratively consider the ways and means through which IIF may be deployed to address the objectives above. The 'Practical Applications of IIF' project further aimed to engage with organisations and institutions beyond those represented by the project partners through a series of seminars and webinars to broaden the discussion, present the project's findings, and engage with experts from across the GLAM sector. The series of online events helped to define and describe a robust range of use cases of IIF, bringing together presentations from individual researchers, mid-level collections, and the national institutions to provide an overview of the ways in which IIF is currently being deployed at different institutions, thereby providing concrete roadmaps for escalation and implementation. The project also convened an international panel of experts to discuss services and

³ Terras, M., 2012. Digitization and digital resources in the humanities. *Digital humanities in practice*, pp.47-70.

⁴ Application Programming Interface (<https://en.wikipedia.org/wiki/API>), which facilitate the publication and re-used of organised data.

⁵ A history of the development of IIF is available in Appendix B – Understanding User Needs and IIF Adoption.

⁶ The 'Arts and Humanities Research Council' - <https://www.ukri.org/councils/ahrc/>

tools available to researchers and the wider public who wish to make use of IIF-compliant resources to carry out new research, create new opportunities, and tell alternative stories.⁷ Finally, the project considered which additional tools, services or training opportunities are available and identified areas which need further development to maximise the potential of IIF resources.

In addition to the online seminars, webinars, and discussions, the project aimed to create a set of ‘demonstrators’ which will serve as tangible outputs of the project’s work. Built collaboratively with both technical and non-technical input, this process increased mutual understanding of both possibilities of development and a user’s practical requirements. Furthermore, in the construction of live ‘demonstrators’, introduced in the Research Approach section, the project benefited from directly engaging with what currently can be achieved utilising the existing IIF framework as well as identifying ways in which the existing framework can be adapted to work with additional digital resources.

We evaluated the impact that participating in the ‘Practical Applications of IIF’ project has had on both the nominated project partners as well as their wider institutions, considered the ways in which IIF is currently being deployed amongst a selection of GLAM organisations across the UK, and presented user feedback data gathered from two surveys. Finally, a firm list of recommendations has been provided to the sector that can be taken up by a wider variety of institutions, including elucidating the benefits, opportunities, and barriers to adopting IIF.

Our work aimed to show that given IIF is now an established and mature set of interoperable open standards, sustained by an engaged and active global community, IIF services and resources, if published by or for all institutions,⁸ taking part within future UK National Collection activities, would provide an efficient, operational mechanism for sharing and building upon high quality digitised collections. We also explored what further support, training, and advocacy might be needed to allow IIF to maximise the potential of existing or newly digitised collections, and this is particularly the case for smaller institutions with fewer technical resources.

The National Collection project will have a central role in providing or supporting those resources for both large and small institutions across the UK GLAM sector. Adopting IIF as a standard to underpin the implementation of the National Collection will ensure further opportunities for institutions as well as their users: however, a failure to mandate the use of this established protocol would risk interoperability and sustainability of digitised materials from various institutional providers, and decrease the usability of a collection, wasting the resources already deployed in digitisation across the sector.

⁷ For videos, transcriptions and slide decks for these events, please see: <https://tanc-ahrc.github.io/IIF-TNC/events.html>. All of the content from our webinars and seminars is also available on Zenodo: “Webinar: Showcasing the Practical Applications of IIF”: <https://doi.org/10.5281/zenodo.4633183>; “Webinar: IIF Services and Tools”: <https://doi.org/10.5281/zenodo.5137298>; “Seminar: Image Registration and IIF”: <https://doi.org/10.5281/zenodo.5215677>; “Collaborative Webinar: PIDs and IIF”: <https://doi.org/10.5281/zenodo.5780055>; Webinar: Project Outcomes and Future Directions: <https://doi.org/10.5281/zenodo.6587143>

⁸ It is recognised that for many institutions IIF services may be best provided by external companies or organisations.

Partnership Structure

The project consortium was composed of representatives from ten organisations: six UK heritage organisations, two universities (UK & USA), one commercial company, along with the IIF Consortium.

The Principal Investigator (Joseph Padfield), supported by the Senior Project Research Fellow (Anne McLaughlin), representing the National Gallery,⁹ led the project consortium and was responsible for coordinating the collaboration between the PI, Co-Investigators (Co-Is) and project partners, who were tasked with delivering the project. The work of **the National Gallery** covered all aspects of the project including organising and facilitating webinars and seminars, coordinating, and evaluating survey results, and contributing to the development of the project IIF demonstrators. Project management and finances were managed by the National Gallery which also led, supported by the project Co-Is, the production of this final report describing the use and potential of IIF.

Co-Investigators (Co-Is)

The Co-Is were drawn from the University of Edinburgh (Melissa Terras),¹⁰ the British Library (Neil Fitzgerald & Torsten Reimer),¹¹ and the National Portrait Gallery (Charlotte Bolland).¹² These Co-Is were responsible for directly supporting the efforts of the Principal Investigator (PI) and the project Senior Research Fellow, bringing their personal and institutional expertise to the project, supporting the use and development of IIF within the heritage community, while working to embed practical IIF solutions within their respective organisations. All three Co-Is were also responsible for participating in and supporting the project's programme of webinars and seminars as relevant to their individual use-cases.

The University of Edinburgh engaged with end user and usability aspects of the project, ensuring that ethical and accessible approaches to survey and service design were adopted (and receiving ethical clearance for this research via the university's protocols). This work in collaboration with the Senior Research Fellow, included the composition, dissemination, analysis, and write-up of surveys designed to gauge the engagement of target groups within IIF, understand the use of IIF in the GLAM sector, and determine what users feel is most necessary in increasing their familiarity and comfort deploying the IIF framework within their own research or at their heritage institution. This research was used to contribute to the project road map, ensuring that user needs from a variety of different communities were taken into consideration in the design of the project demonstrators.

⁹ "The National Gallery, London houses one of the greatest collections of paintings in the world. These pictures belong to the public and entrance to see them is free" - <https://www.nationalgallery.org.uk>

¹⁰ The University of Edinburgh website can be found at - <https://www.ed.ac.uk>

¹¹ The British Library is "... the national library of the United Kingdom and give access to the world's most comprehensive research collection ..." - <https://www.bl.uk>

¹² "Founded in 1856, the aim of the National Portrait Gallery, London is to promote through the medium of portraits the appreciation and understanding of the people who have made and are making British history and culture ..." - <https://www.npg.org.uk>

The British Library (BL) were directly involved with the foundation of the IIF and brought experience in developing infrastructure, services, and repositories as well as collaborations with DataCite¹³ and the Turing Institute.¹⁴ The BL contributed by considering ways to increase access to their own digital collections, especially those in non-traditional formats, such as the audio files of the ‘Save our Sounds’ project. They further contributed their expertise in developing strategies for widening participation, advising in ways in which non-technical users may adopt IIF to tell their own stories. In parallel to their work directly for the project, the BL continued their adaptation of the IIF-compliant Universal Viewer, positioning it, along with IIF, as the standard of delivery for the digital content of largest of the nation’s copyright libraries.

The National Portrait Gallery (NPG) coordinated the design of a IIF Tudor portrait demonstrator in response to issues concerning the adaptation of IIF – namely examining alternative image hosting, tackling inconsistency of metadata, concerns about image licencing, and the desire for tools which facilitated image-led research and long-term preservation of research investment - that were identified by curators, conservators, and collectors in a 2018 workshop. This case study also presented the opportunity for an additional collaboration with Data Futures GmbH,¹⁵ exploring the ways that digital data repositories may function in relation to the IIF framework by providing version-controlled, flexible, and responsive metadata and image storage. Furthermore, the NPG explored the ways in which IIF compatibility was able to benefit their digital and educational presentations, and enhance access to conservation images.

Project Partners

All the collaborating partners worked directly with the project researchers, participated in and where appropriate, directly supported the planned project webinars/seminars and assisted with writing and reviewing, where appropriate, the project recommendations, guidelines, and final report.

- The **Royal Botanic Garden Edinburgh¹⁶ (RBGE)** holds a collection of more than 675,000 digital images and is currently actively exploring options to make these available to the wider research community. Their local IIF end point (<https://iif.rbge.org.uk/>) is already live and they worked directly with the project Researcher to exploit this resource as a test case for work during the project.
- **Digirati¹⁷** staff have been involved in IIF for many years and have developed a range of IIF tools and services. They continue to be involved in the further development of the IIF specifications, especially in the areas of Discovery and the sharing of references to IIF

¹³ “DataCite is a leading global non-profit organisation that provides persistent identifiers (DOIs) for research data and other research outputs.” - <https://datacite.org>

¹⁴ “The Alan Turing Institute is the national institute for data science and artificial intelligence” - <https://www.turing.ac.uk>

¹⁵ “Data Futures GmbH is a not-for-profit company based in Leipzig which works on redelivery and preservation technologies and infrastructure for research data” - <https://www.data-futures.org>

¹⁶ For more details see - <https://www.rbge.org.uk>

¹⁷ Digirati “... integrate strategy, design and software engineering for research, publishing and memory organisations ...” - <https://digirati.com>

resources (e.g., in the context of citation). Their work included creating a graphic user interface for editing and generating groups of IIF resources which was a specific focus of the final development work in the project.

- **Stanford University Libraries**¹⁸ were directly involved with the foundation of the IIF and they are currently active on multiple, related fronts, particularly in relation to the further development and improvement of the IIF image viewer, Mirador V3. They supported the project's work to increase awareness and implementation of IIF tools, such as Mirador V3, among galleries, libraries, archives, and museums. Stanford is also driving a IIF community effort, "IIF Discovery for Humans", which reinforced and complemented the project's activities. Finally, they are also involved in multiple, analogous conversations within the US on some of the same issues—how best to link and leverage the IIF-tooling and resourcing available nationally - and acted as a bridge between these conversations and the project.
- The **Science Museum Group**¹⁹ (SMG) has been following the development of IIF with interest and are already exploring the potential of IIF within their group's collection website. They provided access to their IIF resources and shared their knowledge and experience. The SMG are also extremely interested in the way in which shared vocabularies and keywords, across multiple collections, may greatly enhance interoperability and the potential of cross-collection search of IIF resources and worked to provide support for project activities in these areas.
- The **Victoria and Albert Museum**²⁰ (V&A) is actively involved in IIF and has developed a variety of IIF-driven website features deployed both internally and externally. They also regularly contribute talks to IIF events and have hosted events at the V&A to support the IIF community and plan for future developments. They have collaborated on the development of tools to facilitate the use of IIF as part of the day-to-day work of the museum's curatorial, conservation and research staff while helping to expand awareness and usability of IIF among the larger cultural community.
- The **International Image Interoperability Framework (IIF) Consortium**²¹ provided a direct connection to the international IIF community thereby linking the project to all current IIF-related research and development. They enhanced the dissemination of the project's outputs and helped ensure that project's research activity directly contributed to the wider development of IIF. Furthermore, by maintaining strong links to the IIF community, the project benefited from the ongoing activity undertaken by external institutions and independent developers. Ongoing work and research activities within the IIF community also directly supported several areas of work within the project, such as providing improved documentation, opportunities for training, lists of resources and expertise that directly assisted the project researchers.

¹⁸ For more details see - <https://library.stanford.edu>

¹⁹ For more details see - <https://www.sciencemuseumgroup.org.uk>

²⁰ For more details see - <https://www.vam.ac.uk>

²¹ "IIF is funded by a 60-member global consortium, and leveraged by aggregators, research institutions, national libraries, archives, museums, software companies, and digital agencies around the world." – <https://iif.io>

Staffing Structure

The project Principal Investigator was Joseph Padfield (Principal Scientist at the National Gallery). The Senior Research Fellow, based at the National Gallery, was Anne McLaughlin. The final project Co-investigators were Neil Fitzgerald (Head of Digital Research, British Library),²² Charlotte Bolland (Senior Curator, Research and Sixteenth-Century Collections, National Portrait Gallery) and Melissa Terras (Professor of Digital Cultural Heritage, University of Edinburgh). The project partner organisations were represented by Roger Hyam (Biodiversity Data Systems Developer, Royal Botanic Garden Edinburgh),²³ Tom Crane (Technical Director, Digirati Ltd) and John Baker (Managing Director, Digirati Ltd.), Tom Cramer (Chief Technology Strategist, Assistant University Librarian & Director, Digital Library Systems and Services, Stanford University Libraries), Jamie Unwin (Technical Architect, Collections Online, Science Museum Group), Richard Palmer (Technical Lead, V&A, Luca Carini (Lead Front-end Web Developer, V&A), Glen Robson (IIIF Technical Coordinator), and Josh Hadro (Managing Director, IIIF Consortium). Additional staff from many of the project partners, as well as staff from external organisations, institutions, and the research sector have served the project in an advisory capacity and have been involved in the alpha testing of the key demonstrators of the project; though there are too many to name, their contribution to the project also needs to be acknowledged. We also thank the many voluntary contributions from the community members attending and contributing to seminars and workshops and responding to requests for survey and interview input.

²² Neil Fitzgerald joined the project in addition to Torsten Reimer (Head of Research Services, British Library) in April. Torsten left the project team when he moved from the British Library to the University of Chicago.

²³ Roger Hyam joined the project in May, replacing Lorna Mitchell, (Head of Library, Archives & Publications, Royal Botanic Garden Edinburgh)

Covid-19 Impacts

Even though the project was predominantly based on digital activities, the Covid-19 pandemic had a significant effect on the initial plans for this project. Initially, one of the Co-Is was placed on furlough and there was severe disruption in the process of hiring the project Senior Research Fellow.

The Senior Research Fellow position, based at The National Gallery, was advertised twice. The first attempt, in May 2020 did not attract any suitable candidates; the job description and advert were then revised, and adjustments were made to allow the post to be advertised at a higher grade. At this point all options for recruitment were placed on hold due to Covid-19 restrictions and it was not possible to re-advertise the post until August 2020. This recruitment campaign was more successful with a candidate being selected, with an initially planned start for late November 2020; however, complications in the recruitment process, specifically related to Covid-19, meant the process was further disrupted, with the Senior Research Fellow finally joining the project in early April 2021. As the project work was centred around the planned activities of the Senior Research Fellow collaborating with the project investigators and project partners, most of the project's activities were delayed or put on hold until April; however, the delay in the appointment of the Senior Research Fellow did mean that the furloughing of one of the project Co-Is did not result in any additional delays. Covid-19 also meant the conferences and workshop which were initially planned as in-person events were replaced with online webinars and seminars. Though this format was untenable for one of our originally planned hackathons, the transition to online presentations did allow our project to reach a larger and more global audience, as well as facilitate asynchronous access to the webinar content via recordings, transcripts and the archiving of the slide-decks and other materials presented in the series in Zenodo.^{24,25}

²⁴ Zenodo is an open, free, catch-all data repository supported by CERN (<https://home.cern>), OpenAire (<https://www.openaire.eu>) and the EU Horizon 2020 Programme (<https://ec.europa.eu/programmes/horizon2020>) – For more details see: <https://zenodo.org>.

²⁵ The project resources uploaded to Zenodo have all been tagged with the keyword “Practical IIIF” so they can all be listed using a simple keyword search:
<https://zenodo.org/search?keywords:%22Practical%20IIIF%22>

Revised overall programme

This revised programme of activities for ‘Practical Applications of IIF’ was adjusted to reflect the effects of COVID-19, with adjusted dates for events and the postponed start date for the Senior Research Fellow. The dates given also include a six-month extension, with the project continuing up until the end of April 2022. Milestones are also included for additional work identified within early results that will benefit the project and programme.

Start Date	End Date	Milestone Type	Detail
Dec 2020	Dec 2020	Deliverable	Interim Report
Jan 2021	Mar 2021	Dissemination	Webinar 1 - Showcase and discuss the current IIF use and best practice - VIRTUAL
Mar 2021	May 2021	Collaboration	In preparation for the UK regional meeting at the summer IIF conference in conjunction with IIF-C and Dr Claire Knowles (University of Leeds), we conducted a survey to examine which topics were of greatest interest to the IIF community in the UK resulting in the agenda and speaker selection for the panel. [S1]
Apr 2021	Jun 2021	Dissemination	Webinar 2 - Discuss the potential of shared IIF services and tools
Apr 2021	Aug 2021	Review	Review the plans for IIF demonstrations and examples
Jun 2021	Jul 2021	Dissemination	Seminar 1 - Facilitating Image Registration with IIF
Jul 2021	Sep 2021	Assessment	Identification of IIF resources on the websites of 46 institutions designated with a Gold or Gold Plus rating on ArtUK ²⁶ [S3]
Aug 2021	Oct 2021	Dissemination	Collaborative Webinar - The ‘Practical Applications of IIF’ and the Persistent Identifiers TaNC projects consider the interplay between PIDs and the IIF framework
Sep 2021	Oct 2021	Collaboration	Conduct survey to examine the level of knowledge of IIF in the GLAM sector. [S2]
Sep 2021	Nov 2021	Assessment	Research on the image licencing and rights statements of the 46 institutions designated with a Gold or Gold Plus rating on ArtUK ²⁷
Sep 2021	Mar 2022	Review	Evaluations of relevant IIF resources and user needs based upon the September survey. A summation of these results is being prepared for publication. ²⁸
Nov 2021	Apr 2022	Dissemination	Webinar 3 – Project outcomes and future directions
Nov 2021	Apr 2022	Review	Review the recommendations for future IIF services and tools, along with areas of future research.

²⁶ See Appendix C - IIF implementation for the collected data.

²⁷ See Appendix D - Rights and Licencing for the collection data.

²⁸ See Appendix B – Understanding User Needs and IIF Adoption for an analysis of these results

Start Date	End Date	Milestone Type	Detail
Dec 2021	Jan 2022	Collaboration	Conduct a survey to explore the needs and priorities for a new manifest editor, the final demonstrator of the project. [S4]
Dec 2021	Jan 2022	Review	Analyse the results of the manifest editor survey and present these results to Digirati. ²⁹
Feb 2022	Apr 2022	Assessment	Evaluations of project IIF Demonstrators and Examples.
Mar 2022	Apr 2022	Deliverable	Presentation/Release of project IIF Demonstrators and Examples - Digital dissemination plus targeted virtual presentations.
Apr 2022	Jun 2022	Deliverable	Final Report

²⁹ See Appendix E – Preliminary analysis of the results of the manifest editor survey.

Events and Consultations

Events

Event	Event date	Links	Attendees/ Responses	Note
TaNC: Opening UK Heritage to the world, Programme - Open Meeting London	2020-03-04	-	50+	Presented the IIF project as an example TaNC Foundation Project - and participated in general discussions related to the next steps for TaNC.
TaNC: Opening UK Heritage to the world, Programme - Open Meeting Edinburgh	2020-03-11	-	50+	Presented the IIF project as an example TaNC Foundation Project - and participated in general discussions related to the next steps for TaNC.
IIF Community Call (Technical): Simple-Site – ‘Practical applications of IIF as a building block towards a digital National Collection’	2020-06-17	-	10+	Presented the project to the IIF community, along with the Simple-Site system as the basis of a simple platform to arrange and work with IIF resources.
UWE CFPR Seminar: Simple-Site – ‘Practical applications of IIF as a building block towards a digital National Collection’	2020-07-22	Link	~15	Introducing IIF and the project to the Centre for Fine Print research group at the University of the West of England.
IIF Community Call: ‘Practical applications of IIF as a building block towards a digital National Collection’	2020-06-11	-	~20	Part of a joint presentation with the Programme Director, TaNC.
National Gallery Scientific Consultative Group	2020-11-23	-	21	Senior internal and External review board, includes HEI and IRO representatives.
Museum Computer Group Conference: Objects, institutions, nations and tales: Towards shared stories (image sharing with IIF)	2020-12-10	-	15 ³⁰	Brief presentation followed by a longer discussion about the project and IIF.

³⁰ Followed by 50+ downloads of the Simple Site GitHub repository in the following week: <https://github.com/jpadfield/simple-site> - downloads of this repository have continued.

Event	Event date	Links	Attendees/ Responses	Note
Demonstration of IIF solutions for presentation of complex image sets to members of the EPSRC funded ARTICT project.	2020-12-18	-	5	The ARTICT Project, in which NG researchers are Co-Is, is exploring how to process, present and compare sets of analytical and processed conservation/technical images.
Webinar 1: Practical Applications of IIF	2021-03-19	Link	358 ³¹	Showcase and discuss current best practice
Webinar 2: Services and Tools	2021-06-11	Link	219	Discuss the potential of shared IIF services
IIF for Research (IIF4R) Network Workshop - The 'Practical Applications of IIF'	2021-06-23		50	A presentation of the work of the 'Practical Applications of IIF' Project to date
IIF Annual Conference: Image Registration	2021-06-23	Link	100	A lightning talk discussing the role of IIF in Image Registration
IIF Annual Conference: UK Regional Panel	2021-06-24		50	Co-chairing a panel for the UK Region to discuss needs and developments in IIF
London Rare Book School: IIF in the Book Historian's Digital Toolkit	2021-06-30	Link	15	A day of instruction regarding IIF and its uses in Book History
Seminar 1: Image Registration and IIF	2021-07-26	Link	295	A continuation of discussion arising out of the first webinar looking at current best practice and the role IIF may play in improving Image Registration
Developing a Digital Framework for the Medieval Gaelic World - An Introduction to IIF: Frameworks and Practicalities - Part of Digital Resources, Manuscripts and Texts: An Online Training Event	2021-09-08		70	An Introduction to IIF and its use in manuscript studies
National Gallery Research Centre Staff Forum (Sept	2021-09-15		50	A presentation to inform the staff and students at the

³¹ This figure solely represents the number of registered attendees via Eventbrite for this and the subsequent Webinars and Seminars organised by the project. It does not consider downloads or views of the content on Zenodo or YouTube.

Event	Event date	Links	Attendees/ Responses	Note
2021) - The Practical Applications of IIF at the National Gallery: Towards a National Collection and beyond				National Gallery regarding the ongoing research project
Seminar 2: PIDs and IIF	2021-10-26	Link	150	Collaborative event with the Persistent Identifiers TaNC project, examining the intersection of PIDs and IIF
National Gallery Scientific Consultative Group	2021-11-15	-	21	Senior internal and External review board, includes HEI and IRO representatives.
Connected Collections Series	2021-11-10	Link	1,000	A series of twitter and blog posts highlighting items from each of our project partners' collections
IIF Fall Working Meeting: Simple IIF Discovery	2021-11-17	Link	50	The Simple IIF Discovery System (https://research.ng-london.org.uk/ss-iif/) was presented as a lightning talk.
Digital Methods for Manuscript Studies, Department of Anglo-Saxon, Norse & Celtic, University of Cambridge	2022-03-07		10	A one-day workshop focusing on presenting research via IIF
Webinar 3: Project Outcomes and Future Directions	2022-04-29	Link	135	Present the demonstrators created as part of the project and discuss future directions in which IIF may facilitate the creation of a National Collection
Event Impact Total:			2,759	

Surveys

Survey	Dates	Attendees/ Responses	Purpose and Dissemination
S1 - Issues in IIF in the UK	Apr. 2021	25	Informed the planning and scope of the UK regional meeting which took place at the IIF Annual Conference (June 2021)
S2 - Survey: Engagement, uptake, and perception of IIF in the GLAM sector	Sep. 2021 – Oct. 2021	47	Evaluate the current state of IIF in the GLAM sector. Written up as Appendix B
S3 IIF in Gold and Gold Plus Institutions as defined by ArtUK	2021	43	Research into the public presentation or notification of IIF resources in the major UK collections. The second strand examined the image licencing and permissions conditions at these institutions. The data is available in Appendix C and Appendix D.
S4 - Building a New Manifest Editor: User desires and ranked needs	Dec 2021 – Jan2022	150	Designed to focus development and respond to community needs in preparation of building the new manifest editor
Survey Response Total:		265	

Events and Consultation Impact Summary

We therefore conducted **seven** events and engagements, contributed to **16** others, hosted **four** surveys and reviews, and engaged with over **3,000** people during these activities as part of this research project. To further extend the impact of our project activities, outputs from all our webinars and seminars have been hosted on Zenodo,³² and these have been visited more than **1,200** times. Videos of our webinars and seminar presentations have also been added to the TaNC YouTube Channel where our project presentations have been viewed more than **2,000** times.³³ All these interactions have also led to many other discussions within and between the partner institutions, but also with external researchers and institutions.

A summary of all the re-usable outputs created during the project has been included in Appendix I.

³² A list of all of project resources on Zenodo can be found via:

<https://zenodo.org/search?keywords:%22Practical%20IIF%22>.

³³ <https://www.youtube.com/channel/UCv4wzeFj6EWh5EL4a4rgQJg>

Research Approach

The project assessed the current use of IIIF systems across the sector and gathered the related requirements and ambitions of the project partners, documenting opportunities for and barriers to uptake, whether perceived or technical. In addition, the project explored what new IIIF tools/services might be needed by the sector and how they might be created, used, and maintained. Finally, we carried out user analysis and user studies to ensure that IIIF adoption meets the needs of different user constituencies, including the research community and the general public, in order to best understand how to implement this technology at a national scale. The project's user engagement and survey work employed an 'Action Research'³⁴ methodology paired with 'Grounded Theory'³⁵ analytical approach to interpreting the data and accurately representing the GLAM sector as well as the IIIF community. The results of this work are presented in Appendix B of this current report.

In addition to engaging with our core communities via surveys and interviews, we also hosted a series of seminars and webinars that respectively explored single topics or sought to engage with specific areas of interest to the project. The contents and areas of focus of this series are addressed more fully in the following section, however, our intention in hosting this series was not only to disseminate information regarding current implementations, tools, services, and work with IIIF, but also to foster discussion and create a forum in which the GLAM sector was able to openly participate in the work of the project.

Finally, in response to identified needs within the sector, along with current developments in IIIF, the project designed and developed five live, working IIIF related technology demonstrators in response to specific user and institutional needs. They were as follows:

- [D1 - Simple Site] – “Can we lower the barrier for creating new online presentations of existing IIIF resources?” – In collaboration with several other research projects a new tool was developed to allow less technical users to create, format and publish their own set of webpages, exploiting the free services and hosting functions provided on GitHub.³⁶ The system was designed to be flexible enough to directly incorporate more complex data presentation tools, such as IIIF image viewers.
- [D2 - Simple IIIF Discovery] – “Can we simplify the process of directly searching for IIIF content across multiple collections?” – Exploiting existing tools, provided by D1 - Simple Site, a simple keyword-based search solution that can automatically format requests for IIIF content for multiple collections and present the results directly with a choice of IIIF compatible image viewers was created.
- [D3 - IIIF Collections Explorer] – “Can we provide a user-friendly way of exploring complex collections of images, data and pdfs?” – The data stored in an old bespoke image

³⁴ Action research aims to ‘build a body of knowledge that enhances professional and community practice’. E.T. Stringer, *Action Research*, 4th ed., SAGE Publications, London, 2014, p. 1.

³⁵ See D. Ellis, *Modelling the information-seeking patterns of academic researchers: a grounded theory approach*, *Libr. Q. Information, Community, Policy* 63 (4) (1993) 469–486.

³⁶ An open, online software repository and development platform. For more details see: <https://github.com>.

presentation tool was updated and reformatted to provide the basis of a new generic, reusable, tool to explore and present information stored as IIIF Collections and Manifests documents. This demonstrator was based upon the need to provide access to additional supporting material for digital exhibition catalogues and the National Gallery's Technical Bulletin.³⁷

- [D4 - Tudor Portrait Resource] “How can we publish a research dataset of technical images as IIIF resources?” - To facilitate working with potentially large datasets of images that are collected as part of external research activities, the project fostered a collaboration with Data Futures GmbH to exploit new IIIF related developments of an existing data repository system, InvenioRDM,³⁸ to explore the ways in which images and metadata could be stored, managed, and published in a sustainable, citable system. This demonstrator, the development of which was funded by Data Futures GmbH, was created in partnership with the project's Co-I at the National Portrait Gallery, with support from the project PI at the National Gallery, using images and metadata associated with a selection of the Gallery's collection of Tudor portraits.
- [D5 - The New Digirati Manifest Editor] – “How can we make it easier for non-technical users to organise and present IIIF resources?” - As users, institutions, and publications often need to gather images from different IIIF-compatible repositories, this demonstrator sought to create new aggregated IIIF presentations based on existing resources. The new IIIF manifest aggregator, controlled via a drag and drop based graphical user interface, allows non-technical users to gather images from different IIIF resources and create, as well as describe and annotate, new groups of images for their own research.

³⁷ The National Gallery Technical Bulletin, first published in 1977, has achieved a leading position in the study of the materials and techniques of painting, and the scientific examination of paintings. Published annually, it is essential reading for conservators, conservation scientists, art historians, collectors and curators. - <https://www.nationalgallery.org.uk/research/research-resources/technical-bulletin>

³⁸ “Invenio is an open-source project that was initially developed by CERN ... InvenioRDM ... “ is a “ ... a repository/document management platform” - <https://inveniosoftware.org/products/rdm/>

Research Outputs and Results

Surveys

The four surveys that were conducted as part of this project have each resulted in tangible outputs.

S1 – UK Regional Meeting

The first survey was designed to inform the planning and scope of the UK regional meeting which took place at the IIF Annual Conference 2021. While limited in scope, the responses allowed for Claire Knowles (University of Leeds) and the Senior Project Researcher to successfully recruit appropriate candidates for the panel to foster a lively and productive discussion as part of the Digital conference.

S2 - Familiarity with IIF

The second survey was designed to be sent out after our second webinar, both to participants who had registered for either Webinar 1 or Webinar 2, as well as mailing lists across the UK, Europe, and the Americas. Though the response rate was less than expected, the 40+ respondents that we had provided valuable insight and detailed descriptions of their familiarity, previous use, or implementations of IIF in their own research or institutions. The results of this survey have been analysed and are presented in Appendix B. Four central themes emerge: that there is some confusion about what 'using IIF' actually means; concern that the lack of IIF implementation in smaller institutions is contributing to a 'digital divide' in which their collections are under-represented when looking at the GLAM sector as a whole; the value of creating step-by-step implementation guidance; and the need for IIF advocacy information, designed to speak to both technologists as well as senior managers and directors.

S3 – UK institutional use of IIF

The third piece of research was conducted based upon Art UK's categorisation of museums and galleries within the UK. Taking a sample of 44 major institutions and looking only at their publicly available information via the institution's own website, mention or use of IIF was identified, comments were recorded, and information about the way in which they approach image rights was noted. This information is available in Appendix C and Appendix D. We show that 30 (68%) of institutions had no mention of use of IIF on their website. Only three (7%) had a significant and clearly marked IIF install, although not all of their collections were IIF enabled. Three further institutions (7%) had implemented some part of their collections as IIF compliant. A further eight institutions (18%) did have some IIF functionality but had not mentioned it on their website at all. There is much to be done to both promote current use of IIF, and to ensure its adoption, even amongst this set of major institutions. However, many institutions have some variation of open licensing, which would allow the future open implantation of IIF, and reuse of their digitised image collections.

S4 – Manifest Editor User Requirements

Our final survey considered the needs and desires of the GLAM sector as a whole when designing and developing a new manifest editor. The results of this survey have been analysed and are presented in Appendix E. The survey was analysed by the Senior Research Fellow and the results written up and a slide pack prepared for Digirati Ltd., our development partner for the Manifest Editor.

Seminars and Webinars

Webinar 1: The Practical Applications of IIIF

Originally intended as a workshop for approximately 80 people, due to COVID this webinar was redesigned to be delivered virtually, allowing for a larger and broader group of participants and facilitating a full digital record of the event – available on the project website and on Zenodo – which has subsequently increased the number of people that were able to access the presented content.³⁹ This webinar presented several examples of how IIIF resources are being used for research and public engagement and highlighted some of the available resources/tools, and how they may be used in the future. It featured presentations of projects from large institutions, like the V&A, along with presentations about tools which can be used by individual researchers. This webinar, facilitated by the National Gallery, was divided into two sections: the initial set of presentations showcased how IIIF is being used now, followed by a second set of presentations that focused on some of the research that would be explored within the project.

Webinar 2: IIIF Services and Tools

Also designed to be delivered in-person as a workshop for approximately 30-40 people, this event was also moved online.⁴⁰ While the first webinar showcased the ways in which IIIF was used by institutions and members of the community, this webinar focused more on the services, tools and implementations utilised in varying environments, from individual researchers and small projects to national collaborations. Broken into two sections, the webinar began with an initial set of presentations intended to introduce attendees to the ways, manners and difficulties faced in implementing IIIF as experienced by individual researchers, mid-level organisations, and national collections, followed by an interactive panel discussion featuring experts from across the IIIF and digital humanities landscape to consider what services and tools would be most useful for the GLAM sector.

³⁹ The content of Webinar 1 can be accessed at <https://tanc-ahrc.github.io/IIIF-TNC/webinar01.html> or via <https://doi.org/10.5281/zenodo.4633183>.

⁴⁰ The content of Webinar 2 can be accessed at <https://tanc-ahrc.github.io/IIIF-TNC/webinar02.html> or via <https://doi.org/10.5281/zenodo.5137298>.

Webinar 3: Project Outcomes and Future Directions

This final webinar presented the project demonstrators, pairing technical explanations with user-stories and narratives about how the demonstrators are being used by individuals or by institutions. This section of the webinar was then opened up to the audience and to all the project partners present to ask questions, and discuss the challenges and opportunities posed by the ideas and implementation of a National Collection, future directions for IIF, and how the GLAM sector may continue to play an active role in technological innovation.⁴¹

Seminar 1: Image Registration and IIF

Arising out of the first ‘Practical Applications of IIF’ [Webinar](#), and a subsequent call as part of the IIF Museums Community Group in the beginning of May, it was decided that we needed a dedicated time to discuss not only how Image Registration is currently being employed across various sectors, but also to share some recommendations and effective practices, as well as consider the ways in which Image Registration is evolving and how it may be accomplished in the future. As our ability to capture higher resolution images and delve beyond the surface of complex heritage objects has improved – allowing us to examine paint layers, explore under-drawing, and employ X-rays, infrared spectroscopy, and multispectral imaging to understand the methods production and the subsequent histories of these objects – so has our need to contextualise these samples, present them to our audiences, and use them for conservation and research. This seminar sought to address these questions and respond actively to the community’s interest in Image Registration. Panellists included: Ryan Baumann (Duke University), Giles Bergel (University of Oxford), Andrew Bruce (National Gallery, UK), John Cupitt (Imperial College London), Nathan Daly (National Gallery, UK), Joanne Dyer (British Museum), Rob Erdmann (Rijksmuseum), Adam Gibson (University College London), Luca Carini (V&A), Maria Villafane (Imperial College London), Keats Webb (Smithsonian Institution), Charles Willard (UCL).⁴²

Seminar 2: PIDs and IIF (Collaborative)

Designed as a seminar to discuss the opportunities and challenges associated with embedding Persistent Identifiers (PIDs) in IIF resources, this seminar brought together experts in both fields to discuss the potential for wider implementation of PIDs within the IIF Framework. The emergence of the IIF has presented researchers with an opportunity to annotate and cite digitised or digital resources. However, many of the creative and scholarly uses of IIF are stymied by an inability to reliably and persistently link to objects or collections of objects. Persistent identifiers are long lasting, digital references to resources, whether physical or digital, including objects published in IIF. The second webinar hosted by the ‘Practical Applications of IIF’ Project, highlighted the need for the ability to be able to consistently identify objects or collections of objects in IIF. This seminar provided an occasion for a panel of international experts to discuss the opportunities and challenges these use cases present and suggest a way forward for individual implementations and the

⁴¹ The content of Webinar 3 can be accessed at <https://tanc-ahrc.github.io/IIF-TNC/webinar03.html> or via <https://doi.org/10.5281/zenodo.6587143>.

⁴² The content of Seminar 1 can be accessed at <https://tanc-ahrc.github.io/IIF-TNC/seminar01.html> or via <https://doi.org/10.5281/zenodo.5215677>.

framework as a whole. Panellists: Ben and Sara Brumfield (FromThePage), Andy Irving (Bodleian Libraries), Rachael Kotarski (British Library), Joseph Padfield (National Gallery) and Julien Raemy (University of Basel and DaSCH).⁴³

Demonstrators

D1 - Simple Site

Simple Site began as an open system for creating a consistent set of webpages on GitHub. It is based on a simple set of text (JSON)⁴⁴ files allowing users to create and update a set of consistent, static webpages, stored as part of a GitHub project, and hosted and displayed using GitHub pages. It has been extended to allow more complex features such as presenting IIIF-compatible viewers, Timelines, and ordered Lists and Galleries. Various updates have been added throughout the project and in response to desires for extending the functionality, from discussions with our community. Furthermore, Simple Site was further extended to allow it to be deployed with an option to use the whole system to create dynamic as well as static websites (see the description of the D2 - Simple IIIF Discovery system below). This work was directly supported by work within four research projects, two within the TaNC programme and two external projects:

- ‘Practical applications of IIIF as a building block towards a digital National Collection’ - <https://tanc-ahrc.github.io/IIIF-TNC/home.html>
- Persistent Identifiers as IRO Infrastructure (<https://gtr.ukri.org/projects?ref=AH/T011092/1>) - <https://tanc-ahrc.github.io/HeritagePIDs/>.
- ARTICT | Art Through the ICT Lens: Big Data Processing Tools to Support the Technical Study, Preservation and Conservation of Old Master Paintings (EP/R032785/1) - <https://art-ict.github.io/artict/>
- SSHOC - Social Sciences & Humanities Open Cloud (823782) (<https://sshopencloud.eu/>) - <https://jpadfield.github.io/cidoc-crm.examples/>

In addition to this direct support the Simple Site system has also been exploited within several other TaNC Foundation Projects and a growing number of other external projects.⁴⁵ Some example screenshots can be found in D1 - Simple Site – Screenshots and Examples.

Name:	D1 - Simple Site
Code:	https://github.com/jpadfield/simple-site
Example:	https://jpadfield.github.io/simple-site/ (Including Documentation)

⁴³ The content of Seminar 2 can be accessed at <https://tanc-ahrc.github.io/IIIF-TNC/seminar02.html> or via <https://doi.org/10.5281/zenodo.5780055>.

⁴⁴ “JSON ... is an open standard file ... and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and arrays (or other serializable values).” – for more details and examples see: <https://en.wikipedia.org/wiki/JSON>.

⁴⁵ Connected versions of the Simple Site System can be seen at: <https://github.com/jpadfield/simple-site/network/members>.

D2 - Simple IIIF Discovery

This code demonstrates generic public examples of a Simple IIIF Discovery system, based on tools used within the National Gallery to provide access to images from multiple institutions and present them together in IIIF compatible viewers.⁴⁶ The system is based on a website requesting the details of IIIF images via a Simple IIIF Discovery end-point,⁴⁷ connected to an external institutional API, based on a simple keyword search. The website does not need to understand the complexities of the underlying APIs, this is handled by the end-point. The website just needs to understand the simple structure of the results returned by the end-point, reformat the IIIF results and then feed them into a IIIF based viewer of choice. This version includes a number of updates to the original demonstrator related to improving the user interface, including adding a toggle option to jump between IIIF viewers, and updating the administration process of creating new end-points and related web-pages, this is all achieved via a simple JSON config files now.

At the time of writing, discussions are underway to explore how this software might be extended to provide improved access to non-English collections and the code is being used as the basis of new developments in the use of IIIF for digital documentation purposes within the National Gallery and within other external collaborations.⁴⁸ It has been discussed within subsequent IIIF meetings and how it relates to ongoing developments of IIIF. Some example screenshots can be found in Findings and Discussion [D1]

The development of Simple Site proved to be very useful to the project and beyond. In addition to providing a stable platform for this project's website and a growing number of other related websites, the system has also provided an opportunity for individual researchers, who do not have their own web servers, a free solution to organise and present their own curated sets of published IIIF resources. This use case was specifically documented in a dedicated version of the system - <https://jpadfield.github.io/simple-mirador/>. The system was also used as the basis of some IIIF training activities, like the one described in the final project webinar, in the presentation by Anne McLaughlin, "Simple Site in Practice". The Simple Site system continues to be used and supported by the National Gallery.

D2 - Simple IIIF Discovery – Screenshots.

Name:	Simple IIIF Discovery
Code:	https://github.com/jpadfield/iiif-discovery
Example:	https://research.ng-london.org.uk/ss-iiif/ (Including Documentation)

⁴⁶ The code repository is available here: <https://github.com/jpadfield/iiif-discovery>, with a working demonstration of the system, including the collections of the Art Institute of Chicago, The National Gallery (London), the National Gallery of Art (Washington DC), the Victoria and Albert Museum, and Wellcome Collection is accessible here: <https://research.ng-london.org.uk/ss-iiif/search>.

⁴⁷ A customised, simple local API.

⁴⁸ An example of this work can be seen at: <https://research.ng-london.org.uk/ss-smk/> - which has been setup to explore a selection of technical images from The National Gallery of Denmark (SMK) (<https://www.smk.dk/>).

D3 - IIIF Collections Explorer

For over 10 years, in addition to the cropped zooming images on the public website, the National Gallery has publicly presented prepared selections of high-resolution images on the web. These sets of images have been put together to supplement or enhance descriptions of Exhibitions, Publications and Research projects.⁴⁹ These images were presented in an old system, based on a bespoke IIPImage⁵⁰ viewer connected to an internal database, but it has been showing its age for a while.⁵¹ Work has been carried out within the project to update this system, to replace the website with one based on the IIIF viewer Mirador V3 and replace the underlying relational database with a related set of IIIF Collection and Manifest documents. All the required information needed to describe, present and connect prepared groups of images can be captured within IIIF documents complete with titles, descriptions, external links, and references to related PDFs for publications. The system extracts all this information or metadata from a given IIIF document and presents it as a traditional webpage, complete with links to other IIIF resources or images directly displayed within the Mirador V3 viewer. When links to related PDFs are included are described, in the IIIF documents, these are now presented directly in a simple PDF viewer within the web page next to the zooming images, allowing the reader not only to consult the article, but interrogate the source material independently. In addition to presenting the National Gallery content, IIIF documents from other sources can also be presented and explored. The code for this new system has been made available on GitHub, as indicated, and continued exploitation and development is planned. Some example screenshots can be found in Findings and Discussion [D2]

The Simple IIIF Discovery successfully demonstrated cross-collection searching for IIIF resources, but it also highlighted some of the issues with cross collection searching and some areas for future development:

- Simple keyword searches options make it very easy for anyone to start to explore and find IIIF resources, but when results are combined from multiple collections it is very easy to end up with very large numbers of results. More complex search options, ideally a more robust application of basic Boolean logic, using terms like “and”, “or”, “not”, etc. would make it much easier for user find exactly what they are looking for.
- A few of the institutional APIs connected to the system include limits to the number of results that can be returned and the number of IIIF tiles that can be viewed. When these limits are reached results are often simply not returned, but this can also result in a build-up of server errors. These possible inconsistencies in the results returned obviously

⁴⁹ These resources include volumes 31 – 36 of the National Gallery’s Technical Bulletin, The Sixteenth Century Netherlandish Paintings with French Paintings before 1600 catalogue, technical imaging connected to an external project focused on Rembrandt’s The Entombment, as well as four recent exhibitions, Vermeer & Music: The Art of Love & Leisure, Barocci: A Lesson in Drawing, The Sunflowers, and Building the Picture: Architecture in Italian Renaissance Painting

⁵⁰ “IIPImage is an advanced high-performance feature-rich image server system for web-based streamed viewing and zooming of ultra high-resolution images.” - <https://iipimage.sourceforge.io/>

⁵¹ The old system can be seen at: <https://research.ng-london.org.uk/projects>.

decrease user satisfaction. Further work is required to optimise the system to manage these issues and improve the feedback of information provided to users when limits are reached.

- The option of toggling between OpenSeadragon and Mirador proved very useful, allowing quick visual exploration of galleries of images in OpenSeadragon, but also providing access to the potentially rich metadata presented within Mirador. However, further work will be required to improve the logic here, particularly in relation to harmonising the difference between the number of individual images display within OpenSeadragon and the number of “groups” of images returned within the IIIF Manifests displayed in Mirador, and how they both relate to users’ ability to “page” through large numbers of results.
- This default version of OpenSeadragon does not provide the option for captions or hover texts over the displayed images. Their addition would improve the usability of the system, but further work would be required to explore how best to achieve this.
- The possible future addition of support for multiple languages has also been discussed. The language of keywords entered by users could potentially be automatically identified and then the keywords could be converted into other languages as required. This could allow users to enter keywords in their own language but then get results back from collections described in other languages.

D3 - IIIF Collections Explorer – Screenshots.

Name:	IIIF Collection Explorer
Code:	https://github.com/jpadfield/iiif-collection-explorer
Example:	https://research.ng-london.org.uk/iiif-projects/ (Including Documentation)

D3.1 – IIIF Collection Preview

IIIF Collections can include large numbers of images organised within multiple IIIF Manifests and other nested IIIF Collections. Users can explore these via multiple different viewers, including D3. However, it can still take time to open all the different groups of images and load them into a viewer. As part of the development of D3 an experimental tool which automatically searches through a provided Version 3 IIIF Collection or IIIF Manifest file, identifies all the images referenced within the file and within any of the nested or referenced files and then loads them directly into OpenSeadragon⁵² so they can be quickly previewed and explored. At this time this demonstrator has not been taken beyond a proof of concept, but it is still fully functional and has been well received by members of the IIIF Community. Some example screenshots can be found in Findings and Discussion [D3]

The new IIIF collection explorer has successfully upgraded the old National Gallery research image presentation tool. Discussions have begun to explore how new images and potentially other digital resources can be presented in this manner to support further National Gallery publications.

⁵² OpenSeadragon is an open-source image viewer, which can present IIIF resources: <https://openseadragon.github.io/>.

Although initially tied to the newly created National Gallery V3 IIIF Manifests and Collections the tool was extended to also work with external IIIF resources. However, testing of this option has been minimal due to the smaller number of published IIIF Collections using the newer V3 of IIIF Presentation API. Further development of the system has been discussed, with a few key areas of work proposed:

- Integrate the D5 - The New Digirati Manifest Editor into the workflow for creating new IIIF resource for publication from the National Gallery.
- Providing a simple landing page, with documentation and a form to submit external IIIF Collections.
- Extend the system to work with older V2 Manifests and Collections.
- Examine how the breadcrumb navigation system might work without the need for additional custom metadata.

D3.1 – IIIF Collection Preview.

Name:	IIIF Collection Preview
Code:	https://github.com/jpadfield/iiif-collecton-preview
Example:	https://research.ng-london.org.uk/cv/?uri=https://research.ng-london.org.uk/iiif-projects/json/ng-projects.json&limit=250

D4 - Tudor Portrait Resource

The National Portrait Gallery holds the largest public collection of portraits from the Tudor period. One of the key aims of the project was to use this significant resource for the understanding of visual culture in the English Renaissance, as the basis of exploring new ways to present IIIF content. As part of another major research project, developing the understanding of early painting practice and the production of portraits in Britain in the sixteenth century, many of these paintings underwent a range of scientific examination techniques, including x-radiography and infrared reflectography. A sample of images created during these examinations was organised into an exploitable data set of technical images that could be stored in a new pilot research data repository. As an extension of some preliminary experiments⁵³ with the use of IIIF technologies⁵⁴ within the global catch-all data repository, Zenodo,⁵⁵ the project developed an additional collaboration with Data Futures GmbH,⁵⁶ one of the key developers of the software (InvenioRDM)⁵⁷ underpinning Zenodo. Working with Data

⁵³ See section D4.1 – IIIF Zenodo.

⁵⁴ IIIF-Zenodo (<https://github.com/jpadfield/iiif-zenodo>) was a small experiment to automatically generate IIIF Manifests from the metadata and thumbnails presented for images stored on Zenodo.

⁵⁵ The Zenodo data repository (<https://zenodo.org/>) is managed by CERN (<https://home.cern>), one of the world's largest and most respected centres for scientific research and it manages Zenodo, the on behalf of OpenAIRE (<https://www.openaire.eu/>).

⁵⁶ “Data Futures GmbH is a not-for-profit company based in Leipzig which works on redelivery and preservation technologies and infrastructure for research data” – further details relating to the company and their work can be found on their project website: <https://www.data-futures.org>.

⁵⁷ Details of the InvenioRDM software can be found at: <https://invenio-software.org/products/rdm/>.

Futures the project explored what was required to create a dedicated IIF enabled data repository for images produced during technical analysis. While working to develop the IIF functionality of InvenioRDM, Data Futures also worked with the project to format the required metadata and organise the technical image data set. Once complete, the data set was ingested and further organised to populate a new targeted instance of InvenioRDM. State-of-the-art technologies were used to create this new repository and make this technical research widely accessible and further collaboration with the hasdai partnership⁵⁸ and CERN⁵⁵ guarantees that the results are preservable in the long-term at low cost.⁵⁹ The main output of this collaboration is the now public instance of InvenioRDM which hosts the new Tudor Paintings Research Project (<https://tudor-portraits.npg.hasdai.org>). The collaboration was multi-disciplinary including software engineers, heritage researchers, art historians and more. With the creation of this repository, within a single month, the collaboration has demonstrated the potential of this software within this domain to offer a pathway for institutions to create repositories of IIF assets; future collaborations are in development to showcase how this would work in practice.

Name:	Tudor Paintings Research Project
Code:	https://invenio-software.org/products/rdm/
Example:	https://tudor-portraits.npg.hasdai.org/
Developer:	https://www.data-futures.org/

D4.1 – IIF Zenodo

This was a quick experiment in how one can automatically generate a V2 IIF Manifest for images stored on Zenodo. It has worked for a few tested examples but only as an initial proof of concept and has not had any detailed error management added in. A working example of the code has been set up and if a Zenodo ID, for an image, is added to the end of the URL, such as: <https://cima.ng-london.org.uk/zenodo/3758523> a simple image manifest will be returned.⁶⁰

Name:	IIF Zenodo
Code:	https://github.com/jpadfield/iif-zenodo
Example:	https://cima.ng-london.org.uk/zenodo/3758523

D5 - The New Digirati Manifest Editor

IIF resources can be readily presented via a growing range of free tools and viewers, once they have been described in a formatted IIF Manifest. The format and layout of these IIF Manifests have been documented in detail but for many users working directly with this type of technical document can

⁵⁸ The hasdai partnership (<https://www.hasdai.org/>) “extended CERN's Invenio repository technology for the life and social sciences and humanities”.

⁵⁹ As part of the development of this pilot Data Futures have agreed to present the “Tudor Paintings Research Project InvenioRDM Repository Pilot” for at least 5 years.

⁶⁰ In order to view the images describe within a IIF Manifest it can to be loaded into any public IIF viewer such as: https://mirador-dev.netlify.app/__tests__/integration/mirador/

be difficult and time consuming, and a clear barrier to access. The solution to this is the creation of user-friendly software to guide users through the process of creating, editing and potentially even publishing these IIIF documents. Software that ‘will be customisable to suit different tasks and easy to integrate into existing tools and workflows [... and] the user interface for Manifest editing should not require digital skills beyond the requirements of tools like Google Slides.’ Work has been carried out in this area before, but solutions have still been complex or designed for specific applications. A further key aim of this project was to review existing software and work to develop a new, open-source, up-to-date, generic solution that could support existing users and act as the foundation of future development in this area. Digirati, one of the project’s technical partners, was commissioned to carry out this work. In planning the development work it was possible for Digirati to form additional collaborations to support these activities ensuring additional resources, a wider user evaluation base and a more sustainable solution. The Practical IIIF project has supported some of the initial stages of this development work, but further development and upgrades to the system are already scheduled. The work began with a detailed evaluation of what users needed from this type of software, see Appendix E, followed by a review and prioritisation process categorising features from key components to ideas for future development. All the development work and discussions in relation to required features are included as part of the GitHub repository for the software.⁶¹ By the end of the Practical IIIF project an initial (alpha) working version of the system had been created and was undergoing further user testing, an initial summary of this user evaluation process, can be seen in Appendix F. Furthermore, as this is being developed as part of the Practical IIIF project, the final product shall be open source, free to download, adapt and use. Sustainability will be provided through sector-wide adoptions, and community involvement, with Digirati providing ongoing governance, support, development, and hosting services as required.

Name:	The New Digirati Manifest Editor
Code:	https://github.com/digirati-co-uk/iiif-manifest-editor
Example:	https://manifest-editor-testing.netlify.app/
Developer:	https://digirati.com/

⁶¹ See: <https://github.com/digirati-co-uk/iiif-manifest-editor>

Recommendations for the Programme and Discussion

Rec #	Recommendations
R1	We strongly recommend that the use of IIIF should be formally adopted as part of the future related research projects and activities of the National Collection programme.
R1a	We strongly recommend that this be extended to include other open standards and approaches, related to linking and connecting collection information. Such as the use of PIDs, Ontologies, Vocabularies, Formats, etc. to provide a firm, shared technological foundation for future work.
R2	We strongly recommend that the National Collection programme and UKRI support the development and use of a UK IIIF infrastructure – including issues of storage, hosting management and sustainability.
R2a	The National Collection programme could provide its own resources to create a dedicated shared, interoperable infrastructure, and the support that this would need, including resources for training and to encourage the uptake of IIIF. It could also be useful to establish an information hub, covering the best practice usage of IIIF and other relevant technological standards recommended by the National Collection programme. This could help guide future work, but also act as a focus for practical community discussions relating to the implementation and integrations of recommended technological solutions.
R2b	This will need to be augmented and supported (or even replaced) by more generic services and systems, open to UK collections and researchers, that are designed to be usable and accessible by a range of user types – from individuals to small institutions or even scaling up to national institutions.
R3	We recommend that the National Collection programme join the IIIF Consortium to support the development of the open standard – but also to ensure that the needs of the programme can continue to be directly promoted within the IIIF community.
R3a	This support could also be extended to the development of some of the key open-source tools being developed for IIIF – based on the needs of the National Collection programme.
R3b	We recommend that, for the current Discovery projects, any current use of IIIF be clearly highlighted and where it is not being used that IIIF be adopted and integrated into future work as appropriate.
R4	As part of the development and planning work for the National Collection it is recommended that the programme develop a UK index of IIIF use within the GLAM and related communities.
R4a	This work could be extended to include any other open standards identified and adopted by the programme.
R4b	This work could also include the promotion of recommended and required usages of IIIF – providing worked examples of best practice based on clearly defined applications.
R5	We urge the National Collection programme to look carefully at the needs for shared infrastructure, for IIIF and beyond, that will underpin our future shared digital cultural heritage environment and do what it can to support equitable access to these standards and their implementation.
R6	We strongly recommend the support and development of a “knowledge infrastructure” in relation to key digital technologies, such as IIIF, to ensure the experience and

	opportunities developed within research projects continue to be disseminated and exploited across UK collections, with a particular focus on ensuring that smaller institutions can avoid being left behind a digital divide.
R6a	This could be achieved via the promotion of and support for existing IIF training resources, documentation, and examples (cookbooks).
R6b	The direct promotion and support of knowledge transfer – via programmes mirroring the ‘Wikimedian in Residence’ concept, by developing local areas of excellence or by extending and supporting the existing IIF ambassador framework.
R7	There is a growing number of IIF compliant image viewers being developed for different applications. As the National Collection programme develops, we also recommend that appropriate user studies and evaluation work is carried out, ideally in collaboration with any related work within the IIF community, to determine what viewer options and functions the future users of a National Collection might need, which existing image viewers are best placed to meet these needs and whether additional development support might be needed to ensure the required options and functions are available.

Working across ten different institutions and organisations, each with discrete collections, needs and user requirements, ‘The Practical Applications of IIF as a Building Block towards a Digital National Collection’ project sought to examine the way in which an existing technical standard might be integrated and adapted to work across collections and mediums as a microcosm for the eventual development of a larger National Collection. The fivefold aims of the project⁶² – demonstrating the benefit of IIF; exploring the possibilities for cross collection discovery; building collaborative online resources; lowering the barriers for participation; and examining the opportunities afforded in collating collections and research resources – can be seen as directly reflective of the potential of a National Collection, the way in which such a collection may be structured, and the way in which it may be utilised by its stakeholders.

As the project team was comprised of institutions from across the GLAM sector, we were able to analyse the ways in which IIF was of benefit to our various partners. For instance, the V&A seeks to deploy IIF to fulfil their ambition to only hold a single master copy of each of their images which can then be served in a variety of presentations, streamlining their digital service and significantly reducing the weight and demand on their servers while being able to responsively provide content to their users.⁶³ The National Portrait Gallery has begun to explore annotating their IIF images to aid in the interpretation of their digital assets as well as create bespoke packages as part of their education programme.⁶⁴ The British Library, a pioneer within the IIF ecosystem, has begun to use IIF to engage with content beyond the two dimensional, especially with regard to the Save our Sounds project, and cited their engagement with the ‘Practical Applications of IIF’ project as an opportunity for ‘the BL to take stock of where [they] are on their IIF journey’.⁶⁵

Work on D2 - Simple IIF Discovery brought together institutions internal and external to the project and explored the ways in which IIF was able to display the results of querying institutional endpoints

⁶² The project aims are described in more detail in the section.

⁶³ Interview with Luca Carini 14 March 2022.

⁶⁴ Interview with Dr Charlotte Bolland, 15 March 2022

⁶⁵ Interview with Neil Fitzgerald, 5 April 2022.

to provide a broad-spectrum keyword search – bringing the collections of various institutions together to discover new connections and tell new, linked stories. As a project, we’ve clearly illustrated the ways in which IIF can be of benefit to both discrete institutions, as well as facilitate collaboration and discovery across disparate institutions. As the Towards a National Collection initiative advances, the ability to engage with digital cross-collection resources and images will be paramount. The IIF was designed to facilitate this type of work and is already positioned within the strategic frameworks of some of the nation’s largest holding institutions. In the ten years since IIF’s introduction, it has become deeply embedded in the cultural heritage landscape and has proven to be flexible and adaptable as the nature of digital collections have evolved from digitised microfilms to 3D representations of collection objects and as the nature of how and where we engage with digital collections has changed. As such, it is the project’s recommendation [R1] that IIF be a fundamental part of building a national collection.

Additionally, IIF has the benefit of existing integrations with the digital ecosystem, it provides inputs for crowdsourcing information (Zooniverse), is adaptable for machine learning, and is already used in disciplines from medicine to medieval manuscripts. By engaging with the IIF framework, an envisioned national collection gains the ability to foster research, support big-data enquiry, and encourage discovery, rather than just serve as a simple repository for digital content. Furthermore, as the Heritage Connector⁶⁶ and Persistent Identifiers for Heritage Collections,⁶⁷ two other TaNC Foundation Projects, have illustrated the power of linking collection records and catalogues, IIF can serve as a way to display linked images and data in a user friendly way, building upon a user’s existing experience of engaging with digital content.

However, IIF alone cannot be seen as the only ‘solution’ to the formation of a national collection, but instead, can be a fundamental building block that particularly underpins the delivery and sharing of digitised content as we move forward. Other standards will be needed to support metadata integration, search and discovery, and the management, serving and storage of a huge volume of digital resources. While large institutions, with dedicated developers and information professionals are able to implement IIF locally, allowing their images to be shared and displayed on a variety of platforms, a national collection must engage with smaller institutions that do not have the infrastructure, the technical know-how, or the people to maintain these systems and implement IIF in a local instance [R6].

Four central themes emerged from our surveys of the user community: that there is some confusion about what ‘using IIF’ actually means; concern that the lack of IIF implementation in smaller institutions is contributing to a ‘digital divide’ in which their collections are under-represented when looking at the GLAM sector as a whole; the value of creating step-by-step implementation guidance; and the need for IIF advocacy information, designed to speak to both technologists as well as senior managers and directors. This survey and its analysis have demonstrated that if IIF is to be used to

⁶⁶ Kotarski, Rachael, Kirby, Jack, Madden, Frances, Mitchell, Lorna, Padfield, Joseph, Page, Roderic, Palmer, Richard, & Woodburn, Matt. (2022). Persistent Identifiers as IRO Infrastructure: A Towards a National Collection Foundation Project Final Report. Zenodo. <https://doi.org/10.5281/zenodo.6359926>

⁶⁷ Winters, Jane, Stack, John, Dutia, Kalyan, Unwin, Jamie, Lewis, Rhiannon, Palmer, Richard, & Wolff, Angela. (2022). Heritage Connector: A Towards a National Collection Foundation Project Final Report. Zenodo. <https://doi.org/10.5281/zenodo.6022678>

underpin digitisation activities in the UK's national infrastructure, resources will need to be available for advocacy, training, and support for smaller institutions to adopt and exploit the framework. However, given the extensive development work already invested in IIIF, over more than 10 years, its existing sustainability model via the active global IIIF community, the open nature of its technology and the range of open IIIF tools and services, the cost of providing these resources will be substantially less than the cost of creating something new to do the same job and then also providing the resources to support this different solution.

IIIF is an opensource, community developed standard, able to respond rapidly to needs and desires identified by the GLAM and cultural heritage sectors. As such, the pace of development is often rapid, with new implementations and APIs consistently coming online to support the needs of the community. Training programmes, such as the one recently delivered by Glen Robson⁶⁸ for the staff of the British Library,⁶⁹ as well as those delivered regularly by the IIIF consortium,⁷⁰ have proven that IIIF literacy can be quickly achieved, with more advanced training and advice readily available via IIIF Cookbooks,⁷¹ step-by-step guides which address specific questions and implementations, and via an active and engaged community that participates in monthly calls,⁷² subject-specific virtual meeting groups, and a vibrant Slack channel [R6a]. The project has shown the way in which a direct connection with a more experienced practitioner can help guide a new user through their first engagements with IIIF,⁷³ and various models to provide regional expertise, from mirroring the paid 'Wikimedian in Residence' programme to considering the 'hub and spoke' model implemented by the British Library as part of the Save our Sounds programme⁷⁴ may serve to establish regional centres where smaller institutions could engage directly with experienced IIIF practitioners.⁷⁵ Both models, however, require a commitment to their establishment and persistence, potentially as part of a National Collection framework that could provide sources for such guidance, providing support for new and existing IIIF users. The formulisation of this form of support, on a national level, could ensure that IIIF is rolled out across the whole UK, not only in London and the south-east of England.

A shared IIIF infrastructure will need ongoing support [R2, R5], in various ways: IIIF itself (the specifications and the community that produces them); IIIF compatible tools and clients, that need

⁶⁸ Glen Robson is the Technical Coordinator for the IIIF Consortium and is one of the representatives of the IIIF Consortium on the 'Practical applications of IIIF' project. (<https://iiif.io/community/consortium/staff/>)

⁶⁹ Details of this training workshop can be found at: <https://training.iiif.io/iiif-bl-workshop>

⁷⁰ <https://training.iiif.io/>

⁷¹ "IIIF 'recipes' are different reusable code snippets to help create IIIF manifests for common use cases. ..." - <https://iiif.io/get-started/cookbook>.

⁷² <https://iiif.io/community>

⁷³ As an example, the Senior Project Researcher engaged with the digital team at the National Portrait Gallery to guide them through the creation of an annotated IIIF resource to identify the Kings and Queens of England depicted on a postcard, resulting in <https://tanc-ahrc.github.io/IIIF-TNC/detail08.html>. The National Portrait Gallery is now considering using annotations to guide students through selected content as part of their educational offering.

⁷⁴ See: <https://www.bl.uk/projects/unlocking-our-sound-heritage>

⁷⁵ Support for regional support or a IIIF-ian in residence is further supported by the results of the user survey that we undertook in September that highlighted the need for hands on training, and step-by-step examples which lead a user from the very beginning through to a full IIIF implementation.

supporting but have no “runtime” cost of use (but will have costs related to maintenance and support); and the hosting, storage, and sustainability of platforms when publishing IIIF resources, managing them, and keeping them available for the long term. As well as physical infrastructure, there is a community of practice that needs to be supported [R3, R3a], and training and support needed for those who wish to engage further in the technology. All of these facets will need funding, support and advocacy for a National Collection based on shared digitised image content to be successful.

In addition to people and technical expertise, for smaller institutions the need to host, store and publish IIIF resources may be an additional financial and technical burden [R2]. Digital infrastructure projects at a national or international level, such as E-RIHS's DIGILAB,⁷⁶ have already been the subject of much discussion and there is precedent for IIIF-compliance in national collection projects. Italy's UNI (Ente Nazionale di Unificazione), the official Italian Standardization Body, has already implemented IIIF adoption as of 2019.⁷⁷ Cultural Japan, devoted to presenting ‘Japanese culture published in museums, libraries, etc. around the world, and to provide them with a common and reusable format’, uses IIIF to accomplish this goal.⁷⁸ Heritage Science Data Archive (HESCIDA),⁷⁹ which is working to organise and present Belgian heritage data, has also fully adopted IIIF with their goal to “make our collection of high-resolution photos (1000000+) available through ... IIIF”.⁸⁰ Finally, Germany's *Handschriften Portal* seeks to present a unified search environment for digitised manuscripts in German institutions and aims to provide state-level hosting of digital resources via their libraries, in particular the Staatsbibliothek zu Berlin.⁸¹ The fact that other national-level collections and research initiatives are actively utilising IIIF as a fundamental element of their infrastructure, can be seen as proof of concept when considering IIIF infrastructure for UK national implementations.

However, the support for open standards like IIIF needs to go beyond simple recommendations and potentially involve direct support for the communities looking after the standards [R3] and the required infrastructure [R6, R2]. A key part in developing this kind of infrastructure will be gathering and developing existing data regarding the use of IIIF to develop and maintain an index of institutions, big and small, using IIIF in the UK [R4]. This would be incredibly useful (as would such an index of institutions using other interoperability standards in their digital collections) for planning and management of a IIIF infrastructure. These various support mechanisms should be formalised, with resources, at a national level, for them to become embedded into a more general National

⁷⁶ DIGILAB is a proposed digital infrastructure being developed to support research in Heritage Science across Europe and beyond as part of the services provided by the European-Research Infrastructure for Heritage Science (E-RIHS) <http://www.e-rihs.eu/access/>.

⁷⁷ For information on this development, see Paola Manoni's 2019 presentation, IIIF: An Upcoming Standard in Italy, at the 2019 IIIF Annual Conference. Her abstract is available here: <https://iiif.io/event/2019/goettingen/program/79/>.

⁷⁸ A diagram depicting the way in which Cultural Japan utilises IIIF is available here: <https://cultural.jp/en/about>, and a pair of presentations discussing the use of IIIF in Japan are available https://youtu.be/F2s6yJZ_uZE?t=5184; and https://youtu.be/F2s6yJZ_uZE?t=4685.

⁷⁹ <http://hescida.kikirpa.be/>

⁸⁰ <http://hescida.kikirpa.be/iiif/>

⁸¹ For information on this project and its development, see <https://handschriftenportal.de/guide/?lang=en>.

Collection infrastructure [R1, R3b]. We recommend that the National Collection framework have its own resources to support a roll out of shared, interoperable infrastructure, and the support that this would need [R2a].

With consideration to the research outputs and results from the 'Practical Applications of IIF' Project it is clear support for the framework is strong across the GLAM sector and within the academic community at large. Given that many, particularly small, institutions and individual researchers and research projects are beginning their respective IIF journeys, it will be important in future to make sure that the framework is easily implemented, accessible financially, and supported with robust, sustainable infrastructure. The costs to individuals, research projects and smaller institutions could be driven down, the barriers to participation lowered, and the results of research more easily disseminated should the AHRC or the TaNC programme dedicate resources to infrastructure improvements that would be able to host, store, and publish IIF-compatible digital resources, and commit to maintaining those repositories and supporting ongoing research and technical development. Such a stance would be a significant step towards the creation of a digital national collection and simplify the process of gathering and assimilating the relevant images and metadata as the project advances.

We note that commitment to IIF compliance and a requirement that relevant research outputs, funded by grants from the AHRC or TaNC initiative, are made available via IIF, would position the UK and UK research at the forefront of the IIF community. To date, there is no complete list of the institutions and research projects that are engaging with IIF in the UK; support a UK index of IIF use, as noted above, from the AHRC could help collate and unite these efforts, ensure that research and development work is not repeated and facilitate increased engagement with UK research outputs through a globally recognised framework. As we move towards a national collection, IIF can help us position that collection within an international framework, laying the groundwork for the UK's world-renowned research and collections to connect far beyond our borders.

As our project unfolded, it was noted that in the funded TaNC Discovery Projects, not one project is specifically investigating or supporting the further use of IIF, although all projects are dependent on digital images. We highlight this as a major risk to the AHRC and recommend that any current use of IIF be clearly highlighted and where it is not being used that IIF be adopted and integrated into future work [R3b]. Where possible the ongoing use of IIF should also be supported and promoted across all UK collections taking part in the TaNC initiative, going forward [R2].

Finally, a key first step is our recommendation that IIF should be formally adopted as part of the National Collection infrastructure [R1]. We note that it is just one part of a range of technical standards that need to be identified, mandated, and supported [R1a]. Integrated solutions to the provision of digital content, and sustained support for this infrastructure, is the way forward to ensure interoperability around agreed (and in this case, mature) standards. The lack of focus on shared infrastructure [R2, R5] will lead to inefficiencies if not addressed at the project level. We urge the TaNC programme to look carefully at the shared infrastructure that will underpin our future shared digital cultural heritage environment, and to do what it can to support equitable access to these standards and their implementation.

Contacts

Any questions regarding the content of this report can be directed to:

Joseph Padfield (PI)

Principal Scientist

The National Gallery

joseph.padfield@nationalgallery.org.uk

Neil Fitzgerald (Co-I)

Head of Digital Research

The British Library

neil.fitzgerald@bl.uk

Dr Charlotte Bolland (Co-I)

Senior Curator, Research and Sixteenth-Century Collections

The National Portrait Gallery

cbolland@npg.org.uk

Professor Melissa Terras (Co-I)

Professor of Digital Cultural Heritage

University of Edinburgh

m.terras@ed.ac.uk

Dr Anne McLaughlin (Senior Research Fellow)

am2539@cam.ac.uk

Appendices

Appendix A: Demonstrator Screenshots & Discussions

Where possible the demonstrators have been developed to be responsive to the screens on which they are displayed. Example screenshots are provided presenting the relevant systems in relation to the resolution expected on an average desktop and on a modern mobile device.

D1 - Simple Site – Screenshots and Examples

Simple Site is a system for automatically creating a consistent set of webpages within GitHub, based on a simple set of JSON files.⁸² It is summarised in the D1 - Simple Site section in the main report and is further described and documented at: <https://jpadfield.github.io/simple-site>

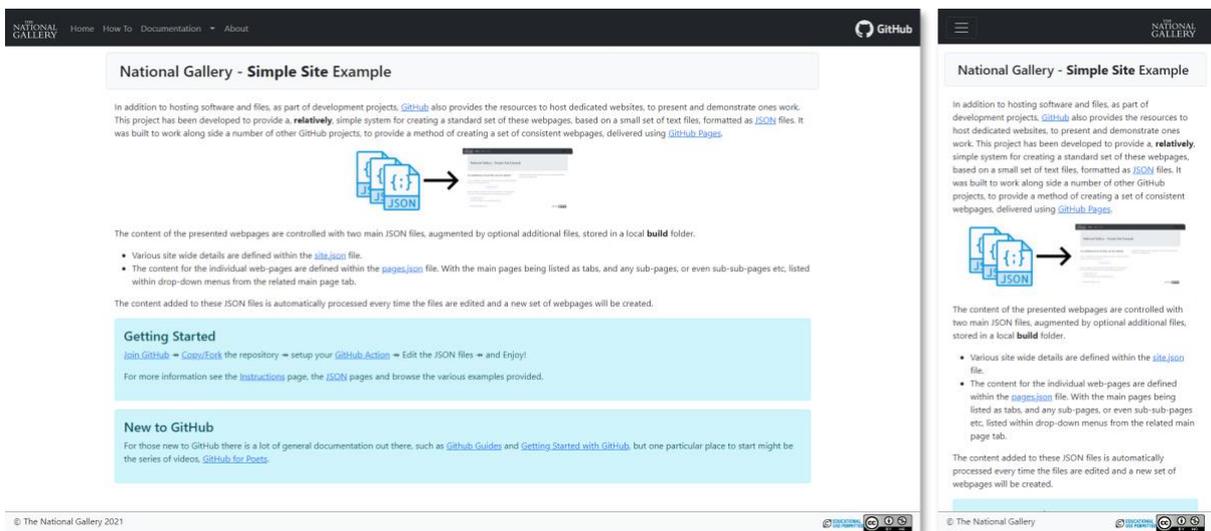


Figure 1: Landing page for the NG Simple Site system (D1), which presents a working example of the system complete with full documentation: <https://jpadfield.github.io/simple-site> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

⁸² "JSON ... is an open standard file ... and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and arrays (or other serializable values)." – for more details and examples see: <https://en.wikipedia.org/wiki/JSON>.

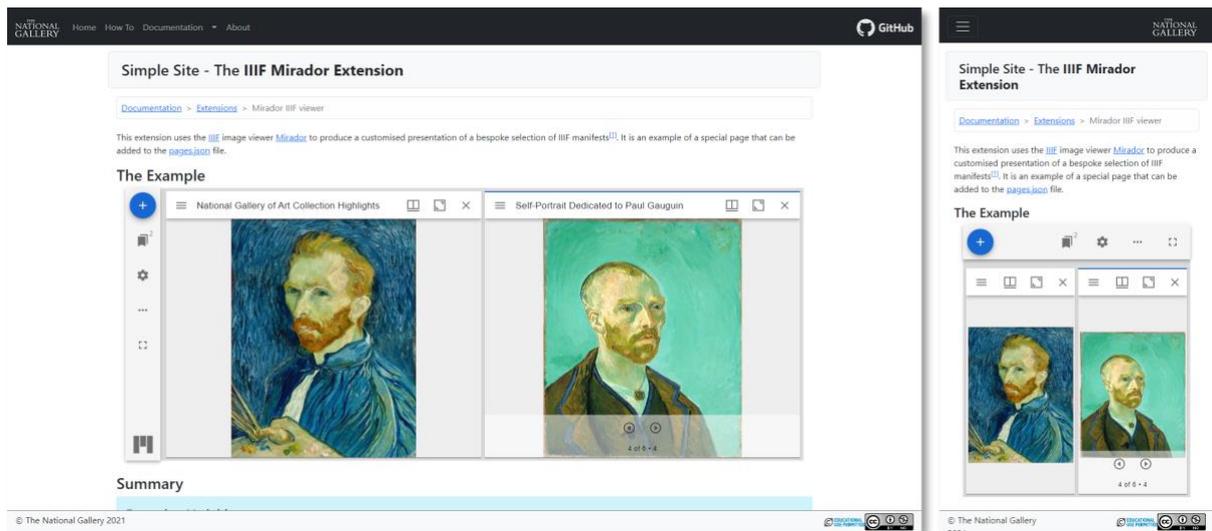


Figure 2: An example of the Mirador V3 extension for Simple Site (D1), which allows users to present and discuss published IIIF resources: <https://jpadfield.github.io/simple-site/mirador-viewer.html> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

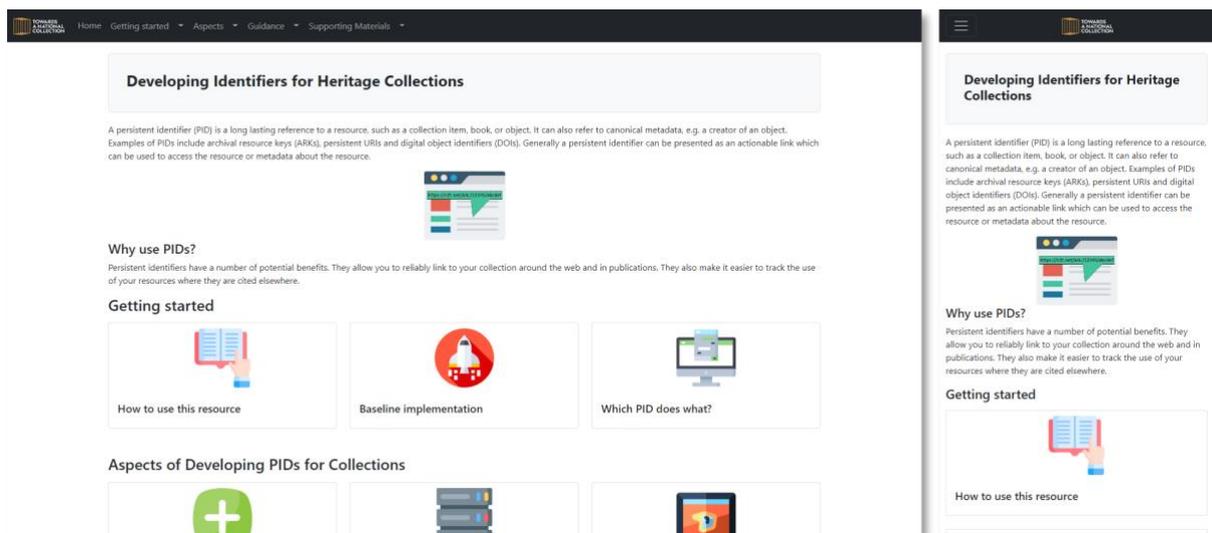


Figure 3: The landing page for a dedicated PID resource website, created with Simple Site (D1) for the AHRC funded 'Towards a National Collection' Foundation Project "Persistent Identifiers as IRO Infrastructure" (<https://tanc-ahrc.github.io/HeritagePIDs/>): <https://tanc-ahrc.github.io/PIDResources/> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

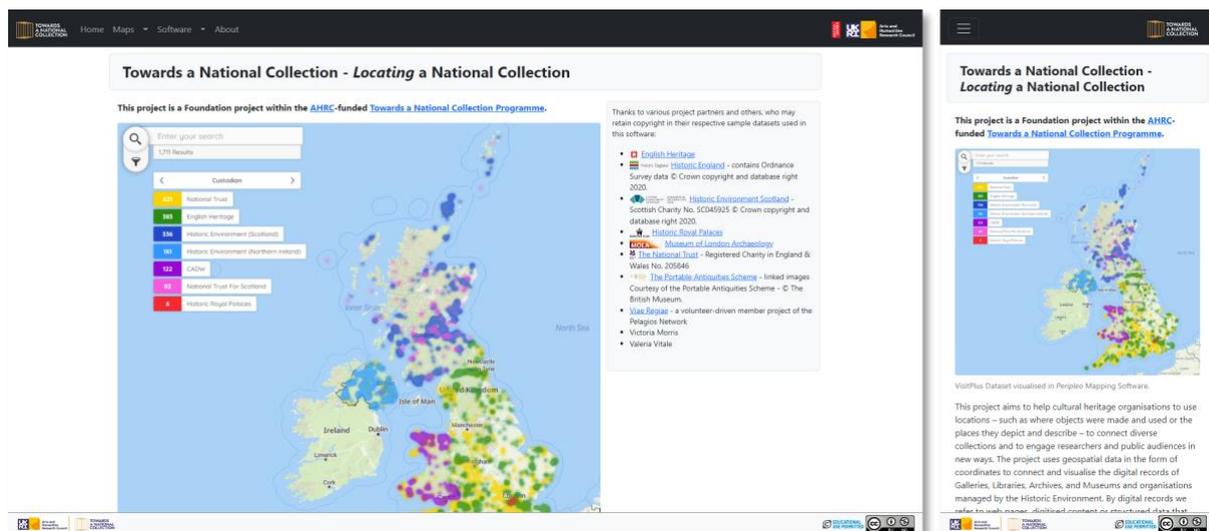


Figure 4: The landing page for the project website, created with Simple Site (D1), for the AHRC funded ‘Towards a National Collection’ Foundation Project “Locating a National Collection”: <https://britishlibrary.github.io/locating-a-national-collection/> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

Findings and Discussion [D1]

The development of Simple Site proved to be very useful to the project and beyond. In addition to providing a stable platform for this project’s website and a growing number of other related websites, the system has also provided an opportunity for individual researchers, who do not have their own web servers, a free solution to organise and present their own curated sets of published IIF resources. This use case was specifically documented in a dedicated version of the system - <https://jpadfield.github.io/simple-mirador/>. The system was also used as the basis of some IIF training activities, like the one described in the final project webinar, in the presentation by Anne McLaughlin, “Simple Site in Practice”.⁸³ The Simple Site system continues to be used and supported by the National Gallery.

D2 - Simple IIF Discovery – Screenshots

Simple IIF Discovery system is based on a dynamic version of the D1 - Simple Site system. The work is intended to demonstrate how shared international open standards, like IIF, can be used to facilitate simple cross collection interoperability. This makes it easier for users to find and explore the rich image content being presented on the web. It is summarised in the D2 - Simple IIF Discovery section in the main report and is further described and documented at:

<https://research.ng-london.org.uk/ss-iiif>.

⁸³ Joseph Padfield, Anne McLaughlin, Charlotte Bolland, Peter Cornwell, Tom Crane, & Josh Hadro. (2022, May 27). The Practical Applications of IIF: Project Outcomes and Future Directions. Zenodo. <https://doi.org/10.5281/zenodo.6592406>

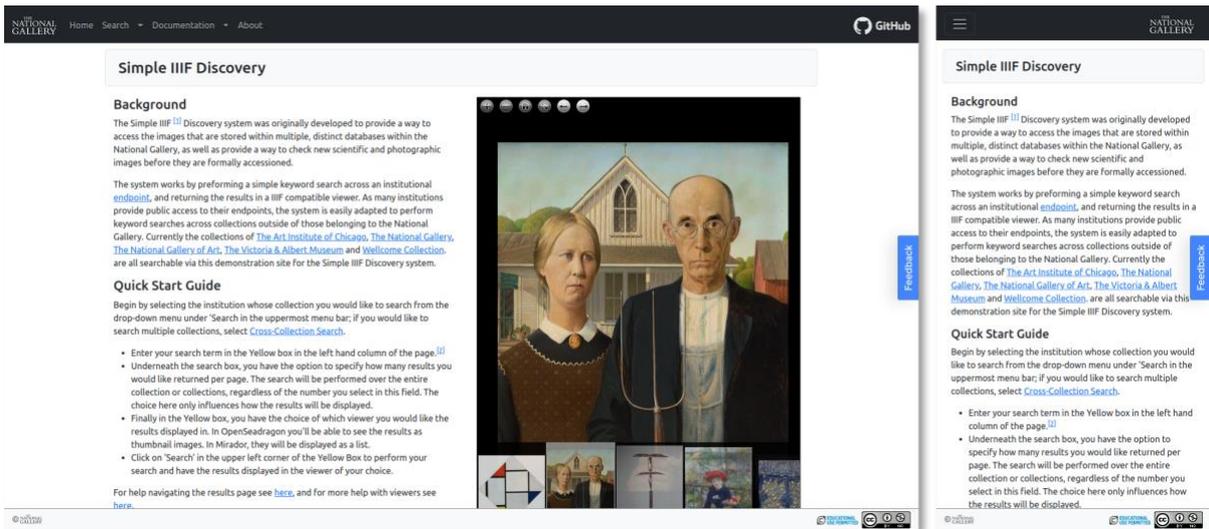


Figure 5: Landing page for the NG Simple IIIF Discovery (D2) system, which presents a working example of the system complete with full documentation: <https://research.ng-london.org.uk/ss-iiif> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

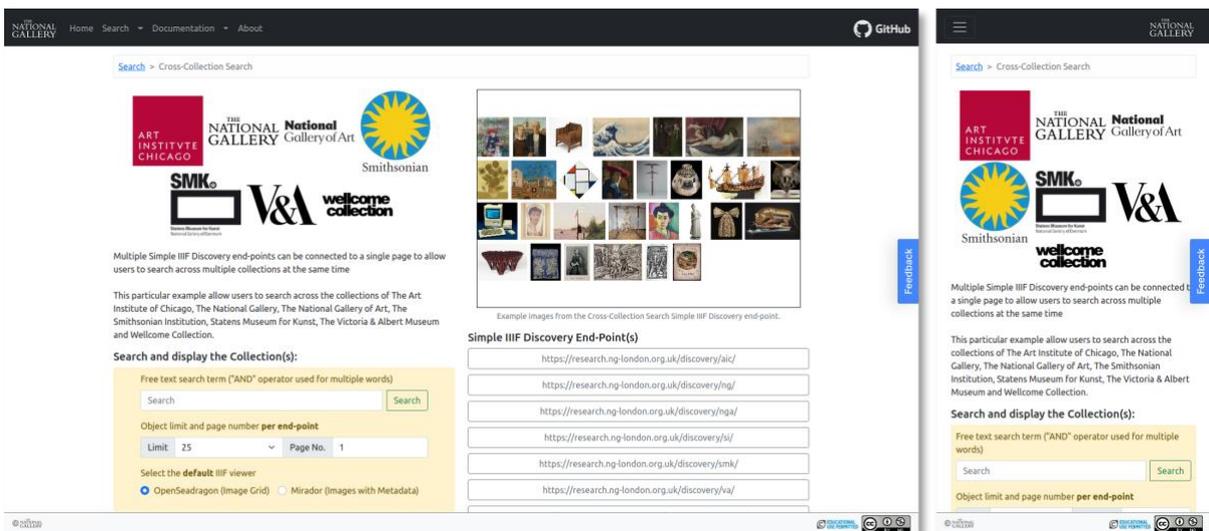


Figure 6: A screen shot of the cross-collection search page of the Simple IIIF Discovery (D2) example system, showing the options for a simple keyword search across seven collections at the same time: <https://research.ng-london.org.uk/ss-iiif/combined-example> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

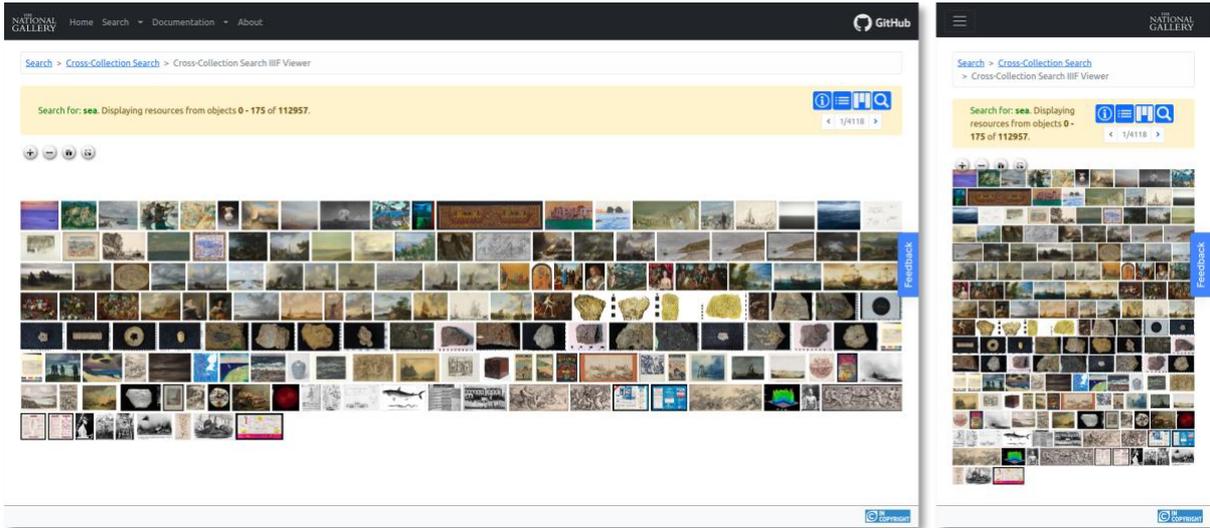


Figure 7: A screenshot of a results page, for the Simple IIIF Discovery (D2) example system, presented in the OpenSeadragon viewer,⁸⁴ for a search for “sea”: <https://research.ng-london.org.uk/ss-iiif/viewer-combined/sea/25/1/osd> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

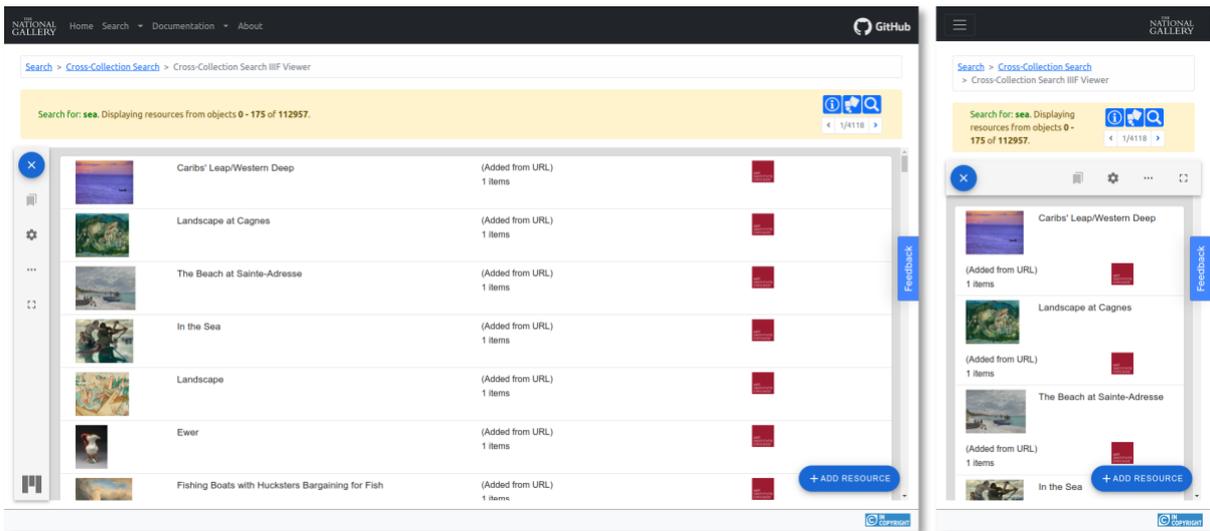


Figure 8: A screenshot of a results page, for the Simple IIIF Discovery (D2) example system, presented in the IIIF image viewer Mirador V3, for a search for “sea”: <https://research.ng-london.org.uk/ss-iiif/viewer-combined/sea/25/1/m> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

⁸⁴ OpenSeadragon is an open-source image viewer, which can present IIIF resources: <https://openseadragon.github.io/>.

Findings and Discussion [D2]

The Simple IIIF Discovery successfully demonstrated cross-collection searching for IIIF resources, but it also highlighted some of the issues with cross collection searching and some areas for future development:

- Simple keyword searches options make it very easy for anyone to start to explore and find IIIF resources, but when results are combined from multiple collections it is very easy to end up with very large numbers of results. More complex search options, ideally a more robust application of basic Boolean logic⁸⁵, using terms like “and”, “or”, “not”, etc. would make it much easier for user find exactly what they are looking for.
- A few of the institutional APIs connected to the system include limits to the number of results that can be returned and the number of IIIF tiles that can be viewed. When these limits are reached results are often simply not returned, but this can also result in a build-up of server errors. These possible inconsistencies in the results returned obviously decrease user satisfaction. Further work is required to optimise the system to manage these issues and improve the feedback of information provided to users when limits are reached.
- The option of toggling between OpenSeadragon and Mirador proved very useful, allowing quick visual exploration of galleries of images in OpenSeadragon, but also providing access to the potentially rich metadata presented within Mirador. However, further work will be required to improve the logic here, particularly in relation to harmonising the difference between the number of individual images display within OpenSeadragon and the number of “groups” of images returned within the IIIF Manifests displayed in Mirador, and how they both relate to users’ ability to “page” through large numbers of results.
- This default version of OpenSeadragon does not provide the option for captions or hover texts over the displayed images. Their addition would improve the usability of the system, but further work would be required to explore how best to achieve this.
- The possible future addition of support for multiple languages has also been discussed. The language of keywords entered by users could potentially be automatically identified and then the keywords could be converted into other languages as required. This could allow users to enter keywords in their own language but then get results back from collections described in other languages.

D3 - IIIF Collections Explorer – Screenshots

The IIIF Collection Explorer system is an example user interface for exploring complex, nested IIIF Collections. The system creates citable pages, image presentation with Mirador V3, along with inline PDF presentation. It is summarised in the D3 - IIIF Collections Explorer section in the main report and is further described and documented at: <https://research.ng-london.org.uk/iiif-projects/>.

⁸⁵ https://en.wikipedia.org/wiki/Boolean_algebra#Basic_operations

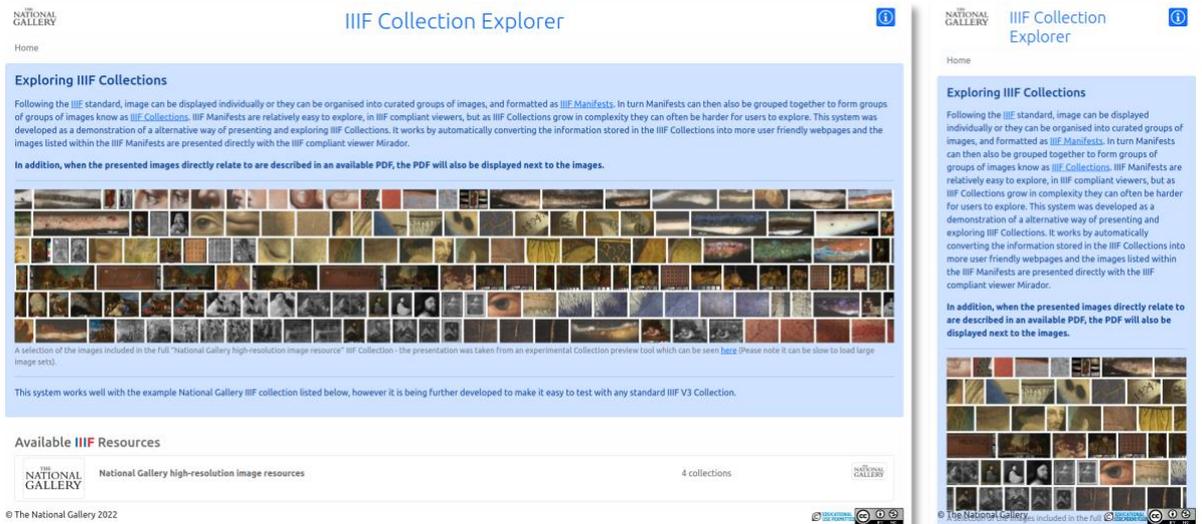


Figure 9: The landing page for the example IIF Collection Explorer (D3), which presents a working example of the system complete with access to full documentation: <https://research.ng-london.org.uk/iif-projects/> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

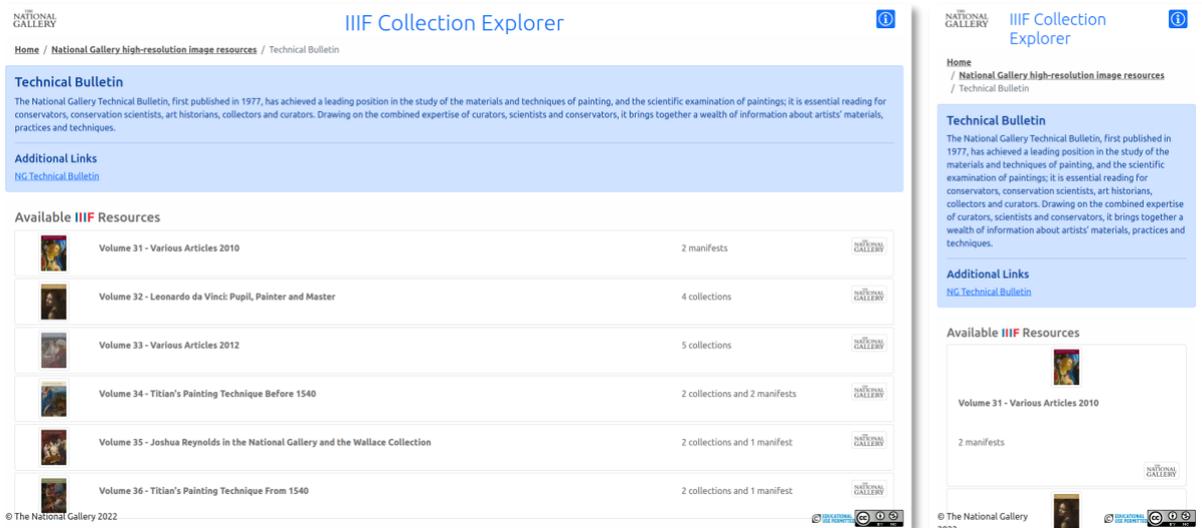


Figure 10: A screenshot of the IIF Collection Explorer (D3), listing a series of IIF resources relating to different volumes for the National Gallery Technical Bulletin:⁸⁶ <https://research.ng-london.org.uk/iif-projects/?root=technical-bulletin> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

⁸⁶ “The National Gallery Technical Bulletin, first published in 1977, has achieved a leading position in the study of the materials and techniques of painting, and the scientific examination of paintings.” - <https://www.nationalgallery.org.uk/research/research-resources/technical-bulletin>.

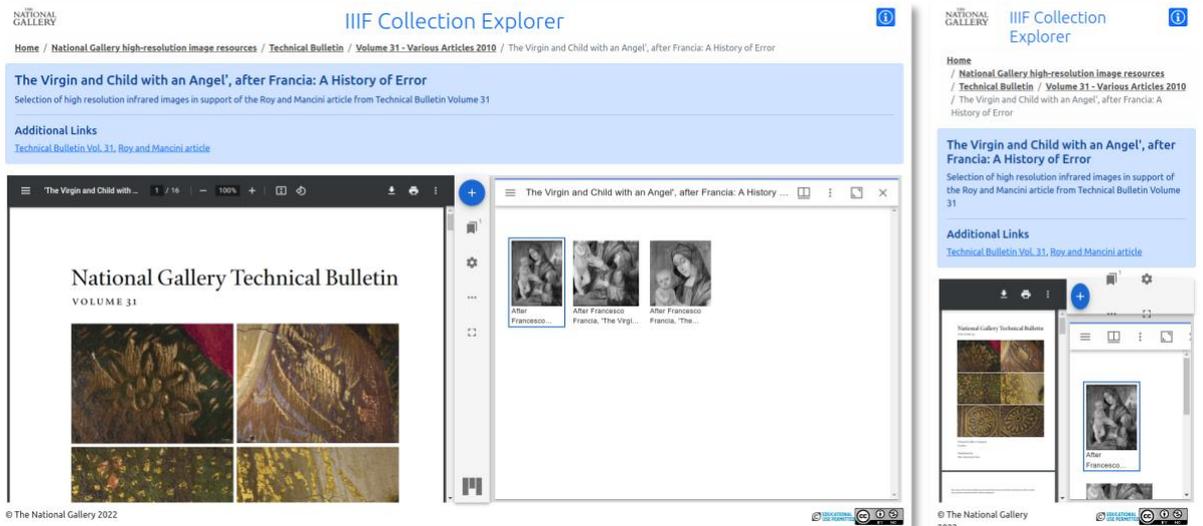


Figure 11: A screenshot of the IIF Collection Explorer (D3), displaying a set of images in the Mirador V3 viewer alongside a PDF of the related article from National Gallery Technical Bulletin: https://research.ng-london.org.uk/iif-projects/?root=roy_mancini2010 (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

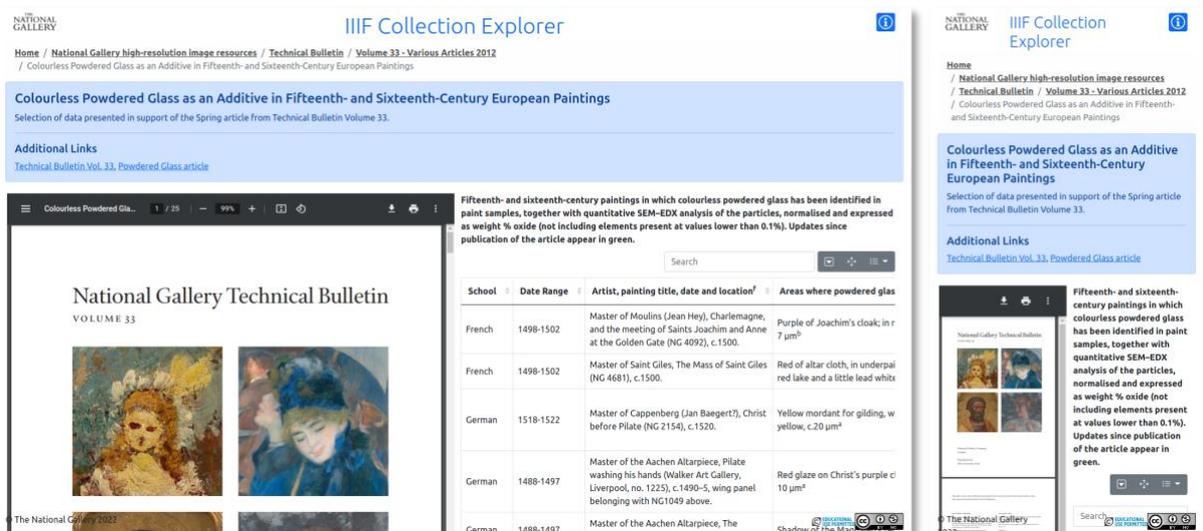


Figure 12: A screenshot of the IIF Collection Explorer (D3), displaying a table of analytical data alongside a PDF of the related article from National Gallery Technical Bulletin: <https://research.ng-london.org.uk/iif-projects/?root=spring2012> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

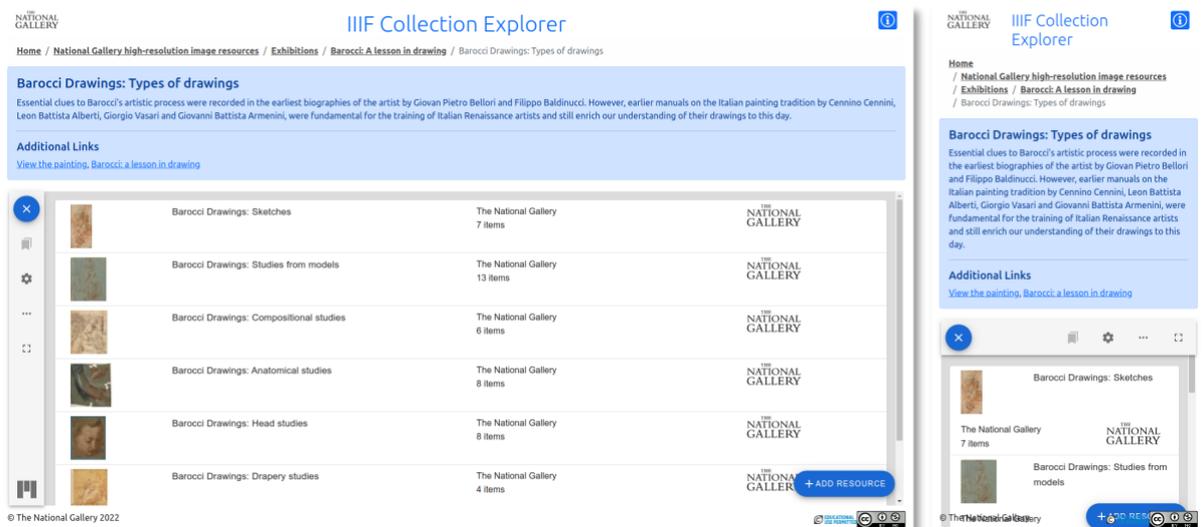


Figure 13: A screenshot of the IIF Collection Explorer (D3), displaying a series of IIF Manifests, relating to an online National Gallery exhibition, Barocci: a lesson in drawing,⁸⁷ loaded into the Mirador V3 viewer: <https://research.ng-london.org.uk/iif-projects/?root=typesofdrawing> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

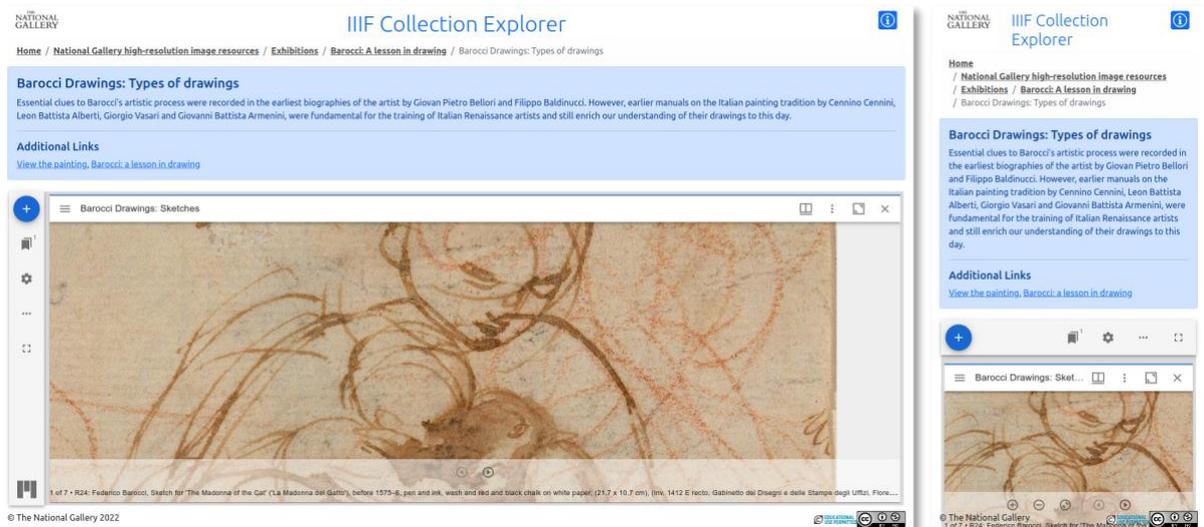


Figure 14: A screenshot of the IIF Collection Explorer (D3), displaying high resolution image of a sketch from the online National Gallery exhibition, Barocci: a lesson in drawing,⁸⁸ loaded into the Mirador V3 viewer: <https://research.ng-london.org.uk/iif-projects/?root=typesofdrawing> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

⁸⁷ Details of this exhibition can be found at: <https://www.nationalgallery.org.uk/paintings/learn-about-art/paintings-in-depth/barocci-a-lesson-in-drawing>.

⁸⁸ Details of this exhibition can be found at: <https://www.nationalgallery.org.uk/paintings/learn-about-art/paintings-in-depth/barocci-a-lesson-in-drawing>.

Findings and Discussion [D3]

The new IIIF collection explorer has successfully upgraded the old National Gallery research image presentation tool.⁸⁹ Discussions have begun to explore how new images and potentially other digital resources can be presented in this manner to support further National Gallery publications. Although initially tied to the newly created National Gallery V3 IIIF Manifests and Collections⁹⁰ the tool was extended to also work with external IIIF resources. However, testing of this option has been minimal due to the smaller number of published IIIF Collections using the newer V3 of IIIF Presentation API⁹¹. Further development of the system has been discussed, with a few key areas of work proposed:

- Integrate the D5 - The New Digirati Manifest Editor into the workflow for creating new IIIF resource for publication from the National Gallery.
- Providing a simple landing page, with documentation and a form to submit external IIIF Collections.
- Extend the system to work with older V2 Manifests and Collections.
- Examine how the breadcrumb navigation system might work without the need for additional custom metadata.

D3.1 – IIIF Collection Preview - Screenshots

The IIIF Collection Preview system is an experimental tool which searches through a provided Version 3 IIIF Collection or IIIF Manifest file, identifies all the images referenced within the file and within the any nested/referenced files and then loads them into OpenSeadragon. The link to a IIIF document needs to be given as an GET variable called “uri” and an optional “limit” variable can also be provided to limit the total number of images loaded (there is currently a hard limit of 2,000 images included in the code as the loading times increase quite a bit as the total number of images increases). Details of the additional collaboration that led to the creation of this system is summarised in the D3.1 – IIIF Collection Preview section in the main report. The following example URL was used to generate Figure 15, Figure 16 and Figure 17: <https://research.ng-london.org.uk/cv/?uri=https://research.ng-london.org.uk/iiif-projects/json/ng-projects.json&limit=2000>

⁸⁹ <https://research.ng-london.org.uk/projects>

⁹⁰ The full set of these new IIIF Manifests and Collections can be accessed at: <https://research.ng-london.org.uk/iiif-projects/json/>

⁹¹ <https://iiif.io/api/presentation/3.0/>

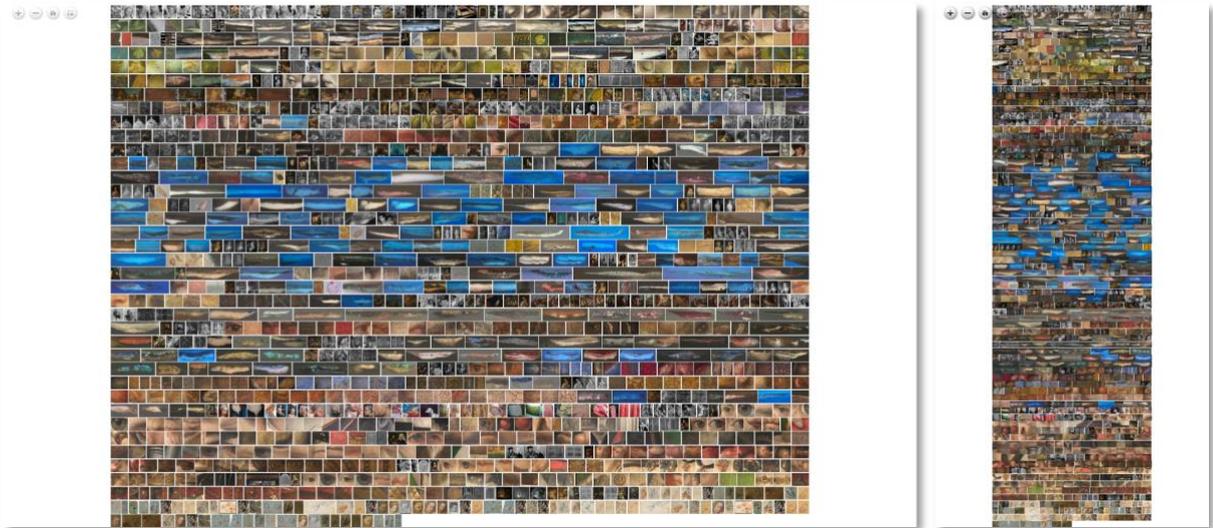


Figure 15: A screenshot of the IIIF Collection Previewer (D3.1), displaying all 1,500+ images referenced via the top level IIIF Collection document⁹² used to define the data presented by the IIIF Collection Explorer (D3). (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

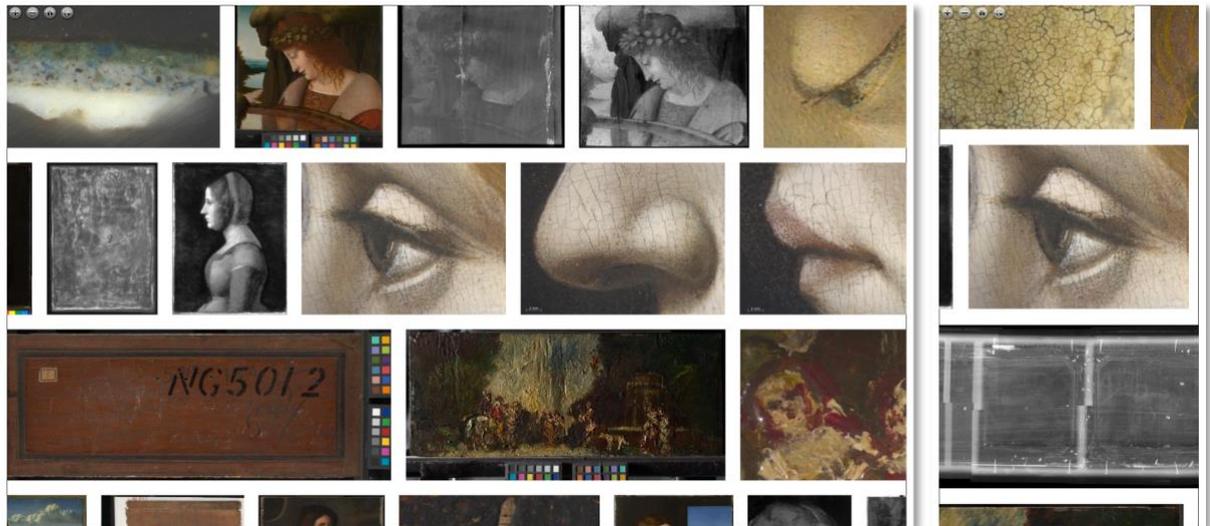


Figure 16: A screenshot of the IIIF Collection Previewer (D3.1), displaying all 1,500+ images referenced via the top level IIIF Collection document used to define the data presented by the IIIF Collection Explorer (D3). Zoomed in to show just a few images. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

⁹² The contents of the top level IIIF Collection document used to define the data presented by the IIIF Collection Explorer (D3) can be seen at: <https://research.ng-london.org.uk/iiif-projects/json/ng-projects.json>



Figure 17: A screenshot of the IIF Collection Previewer (D3.1), displaying all 1,500+ images referenced via the top level IIF Collection document used to define the data presented by the IIF Collection Explorer (D3). Zoomed in to show the detail of a single image. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

Findings and Discussion [D3.1]

This demonstrator was created as a spin off from the work being carried out on D3 - IIF Collections Explorer as a result of a question posed on the IIF Slack Channel.⁹³ It was produced as a simple and successful proof of concept. Further development of the system has been discussed, with a few key areas of work proposed:

- Providing a simple landing page, with documentation and a form to submit new IIF Collections.
- Extend the system to work with older V2 Manifests and Collections.
- Add in pagination functionality to allow users to step through the content of larger IIF Collections.
- Larger sets of images can take some time to load so the addition of some “loading” or “wait” graphics/information would also improve the user experience.

D4 - Tudor Portrait Resource – Screenshots

The Tudor Paintings Research Project is a pilot instance of a corpus repository based on the InvenioRDM data repository software. It provides an example of how a state-of-the-art repository system can act as a data archive and IIF image presentation system. Details of the additional

⁹³ <https://iif.slack.com/archives/CRLCM8CQH/p1647958944510259> (A membership of the IIF Slack Channel is required to see the details of the conversation).

collaboration that led to the creation of this system is summarised in the D4 - Tudor Portrait Resource section in the main report and the live system can be found at: <https://tudor-portraits.npg.hasdai.org/>.

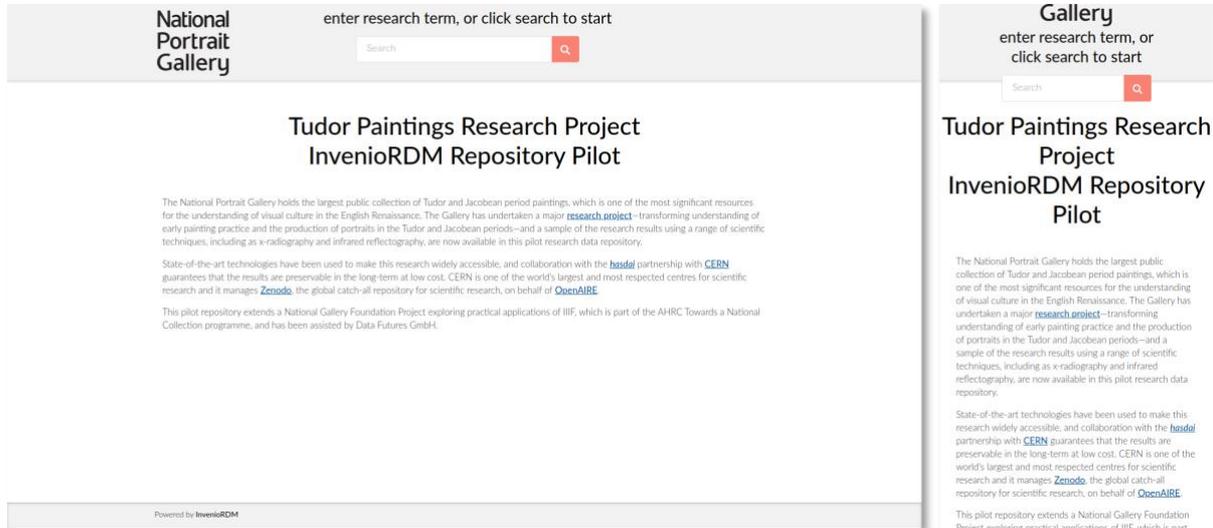


Figure 18: The landing page for the pilot Tudor Paintings Research Project (D4), created in collaboration with Data Futures GmbH⁵⁶: <https://tudor-portraits.npg.hasdai.org> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

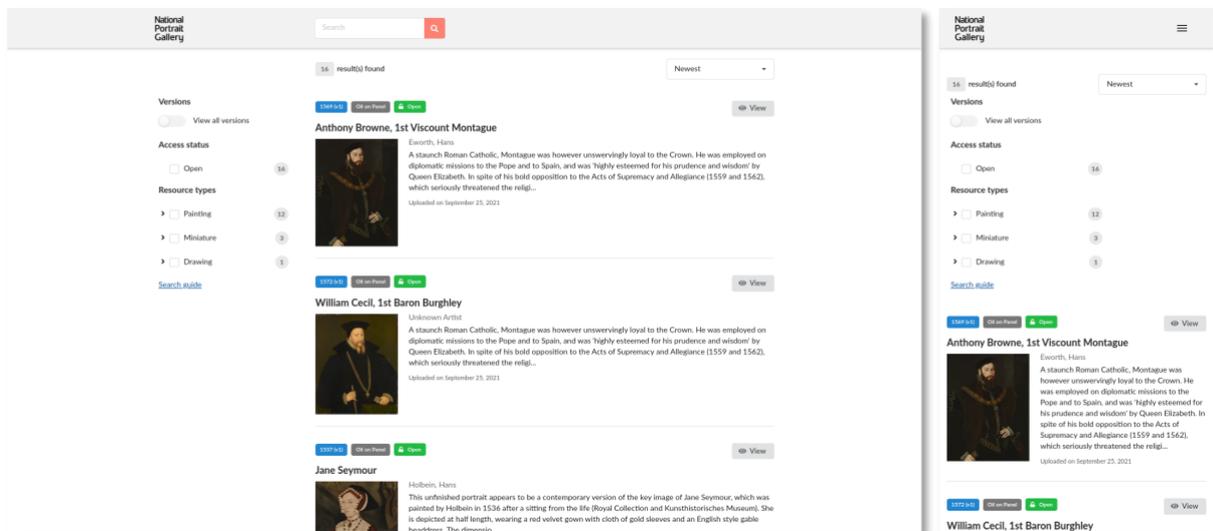


Figure 19: A screenshot of a results page listing the paintings included in the Tudor Paintings repository (D4): <https://tudor-portraits.npg.hasdai.org/search?q=&l=list&p=1&s=10&sort=newest> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

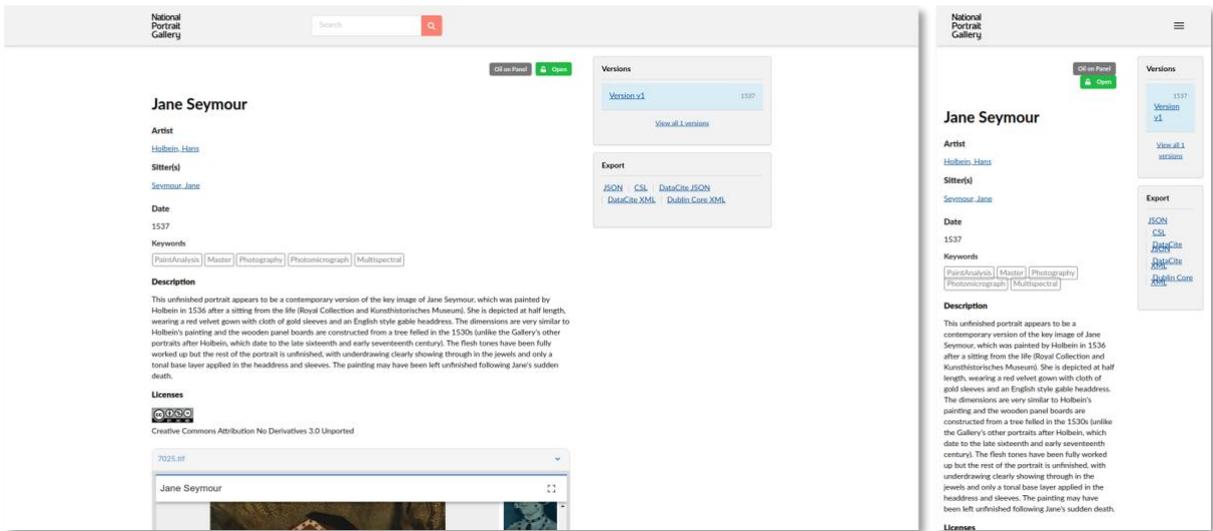


Figure 20: A screenshot displaying some of the details presented for a single painting (D4), “Jane Seymour”, by Hans Holbein, showing the core metadata details for the painting: <https://tudor-portraits.npg.hasdai.org/records/1q1ek-yfv13> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

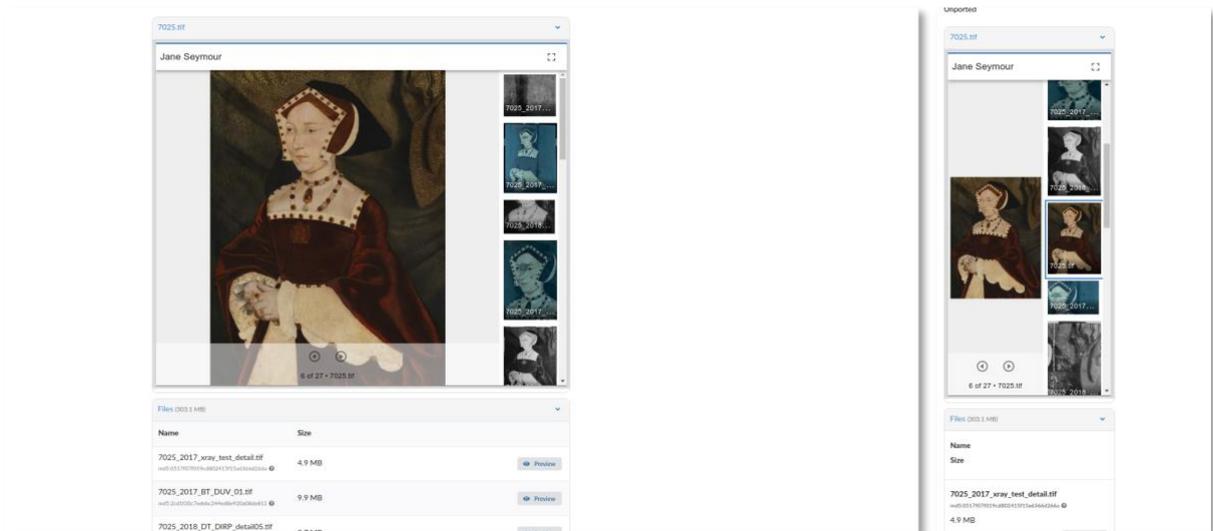


Figure 21: A screenshot displaying some of the details presented for a single painting, “Jane Seymour”, by Hans Holbein, showing an example of the image preview IIF viewer (D4): <https://tudor-portraits.npg.hasdai.org/records/1q1ek-yfv13> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

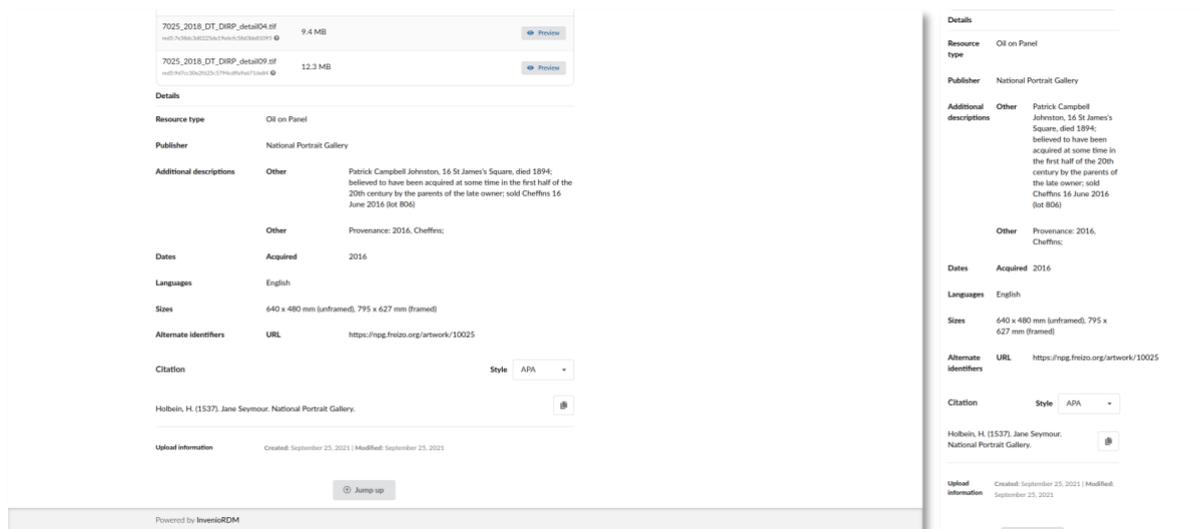


Figure 22: A screenshot displaying some of the details presented for a single painting, “Jane Seymour”, by Hans Holbein, showing the additional metadata details for the painting (D4): <https://tudor-portraits.npg.hasdai.org/records/1q1ek-yfv13> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

Findings and Discussion [D4]

This result has far surpassed the original expectations for this demonstrator, with the external collaboration with Data Futures providing the opportunity to explore and demonstrate the potential of heritage IIF resources being “published” as robust research resources via a globally trusted state-of-the-art data repository rather than just directly via a local IIF server. Zenodo has been in service using invenio since 2014, and in 2017 was underwritten by the G7 as the global catch-all repository for preserving research data investment. CERN is now reimplementing Zenodo using the newly developed cross-disciplinary invenioRDM that was used in the Tudor portrait demonstrator. The work has demonstrated that the invenioRDM platform can very rapidly provide a standards-based repository system for cultural heritage data and provided a valuable model or pilot for future management of digital resources within Heritage and Heritage Science research, specifically within the EU funded H2020 research project IPERION-HS⁹⁴ and the future ERIC⁹⁵ E-RIHS.⁹⁶ This work has exploited the development of software initially targeted at the general global research community, demonstrating how it can be customised and tailored to the need of the GLAM community and potentially the wider development of IIF resources under pinning a future National Collection.

“... what we've been able to demonstrate here is that infrastructure that had large scale contribution over many years from multiple countries and multiple funding sources, not least

⁹⁴ <https://www.iperionhs.eu/> - The project PI is actively involved with the data management and data interoperability work being carried out within this European research project.

⁹⁵ https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/european-research-infrastructures/eric_en

⁹⁶ <http://www.e-rihs.eu/>

the European Commission's OpenAIRE⁹⁷ program, has provided a pretty gentle on ramp for heritage data ...⁹⁸

D4.1 – IIF Zenodo - Screenshots

An experimental tool which searches and scrapes data from an image uploaded to Zenodo, including the IIF related details of the image preview and creates a simple V2 IIF Manifest. Details of the additional collaboration that led to the creation of this system is summarised in the D4.1 – IIF Zenodo section in the main report. The following example URL was used to generate:

<https://cima.ng-london.org.uk/zenodo/3758523>

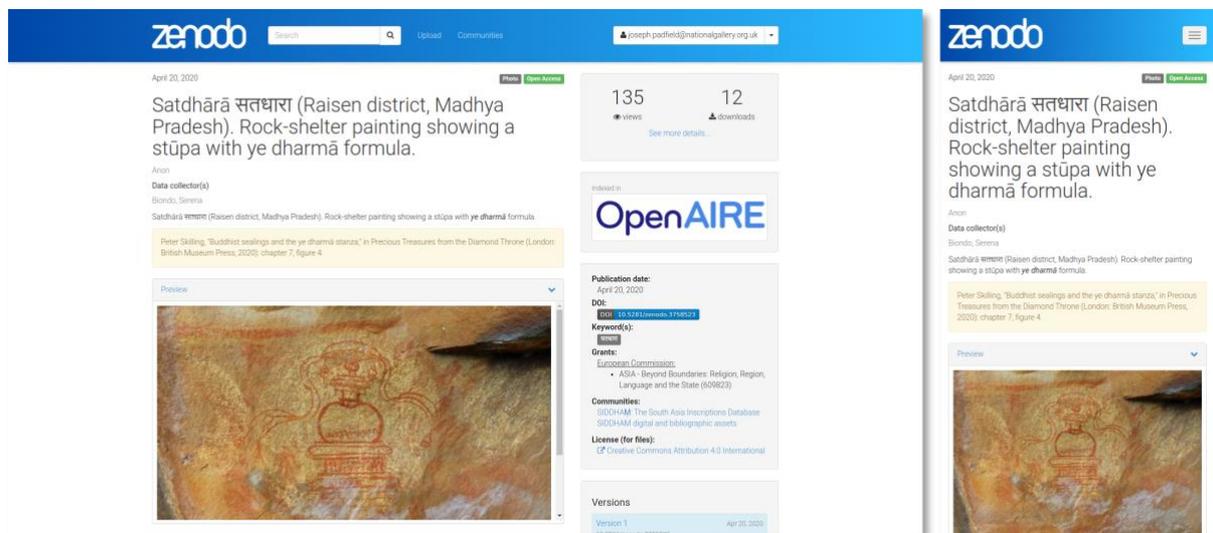


Figure 23: A screenshot taken from the landing page for the Zenodo resource: Anon. (2020). Satdhārā सतधारा (Raisen district, Madhya Pradesh). Rock-shelter painting showing a stūpa with ye dharmā formula. Zenodo. <https://doi.org/10.5281/zenodo.3758523> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

⁹⁷ “OpenAIRE is a Non-Profit Partnership, established in 2018 as a legal entity, OpenAIRE A.M.K.E, to ensure a permanent open scholarly communication infrastructure to support European research.” - <https://www.openaire.eu/>

⁹⁸ Quoted from the D4 presentation within the projects’ Webinar 3: Project Outcomes and Future Directions.

```

{"@context": "http://iiif.io/api/presentation/2/context.json",
"@id": "10.5281/zenodo.3758523",
"@type": "sc:Manifest",
"label": "Satdhārā ॐॐॐ (Raisen district, Madhya Pradesh). Rock-shelter painting showing a stūpa with ye dharmā formula.",
"license": "CC-BY 4.0",
"attribution": "Anon",
"logo": "https://about.zenodo.org/static/img/logos/zenodo-gradient-200.png",
"metadata": [
{
"label": "Image Description",
"value": "cp-Satdhārā ॐॐॐ (Raisen district, Madhya Pradesh). Rock-shelter painting showing a stūpa with <em>ye dharmā </em>formula.</p>"}
],
"description": "Peter Skilling, 'Buddhist sealings and the ye dharmā stanza,' in Precious Treasures from the Diamond Throne (London: British Museum Press, 2020): chapter 7, figure 4.",
"viewingDirection": "left-to-right",
"viewingHint": "individuals",
"sequences": [
{
"@id": "/zenodo/manifests/sequence/normal.json",
"@type": "sc:Sequence",
"label": "Normal Order",
"canvases": [
{
"@id": "https://cima.ng-london.org.uk/zenodo/manifests/sequence/10.5281/zenodo.3758523/normal.json",
"@type": "sc:Canvas",
"label": "Satdhārā ॐॐॐ (Raisen district, Madhya Pradesh). Rock-shelter painting showing a stūpa with ye dharmā formula.",
"height": 3888,
"width": 5184,
"images": [
{
"@type": "oa:Annotation",
"motivation": "sc:painting",
"resource": {
"@id": "https://zenodo.org/api/1111/v2/c0808e08-456e-4a46-92d2-5eeecb470b7-857e9878-0311-455a-bef5-0b654875fed/Satdhara%20stupa.tif/full/full/default.jpg",
"@type": "dctypes:Image",
"format": "image/jpeg",
"height": 3888,
"width": 5184,
"service": {
"@context": "http://iiif.io/api/image/2/context.json",
"@id": "https://zenodo.org/api/1111/v2/c0808e08-456e-4a46-92d2-5eeecb470b7-857e9878-0311-455a-bef5-0b654875fed/Satdhara%20stupa.tif",
"profile": "http://iiif.io/api/image/2/level2.json"
}
}
]
}
]
}
]
}
]
}

```

Figure 24: A screenshot of the V2 IIIF Manifest automatically generated, using D4.1, from the data presented on Zenodo for resource <https://doi.org/10.5281/zenodo.3758523> - generated using: <https://cima.ng-london.org.uk/zenodo/3758523> (Screenshots displaying the responsive formatting of a desktop and mobile presentation).



Figure 25: A screenshot of the V2 IIIF Manifest (<https://cima.ng-london.org.uk/zenodo/3758523>) automatically generated, using D4.1, loaded into an example Mirador V3 viewer. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

Findings and Discussion [D4.1]

This introductory work was successfully carried out to explore three specific questions:

- How was IIIF used with Zenodo?
- Could Zenodo be used as free IIIF image server for smaller sets of images?
- How complex was the process of automatically generating IIIF V2 Manifests?

The work demonstrated that although technically Zenodo's use of IIIF could allow researchers to publish IIIF resources, it could not provide real support for zooming applications due to connection limitation imposed by Zenodo. However, as noted before (see section D4 - Tudor Portrait Resource) the process of exploring the IIIF potential of Zenodo led to the valuable additional collaboration with Data Future GmbH. This work also contributed to the Principal Investigator's understanding of IIIF and the construction of IIIF Manifest, but with the new developments within of InvenioRDM, which will soon be rolled out to Zenodo, along with the creation of the D5 - The New Digirati Manifest Editor, there is no current need/plan to develop this demonstrator any further.

D.5 - The New Digirati Manifest Editor – Screenshots

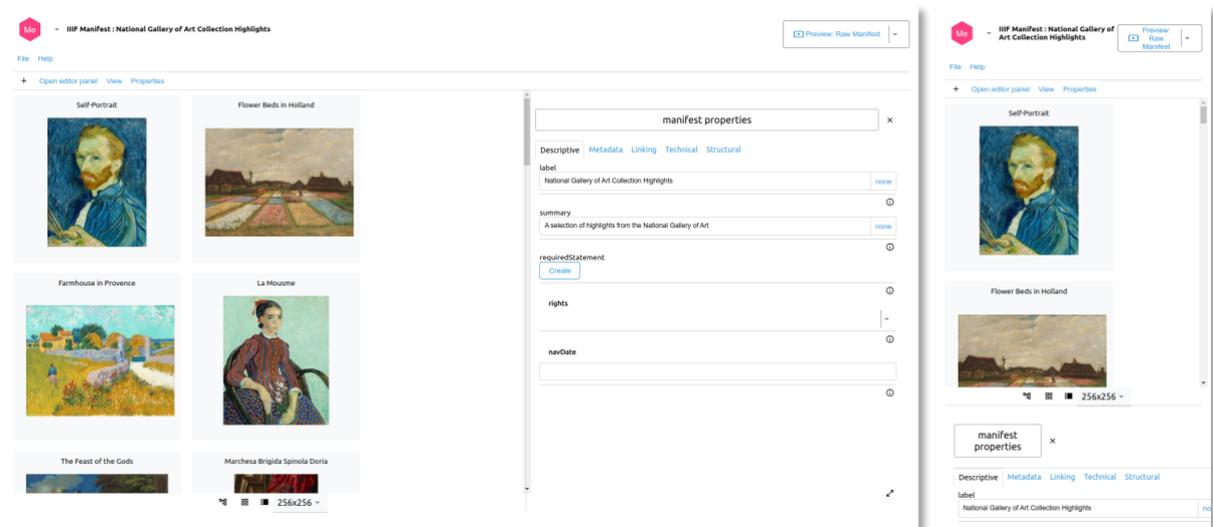


Figure 26: An example screenshot taken from the initial test version of the new Digirati IIIF Manifest Editor, showing how some of the details of an existing IIIF Manifest (National Gallery of Art Collection Highlights - https://media.nga.gov/public/manifests/nga_highlights.json) can be explored and edited. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

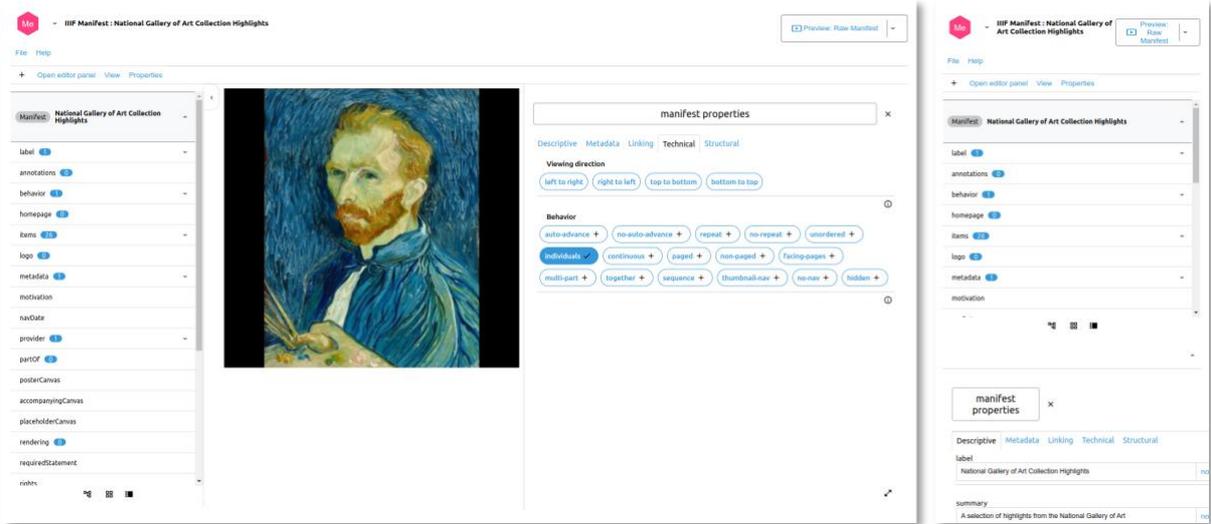


Figure 27: An example screenshot taken from the initial test version of the new Digirati IIF Manifest Editor, showing the various types of metadata attached to an image and how simple click button options can be used to set the details in a Manifest. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

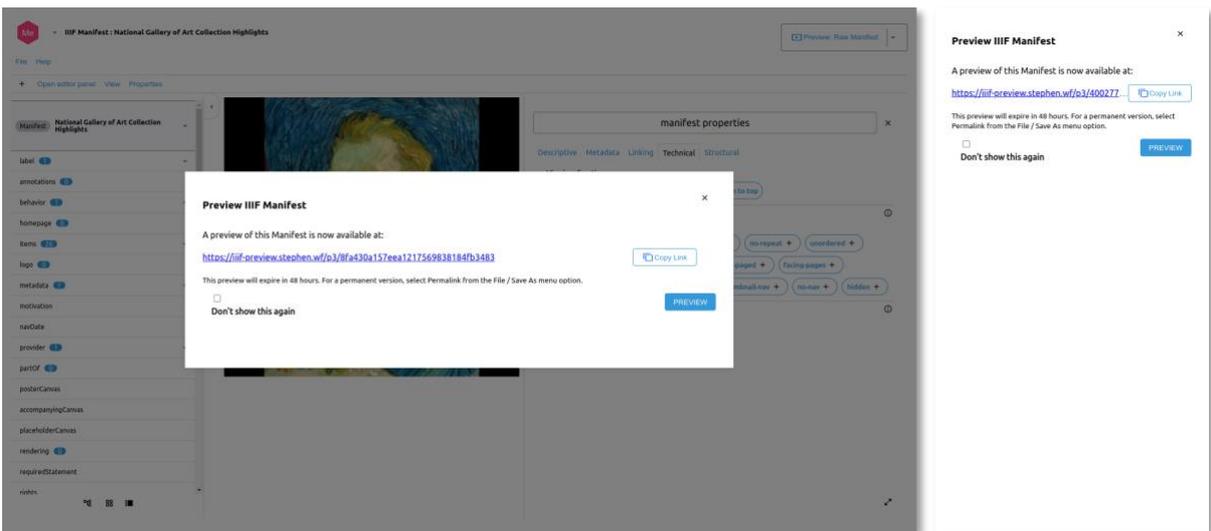


Figure 28: An example screenshot taken from the initial test version of the new Digirati IIF Manifest Editor, showing how the system can create a live preview version of a Manifest, allowing users to visualise the results within other IIF systems and viewers. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).



Figure 29: An example section of one of the IIIF Manifests processed using the initial test version of the new Digirati IIIF Manifest Editor. (Screenshots displaying the responsive formatting of a desktop and mobile presentation).

Findings and Discussion [D5]

It was possible to publish zooming images before IIIF was created but by providing a shared and open approach to handling and presenting digital content, the development of IIIF and the growing range of IIIF compliant open tools and services has made it so much easier and sustainable for institutions to publish and exploit their digital resources. However, IIIF goes far beyond simple presentation and can allow the same digital content to become dynamic, citeable, re-usable “research” resources that can be exploited for professional or personal purposes, but only if users had the technical skills to construct their own IIIF Manifests to group and describe the IIIF resource they want to exploit. The development of this new, improved and user friendly, IIIF Manifest Editor is a key step to lowering this technical expertise barrier, and begins to put more of the power of IIIF directly into the hands of individual users.

“While most [IIIF] Manifests today are published by automated workflows, the ability to hand-craft [IIIF] Manifests opens up many potential applications for research and scholarship as well as creation of bespoke content for digital user experiences: stories, slide shows, exhibitions.”⁹⁹

Work on the D5 - The New Digirati Manifest Editor has progressed very well within the scope of this project, creating the initial alpha version based on the survey S4 – Manifest Editor User Requirements and further community engagement.¹⁰⁰ This initial version of the tool also underwent user evaluation, as the Practical IIIF project was coming to an end, which is summarised in Appendix F - IIIF Manifest Editor - Usability test and recommendations.

⁹⁹ Taken from: <https://github.com/digirati-co-uk/iiif-manifest-editor/wiki/Product-Vision>

¹⁰⁰ The full list of user requirements has been distilled into a series of Issues within the IIIF Manifest Editor’s GitHub repository: <https://github.com/digirati-co-uk/iiif-manifest-editor/issues>

The development of this tool is continuing on beyond the end of this project, based on this evaluation work, supported through funds from an additional external collaborator - Delft University of Technology Library,¹⁰¹ who have been supporting the development of Manifest editing tools for several years.¹⁰² The potential of this tool is also of great interest to the wider IIF community¹⁰³ and to ensure its continued impact and exploitation the software has been released under an open MIT licence¹⁰⁴ and ensures the software and its source code will continue to be freely available and be open to community development or further funded support from future projects and programmes.

¹⁰¹ <https://www.tudelft.nl/library>

¹⁰² <https://github.com/digirati-co-uk/iiif-manifest-editor>

¹⁰³ This can be seen from the direct engagement with the work via GitHub, the IIF Slack Channel and during the various related presentations within the project webinars and IIF community events.

¹⁰⁴ <https://github.com/digirati-co-uk/iiif-manifest-editor/blob/main/LICENSE>

Appendix B – Understanding User Needs and IIF Adoption (S2)

Results of a 2021 community survey – April 2022

Introduction

Since 2011, the Image Interoperability Framework has provided a set of open standards and best practices for delivering high quality digital objects online at scale, in a way that could be integrated across different collections and communities. From late 2020, ‘Practical Application of IIF as a Building Block Towards a Digital National Collection’ AHRC funded project began to analyse how institutions and users are currently engaging with IIF, and how the IIF community can best support those who wish to implement or make further use IIF. Here we report on a survey of the user community, conducted in Autumn 2021, to understand the needs of the international network in further adoption of IIF. Four central themes emerged: that there is some confusion about what ‘using IIF’ actually means; concern that the lack of IIF implementation in smaller institutions is contributing to a ‘digital divide’ in which their collections are under-represented when looking at the GLAM sector as a whole; the value of creating step-by-step implementation guidance; and the need for IIF advocacy information, designed to speak to both technologists as well as senior managers and directors. This survey and its analysis have demonstrated that if IIF is to be used to underpin digitisation activities in the UK’s national infrastructure, resources will need to be available for advocacy, training, and supporting smaller institutions into adopting the framework.

IIF and the ‘Practical Applications of IIF’ Project

From the late 1990s, many GLAM institutions worldwide began to digitise their collections of manuscripts, archives, rare books, and artworks in ever increasing numbers, mostly to improve access to researchers and other users.¹⁰⁵ While standards for digital image capture rapidly emerged, the resulting digitised content (the vast majority of which is digitised images) resided only in institutional content management systems, effectively siloed from being available for comparison, sharing, analysis and annotation.¹⁰⁶ The IIF, which aims to provide the mechanism by which institutions can share their digital collections while also maintaining control over image quality, licensing, and ownership, had its beginning in the first decade of the 2000s. Major holding institutions – among them the British Library, the Bibliothèque nationale de France, the Bayerische Staatsbibliothek, the Wellcome Library, The Parker Library (in conjunction with Stanford University), the Bodleian Library, Johns Hopkins University and e-codices (the Virtual Manuscript Library of Switzerland) came together in order to present their digitised content on the web. Each institution set up an independent repository and relied upon bespoke development to create viewers to display

¹⁰⁵ M. Terras, “The Rise of Digitization” 2011. In: R. Rikowski (ed). *Digitisation perspectives*, 2011, p. 3-20. Rotterdam: Sense Publishers.

¹⁰⁶ M. Terras. “Cultural heritage information: Artefacts and digitization technologies”, 2015. In Ruthven, Ian, and Gobinda G. Chowdhury, eds. *Cultural Heritage Information: Access and Management*. 2015, p. 63-88. London: Facet Publishing.

their images and the associated metadata.¹⁰⁷ Search was limited to single institutions, and integration with other web applications, such as those for transcription or reference platforms, was dependent upon the transfer of copies of images from one repository to another, an expensive, labour intensive, and, often, lengthy process.

As early as 2003, the utility of combining images and metadata from various libraries was elucidated by Barbara Shailor in her discussion of the manuscript fragments created by Otto Ege (1888–1951),¹⁰⁸ a self-titled ‘Biblioclast’ who purchased entire manuscripts before he broke them apart into individual folios or bifolios for resale in sets or as individual leaves.¹⁰⁹ Shailor posited that ‘the advent of electronic technology holds remarkable promise for re-assembling the fragments [...]’, and suggests that if institutional repositories and private collectors were willing to image their ‘Ege leaves’, these images could then be compiled into a singular database and the hundreds of codices that Ege broke could be, at least in part, re-assembled to allow scholars and researchers to consult entire volumes, as if they had never encountered Ege’s razor.¹¹⁰

In the same year, Stanford University partnered with the Parker Library of Corpus Christi College, Cambridge to begin development on the prototype of ‘Matthew Parker on the Web’, funded by an initial grant from the Mellon Foundation.¹¹¹ Subsequent Mellon grants not only served to drive the project forward, with *The Parker on the Web 1.0* launching in 2009, but also supported additional, early work around the idea of interoperability.¹¹² The first steps towards what we now refer to as the

¹⁰⁷ T. Cramer, “The International Image Interoperability Framework (IIIF): Laying the Foundation for Common Services, Integrated Resources and a Marketplace of Tools for Scholars Worldwide”, Coalition for Networked Information: Project Briefing, Fall 2011. Available: <https://www.cni.org/topics/information-access-retrieval/international-image-interoperability-framework>.

¹⁰⁸ B. A. Shailor, “Otto Ege: His Manuscript Fragment Collection and the Opportunities Presented by Electronic Technology”, *The Journal of the Rutgers University Libraries*, vol. 60 (2003), p. 17. Available: <https://doi.org/10.14713/jrul.v60i1.4>.

¹⁰⁹ O.F. Ege, “I am a Biblioclast”, *Avocations: A Magazine of Hobbies and Leisure*, vol. 1, no.6 (March 1938), pp. 516 – 520.

¹¹⁰ B.A. Shailor, “Otto Ege”, pp. 17 – 19. For further information about the reconstruction of Ege fragments and its application to the IIIF Framework see B. Albritton, “Thoughts on a Decade of Fragments, Reconstructions, and IIIF”, *Digital Philology*, forthcoming. The author is grateful to Dr Albritton for sharing his copy of his forthcoming publication as well as his council concerning the early evolution of The Parker Library on the Web, SharedCanvas, and the development about IIIF. All errors and omissions taht may follow are the author’s alone.

¹¹¹ <https://mellon.org/grants/grants-database/grants/stanford-university/40300607/>

¹¹² The Mellon foundation awarded four subsequent grants to Stanford University. In 2008, Interoperability of Medieval Manuscripts – Use-Case Study sought ‘to support the creation of new electronic scholarly resources in medieval studies and their interoperability’, (<https://mellon.org/grants/grants-database/grants/stanford-university/40800658/>). In 2010, Interoperability of Medieval Manuscripts – Technical Workshop ‘support[ed] planning for increased interoperability among digitized medieval manuscript resources, (<https://mellon.org/grants/grants-database/grants/stanford-university/21000104/>). Also in 2010, Defining a Modular and Interoperating Environment for Collections of Digitized Manuscripts, Tools, and Users aimed ‘to support the development of standards, services, and scholarly tools that would enhance the use of digitized medieval manuscripts’, (<https://mellon.org/grants/grants-database/grants/stanford->

IIIF were taken in January of 2010, when the first inter-institutional meeting was held at the Bibliothèque nationale de France with both institutional and scholarly stakeholders present.¹¹³ Under the banner of ‘Shared Canvas’, work began in earnest and continued throughout 2010 to create a ‘model based on the principles of Linked Data that [could] be used to describe the interrelationships of images, texts and other resources to facilitate the interoperability of repositories of medieval manuscripts or other culturally important handwritten documents’.¹¹⁴ By building upon the Open Annotation Collaboration (OAC), which facilitates the annotation of any resource with any other resource regardless of media type, in order to connect (annotate) digital images to a section of a predefined area (called the ‘canvas’), and then using an Open Archives Initiative Object Reuse and Exchange (OAI-ORE) Aggregation to define the manner in which those canvas can be ordered and grouped, complex digital objects could be expressed in a standardised way with all of the sequences and annotations collected together in a single unit (referred to as a ‘manifest’).¹¹⁵

On the 12th of September 2011, Stanford received the first Mellon grant under the International Image Interoperability Framework banner, designed ‘to support the development and assessment of a software framework that will make digital images from different collections interoperable’.¹¹⁶ Through a series of working group meetings, the framers of IIIF had defined a collection of Application Programming Interfaces (APIs) that would establish a ‘common language’, allowing each institutional repository to retain control of their images and metadata, while allowing other institutions, platforms, and applications to make use of this content without the need to create and store independent copies nor establish direct links.¹¹⁷ Additionally, the lack of standardisation in the way in which a user was able to interact with a digital object was inhibiting the take-up and use of the available digital resources.¹¹⁸ September 2011 also saw the release of the first draft of the Image API, which ensured that digital images could be processed in similar ways across platforms, was

university/31000680/). Finally, in 2010, Interoperability of Medieval Manuscripts – Phase II was awarded ‘to support the further development of standards and services that would enhance the use of digitized manuscripts’, (<https://mellon.org/grants/grants-database/grants/stanford-university/31200641/>). Benjamin Albritton served as project manager on each of these grants.

¹¹³ Personal communication with Benjamin Albritton, 10 January 2022.

¹¹⁴ R. Sanderson, B. Albritton, R. Schwemmer, & H. Van de Sompel, “SharedCanvas: a Collaborative Model for Medieval Manuscript Layout Dissemination”, Joint Conference on Digital Libraries (2011), p. 1. Available: <https://arxiv.org/pdf/1104.2925.pdf>.

¹¹⁵ R. Sanderson, B. Albritton, R. Schwemmer, & H. Van de Sompel, “SharedCanvas: a Collaborative Model for Medieval Manuscript”, pp. 5 - 6. For further information about the SharedCanvas model see: R. Sanderson, B. Albritton, R. Schwemmer, & H. Van de Sompel, “SharedCanvas: a Collaborative Model for Digital Facsimiles”, *International Journal on Digital Libraries*, vol. 13 (2012), pp. 3 – 16. R. Sanderson, H. Brugman, B. Albritton, & H. Van de Sompel, “Evaluating the SharedCanvas Manuscript Data Model in CATCHPlus”, (2011). Available: <https://arxiv.org/pdf/1110.3687.pdf>.

¹¹⁶ <https://mellon.org/grants/grants-database/grants/stanford-university/41100102/>.

¹¹⁷ T. Cramer, “The International Image Interoperability Framework (IIIF)”.

¹¹⁸ T. Cramer, “The International Image Interoperability Framework (IIIF)”.

released for comment by the founding participants,¹¹⁹ and plans were laid for the creation of metadata and annotation APIs.¹²⁰

The SharedCanvas structure and data model came to be integrated into IIIF as the Presentation API, taking the place of the proposed ‘Metadata and Annotation APIs’ referred to by Cramer in his presentation to the *Coalition for Networked Information*. In the last decade, IIIF has grown considerably, it now encompasses six distinct APIs,¹²¹ documenting an open standard approach to the management and presentation of media on the web. Collectively these APIs govern the way in which images and metadata are presented on the web (Image and Presentation API), allow users to search within the metadata associated with a IIIF manifest (Content Search), see when manifests have been modified (Change Discovery), permit access only for certain users (Authentication), and allow for a user to share a specific view or sections of images via a simple link (Content State). All of this together serves to facilitate research across institutions and collections, without the need to download large image files. Support for the framework has expanded: from the 15 original members who joined the IIIF Consortium in 2015, today there are 63 Consortium members,¹²² IIIF has been implemented in hundreds of institutions across the globe, and the recent annual conference had more than 2,000 registered attendees.

Begun in December of 2020, ‘The Practical Application of IIIF as a Building Block Towards a Digital National Collection’ project (<https://tanc-ahrc.github.io/IIIF-TNC/>)¹²³ is part of the larger ‘Towards a National Collection’ initiative (<https://www.nationalcollection.org.uk/>),¹²⁴ funded by the Arts and Humanities Research Council (AHRC), part of UK Research and Innovation. The project aims to explore the ways in which IIIF can be implemented by heritage institutions and researchers to share, present and re-use high quality images and media on the web, as well as ‘develop the potential for IIIF to virtually connect collections from different organisations, allowing users to experience and dynamically interact with collection images and related material [... and develop] a selection of targeted IIIF demonstrators showing how collection and cross-collection research can be presented, how high resolution images can enhance publications, and how researchers can create their own IIIF presentations’.¹²⁵ Led by Joseph Padfield from the National Gallery, the project team consists of a Senior Research Fellow, Anne McLaughlin, and representatives from seven other UK Heritage Institutions, a commercial partner, and the IIIF Consortium.¹²⁶

¹¹⁹ Bibliothèque nationale de France, The British Library, Cornell University, Los Alamos National Laboratory, Nasjonalbiblioteket (the National Library of Norway), Oxford University (The Bodleian Libraries), and Stanford University, with additional support funded by the Andrew J. Mellon Foundation.

¹²⁰ T. Cramer, ‘The International Image Interoperability Framework (IIIF).

¹²¹ Image API (v3.0), Presentation API (v3.0), Authentication (v1.0), Content Search (v1.0), Change Discovery (v.1.0), and Content State (v.1.0). See <https://iiif.io/> for more information.

¹²² For a full list, see <https://iiif.io/community/consortium/members/>.

¹²³ <https://gtr.ukri.org/projects?ref=AH%2FT011084%2F1>

¹²⁴ <https://gtr.ukri.org/projects?ref=AH%2FV000802%2F1>

¹²⁵ J. Padfield, *The Practical Applications of IIIF as a Building Block Towards a Digital National Collection: Interim Report (2020)*, p. 1.

Method

The survey upon which this report comments was intended to understand the ways in which people are currently engaging with IIF as well as evaluate how the IIF community can support those who wish to implement or use IIF and reflect upon the project's activities up in the first nine months of activity. The survey ran from 9 September 2021 – 12 October 2021 and garnered 42 valid responses.¹²⁷

The 'Practical Application of IIF' collaborated on developing a 12-question survey that would take no more than 10 minutes for respondents to complete. Ethical approval was granted by the University of Edinburgh, and the survey was hosted by Jisc Online Surveys, a GDPR (General Data Protection Regulation) compliant research questionnaire platform. It was disseminated through the IIF newsletter, the IIF slack channel, and IIF-Discuss (a Google Group that functions as an online forum and message board).¹²⁸ The survey was additionally sent to the participants who agreed to be contacted from the second project webinar, *IIF Services and Tools*,¹²⁹ and a seminar discussing *Image Registration and IIF*.¹³⁰ The survey was also shared through email lists including the Digital Libraries Federation (1,269 subscribers),¹³¹ Museum Computer Network (644 subscribers),¹³² The Consortium for European Research Libraries (CERL) mailing list, Code4Lib (3,760 subscribers),¹³³ and LIS-Rarebooks (915 Subscribers).¹³⁴ The study did not store personal information, or any protected characteristics data from participants: results were fully anonymized.

As most of the questions were open ended, the feedback received by the project has been categorised and responses grouped together along thematic lines to more quantitatively understand the needs and desires of our respondents. Each question is summarised below, followed by a brief discussion.

¹²⁶ Co-investigators: Melissa Terras (University of Edinburgh), Neil Fitzgerald and Torsten Reimer (The British Library), and Charlotte Boland (the National Portrait Gallery). Other project members: Luca Carini and Richard Palmer (the Victoria and Albert Museum), Tom Cramer (Stanford University Libraries), Tom Crane and John Baker (Digirati Ltd.), Roger Hyam and Lorna Mitchell (the Royal Botanic Gardens Edinburgh), Glen Robson (IIF-C), and Jamie Unwin (the Science Museum Group).

¹²⁷ The total number of respondents was 44; however, two respondents were removed as every field in the survey was left blank.

¹²⁸ The IIF-Discuss forum can be found at <https://groups.google.com/g/iif-discuss>.

¹²⁹ <https://tanc-ahrc.github.io/IIF-TNC/webinar02.html>

¹³⁰ <https://tanc-ahrc.github.io/IIF-TNC/seminar01.html>

¹³¹ dlf-announce@lists.clir.org

¹³² mcn@groups.io

¹³³ code4lib@lists.clir.org

¹³⁴ lis-rarebooks@jiscmail.ac.uk

Questions

Our first two questions were designed to understand the audience that our survey had reached by asking about the ways in which a respondent had engaged with IIIF personally, and their level of experience with the various implementations and manners in which IIIF is often deployed.

The first question asked users to ‘describe their relationship with IIIF’, giving them seven predefined options: ‘I plan adoptions and/or implementation of IIIF’, ‘I generate content for IIIF dissemination’, ‘I technically implement IIIF services’, ‘I am a research user’, ‘I engage with IIIF for fun’, ‘I have never used it’, and ‘Other’ – which then invited respondents to contribute their own response, see Figure 30. Formulated as a multiple-choice question in which a single respondent could select more than one option, 16 of our 42 (38%) respondents choose more than one answer. The most frequent answer, selected by 12 respondents, was ‘I plan adoption and/or implementation of IIIF’ suggesting a high-level of understanding about the functionality to be gained in deploying IIIF, even if they may not be able to implement the framework technically.¹³⁵ Eleven respondents stated that they ‘technically implement IIIF services’, and 10 respondents identified themselves as ‘research users’. Perhaps most tellingly for this section of the survey, 10 respondents also stated that they had ‘never used IIIF’.

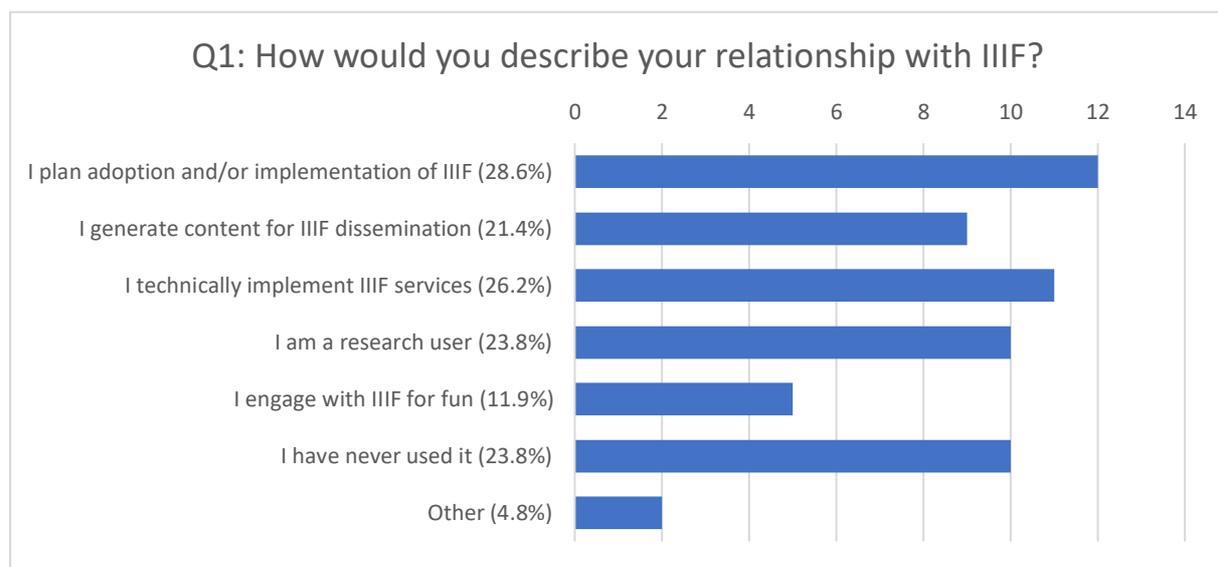


Figure 30: A summary of the responses to responses to Question 1: How would you describe your relationship with IIIF?

Identical in format to the first question, the second question was multiple-choice and allowed respondents to select more than one answer. However, unlike question 1, a majority did emerge as 22 of our 42 respondents (52.4%) have engaged with resources which use IIIF to deliver images (Figure 31). The second most popular response, with 16 respondents, was that these users had ‘never used IIIF, but would like to learn more’. Given that only 10 respondents indicated that they

¹³⁵ Of the 16 respondents, only 3 indicated that they were also active in the technical implementation of IIIF.

had ‘never used IIF’ in question 1, the addition of six respondents here is noteworthy; especially since four respondents who stated that they ‘never used IIF’ also stated that they have engaged with ‘resources that deliver images via IIF’. Selecting both statements seems to indicate that there is a divide in the way that IIF is understood in the community of people that we surveyed with some respondents believing that ‘using IIF’ perhaps refers to the process of creating resources rather than engaging with existing resources. It is possible that these respondents are mirroring the language used for other presentation tools: one would ‘use PowerPoint’ to create a presentation but would not be ‘using PowerPoint’ when clicking through slides on a website. However, within the IIF framework, the ability to manipulate images within an online viewer through utilising even basic functionality, such as the ability to seamlessly deep zoom, means that the user is utilising IIF, even though they may not believe that they are doing so.¹³⁶

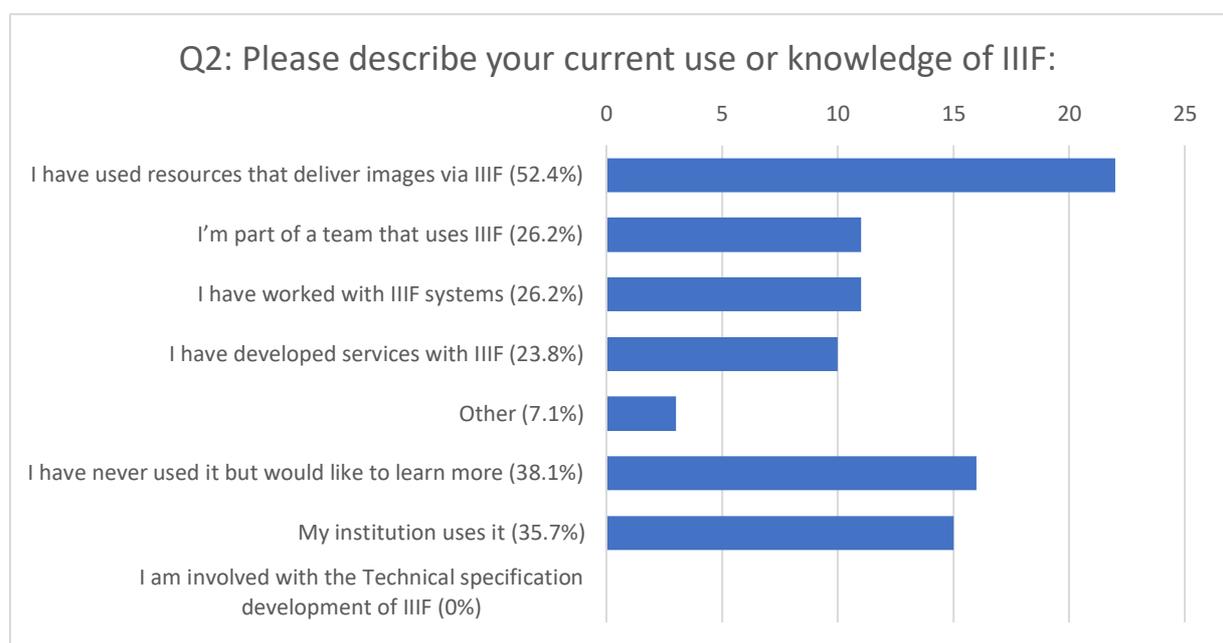


Figure 31: A summary of the responses to responses to Question 2: Please describe your current use or knowledge of IIF.

Question 2 also revealed the level of institutional take-up of IIF as 15 of our respondents also reported that their institutions use IIF, with one of the ‘Other’ responses stating the ‘my institution is beginning to use it [IIF]’. The active engagement of GLAM organisations with IIF is fundamental to the utility of the framework as the more content that is made available via IIF, the greater the possibility for cross-collection work and general interoperability. Additionally, almost all the respondents who indicated that their institutions used IIF reported that they had other knowledge

¹³⁶ The ability to engage with IIF resources, without realising that you are engaging with IIF, might be an indicator of the success of the framework as the users are able to work with resources without needing additional support or finding the experience too challenging. However, the fact that IIF resources can be seamlessly integrated into existing web platforms could also contribute to the lack of ‘brand’ recognition of IIF as an independent framework and as something that a ‘non-technical’ user can also engage with.

areas relating to IIF (Figure 32).¹³⁷ While it is not enough to clearly demonstrate that institutional adoption is driving user knowledge, it does perhaps indicate that those respondents who work at institutions that have adopted IIF see themselves as engaging more broadly with it.

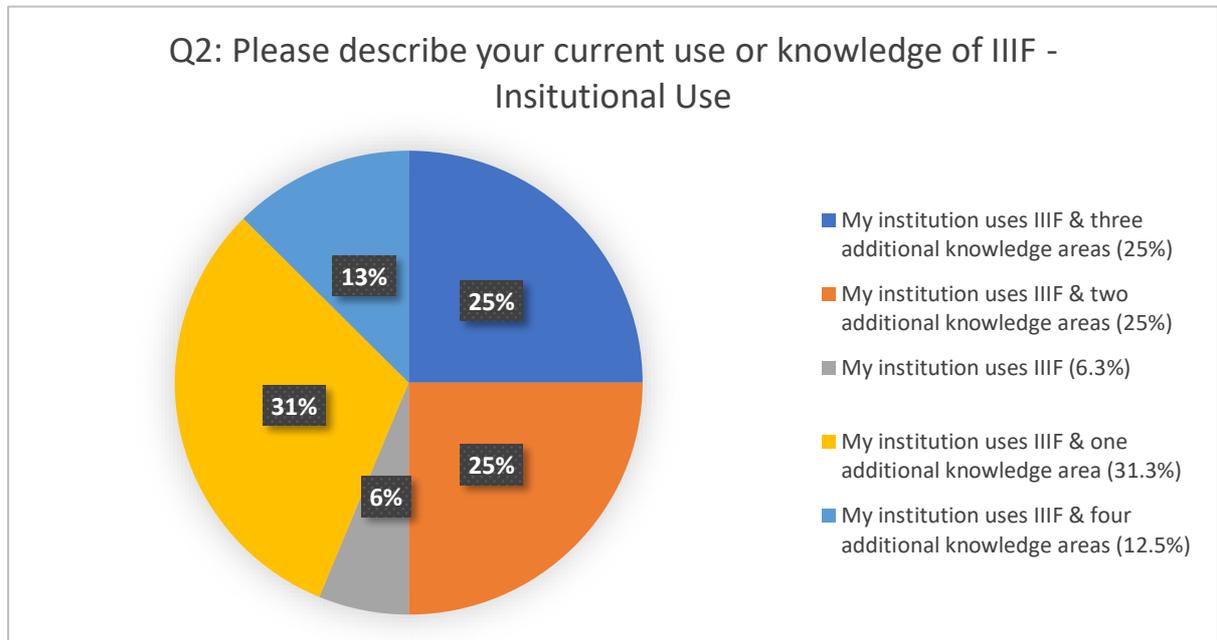


Figure 32: From the answers for Questions 2: Extent of further areas of IIF knowledge for Institutions using IIF – relates to 16 of the total responses (42).

The next set of three questions focused on the work of the ‘Practical Applications of IIF’ project seminars and webinars, as we directly sent the survey to attendees who had given us permission to contact them subsequently. We sought to understand what proportion of the respondents had participated in our webinar and seminar series, what was most useful, and what we as a project ought to be doing to support the cultural heritage community.

Question 3 simply laid the groundwork asking whether the respondent had ever attended any of the ‘Practical Applications of IIF’ events or accessed any of the content online subsequently.¹³⁸ Nineteen

¹³⁷ The respondent who indicated in the ‘Other’ field that their institution is ‘beginning to use it [IIF]’ also reported that they ‘used resources that deliver images via IIF’, had ‘worked with IIF systems’ and had ‘developed services with IIF’. Their responses are included in the ‘My institution uses IIF & three additional knowledge areas’ in Figure 32, however, in this case, it may be that this respondent is driving IIF engagement at their institution rather than developing additional knowledge areas as a product of institutional involvement.

¹³⁸ Transcripts, videos and slides are all available via the ‘Practical Applications of IIF’ project website: <https://tanc-ahrc.github.io/IIF-TNC/events.html>. We also created Zenodo repositories for each of our events in order to provide them with persistent identifiers and allow for all of the content to be downloaded after each event. Webinar 1: Showcasing the Practical Applications of IIF

respondents (44.2%) replied that they had attended at least one event, 24 respondents (55.8%) had not. Question 4 was addressed to those who had attended one of our events and asked whether the attendee had ‘any comments on what was most useful to you from these events’. In general, the responses that we received can be grouped into three main categories: ‘open discussions’ (two comments), ‘brief overviews of projects and people’ (five comments), and our ‘range of topics and implementations’ (six comments). Attendees generally liked the fact that each of our events included a range of speakers from a range of institutions and projects, and from a range of backgrounds: from individual researchers seeking to present records of the Somali community in London, to the complex integrations at the National Library of Wales, from photographers to computer programmers, from scholars to commercial vendors of technical solutions incorporating IIIF. In addition to these more positive comments, two respondents also provided some constructive criticism. In the first case, they wished that the webinars had been more focused, with common objectives and a more practical ‘hands on’ approach; in the second, they wished that we had focused more on ‘how’ to build resources with IIIF, rather than show ‘what’ was possible so that they could ‘advise researchers and users how they can use IIIF content more imaginatively’.¹³⁹

Question 5 asked our respondents to consider ‘what they would like to see the ‘Practical Applications of IIIF’ project doing ‘right now’ to support the cultural heritage community’. Seven of our respondents stated that links to or a ‘getting started with IIIF’ tutorial would be most useful with an additional respondent stating that they wished that IIIF were ‘simpler’. Such comments are well founded, as often it is difficult to begin to engage with IIIF as an individual, especially for those without a technical background. While simple, easy to use tools and services that allow individuals to engage with IIIF content without needing to set up their own image or annotation servers may be a way to break down the barriers to entry for researchers or scholars, there is little straightforward guidance to support a small institution who is looking to engage with the wider IIIF community. Four comments focused on the need for advocacy for IIIF beyond the tech community, perhaps by generating sample content that could be shared with collaborators who might use IIIF if they knew about it. In a similar vein, two respondents mentioned that they would value more open collaboration with peers, either through knowledge sharing or a mentorship scheme, whereas three respondents sought out-of-the-box solutions, either from vendors, or infrastructure projects on a local or national level to ‘enable smaller, less technical, less resourced institutions to engage

is available: <https://doi.org/10.5281/zenodo.4629373>; Webinar 2: IIIF Services and Tools is available: <https://doi.org/10.5281/zenodo.5137298>; The Seminar on Image Registration is here: <https://doi.org/10.5281/zenodo.5215677>. We have subsequently run additional events after the closing date of the survey. A seminar in collaboration with the Heritage PIDs project, also part of the Towards and National Collection initiative. The materials connected to this event are also available via Zenodo: <https://doi.org/10.5281/zenodo.5780055> and then our final project webinar looking at Project Outcomes and Future Directions available: <https://doi.org/10.5281/zenodo.6587143>.

¹³⁹ In addition to the critiques given above, we did also receive a few comments related to the fact that the ‘Practical Applications of IIIF’ project has run alongside the Coronavirus pandemic, necessitating almost all of our project engagement, along with everybody else’s work, moved from physical events to online seminars and webinars. Respondents noted that ‘they couldn’t recall which IIIF events were related to this project’, and another respondent commented ‘I think I’ve watched presentations from this project – I don’t tend to think about where presentations come from. I’ll take another look now though’.

practically'. Drawing this all together, the picture emerges of individuals and small institutions who are seeking to explore the possibilities of IIIF but find themselves overwhelmed by either the technical or perceived financial barriers to entry and are in need of simple, clear instructions about how to begin engaging with IIIF paired with their need to be able to explain and demonstrate the benefits to internal or external stakeholders.

In question 6, we sought to look beyond the 'Practical Applications of IIIF' project to examine what our respondents were interested in with regard to IIIF, but perhaps beyond the scope of the project. In answering 'What themes do you want to see explored in upcoming IIIF events?', our respondents tended to be more granular, seeking sessions on annotations (2), cross-collection working (2), image and metadata management (2), copyright concerns (2), and hierarchical descriptions (1). In addition to these more discrete issues, our respondents also echoed many of the concerns that they highlighted in question 5, with three respondents asking for a 'Beginners start guide for GLAM institutions', two asking for practical demos that could be copied or reused, and two more asking for demonstrations as to how IIIF has been implemented to demonstrate impact and establish institutional worth. However, far and above the other concerns, 13 respondents wanted to know 'how to deploy IIIF infrastructure in their own work or for their institution'. While some respondents in question 5 did mention that they'd like resources about 'getting started', the strong response to this question seems to suggest that while work still needs to be done regarding specific areas within the IIIF specification and institutional buy-in, for many of our respondents, they are ready to begin exploring IIIF and are looking for a concrete, step by step guide to setting up their own infrastructure. The raising of this concern in response to a question about IIIF events, rather than part of the 'Practical Applications of IIIF' project can also be seen as indicative of the kind of training that our respondents are looking for. While the project focuses on demonstrating what people and institutions can do with IIIF, in this case our respondents are asking to go back a few steps and receive help setting up their own IIIF implementations.

The responses to question 7, 'What can be done to make future IIIF events more useful?', further affirm the theme that emerged from both question 5 and 6: users are looking for workshops and tutorial sessions which are aimed at beginners that walk them through a first implementation of IIIF. Of the 13 responses that we received, seven respondents asked for workshop sessions for absolute beginners. While most of these responses were rather general – 'Have "beginners" sessions, that assume no knowledge and talk us through its [sic] uses, and how we can engage'; 'very practical, basic, starting points for non-technical people'; 'perhaps a hands-on beginners' workshop – not aimed at implementation on an organisational scale, but for researchers and collections managers who might want to use IIIF'; 'more tutorial/workshop style of events' – some were quite specific:

"Perhaps a short series where you do things in between each one, more like a course? So, a set of webinars or something a bit like the Library Carpentry set up? Most of the ones I have seen advertised seemed too advanced for me as a complete beginner or are just a brief description of it rather than walking you through setting up a trial project using it."

Thus, not only are our respondents generally saying that they'd like help getting started, they are concretely envisioning what form that help might take, and, having seen what they are able to do with IIIF, the focus has shifted from applications of IIIF to instantiating IIIF environments.

While our previous questions had focused on IIIF events, in question 8 we wanted to be more general, asking ‘What challenges do you encounter when using or implementing IIIF, and what would help you?’. Many of the 24 answers that we received to this question touched upon multiple, and often overlapping points; however, the three main things that emerged were the need for institutional buy-in from users as well as upper management, a lack of understanding about how IIIF may be applied in ‘unideal’ conditions (e.g. where metadata is not standardised, images are of low quality, or how the structure of a manifest can be adapted to represent archival collections), and technical difficulties with regard to insufficient infrastructure or institutional know-how, both with regard to initial set-up as well as how to more fully make use of IIIF-compliant services and tools. In responding to what may help a user overcome these challenges, the answers tended to centre around more worked examples, especially examples that break down step by step the way in which IIIF has been implemented, and examples that deal with real-world, ‘imperfect materials’. In essence, the respondents to this question often cited the same challenges that they would like to see addressed in future IIIF events but didn’t tend to cite the need for more specific training, but rather introductory guides and supporting materials that they could follow without needing to read ‘though GitHub, which sometimes is great, sometimes confusing’.

When asking specifically about ‘additional training or support that [users] would like to see implemented in the IIIF space’, respondents tended to focus on the increased technical training and support, offering responses such as: ‘Examples of end-to-end deployments’, ‘hands on tutorials on YouTube’, ‘Maybe provide ready to go docker images? Detailed documentation (or pointers to detailed documentation) for setting up a IIIF server and test client implementation pages’, ‘A course of intro workshops where you actually do it, not watch someone else do it’, ‘technical training based around one well supported version’. Users who described themselves as familiar with IIIF, and who were comfortable engaging with the technical side of framework as identified in question 2, offered positive feedback, stating that they were happy with the training that was already taking place and that they felt that the existing offering was good, with one of these participants suggesting that issuing qualifications or certificates would also be of interest.

Our last pair of questions sought to understand what features our respondents were making use of specifically, and whether they felt that they understood the potential value and utility of the framework more generally, see Figure 33.¹⁴⁰

¹⁴⁰ Question 10 read, ‘What do you find most useful about IIIF? Can you provide an example of where this has helped in your or your institution’s work?’; Question 11, ‘Do you feel like you have a good understanding of the value and utility IIIF can provide? If not, what might help you get a better sense?’

Q11. (Optional) Do you feel like you have a good understanding of the value and utility IIF can provide?

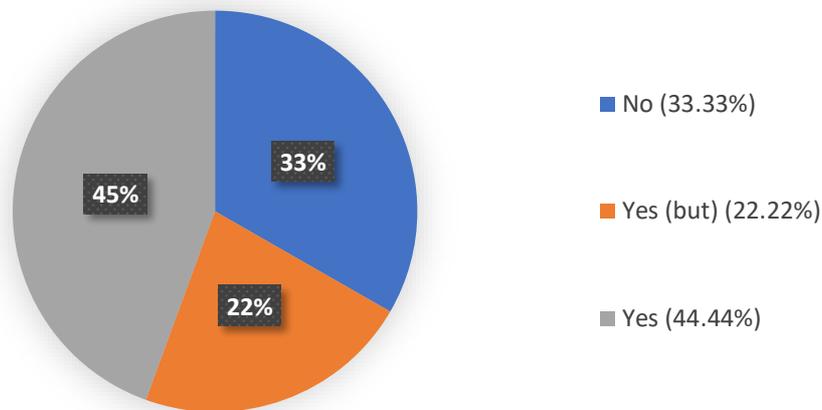


Figure 33: A summary of the responses to Question 11: Do you feel like you have a good understanding of the value and utility IIF can provide – relates to 18 to the total responses (42)

In considering the features that our respondents are already using, the ability to compare images (four times), work across collections (six times), and quickly access high resolution images via deep-zoom (five times) were all mentioned frequently, and often in combination with one another. This can perhaps be attributed to the fact that these are some of the most lauded, and therefore the most well-known aspects of IIF; however, the fact that they often were cited by our respondents in describing how IIF has impacted their own work, suggests that these features are valued not only individually, but for the effect they can have when used together within a single platform.¹⁴¹ Several respondents commented as well on the way in which using IIF resources has changed their research practice, opened up collections, and lowered barriers when approaching digital humanities projects:

“IIF makes it possible for my team to create digital humanities projects (such as the digital edition we’re working on) without having to host the facsimile images on our own server. With the help of IIF, my team is able to create a resource based on publicly-available facsimile images without having to travel to the holding institution and without having to unnecessarily duplicate the work done by the holding institution to host and store the images. This is a huge step toward democratizing the DH field, in that it removes the (often insurmountable) barriers of physical proximity to the holding institution and digital storage infrastructure.”

In addition to benefiting researchers, several respondents commented on the benefits IIF had to their institutions, from ‘saving staff time as images can be downloaded from the viewer instead of having to be sent to readers’, to commenting that ‘since we implemented IIF as part of our digital library usage of some manuscripts have increased significantly. It is anecdotal, but IIF appears to be having a direct and positive impact of researchers using our materials’.

¹⁴¹ Owing the dual focus given on comparison and cross-collection work, it is logical to assume that the majority of our users are using Mirador as their IIF viewer of choice, given the primacy it gives to comparative work.

When considering whether our respondents felt that they understood the potential utility and value of the framework, of those that answered the question, most of those who responded answered ‘Yes’ (66.7%), see Figure 33. However, both beginners as well as advanced IIIF-users highlighted that while they understood the benefits of IIIF, that they remained confused about some of the technical details.¹⁴² For example, one user remarked that ‘Yes [they did understand, but] it is just still a little mysterious how to get started and to use IIIF on a regular basis’, while another stated that:

“Yes, I think so. Links with Linked Data / triple stores etc. are a bit unclear. i.e. annotating an image with IIIF creates new data. Where is that data stored? Is IIIF responsible to saving it? Is activity streams the only schema supported?”.

In sum, it appears that it is clear that our respondents do understand the benefits, but, in many cases, they do not understand how to get there.

Our final question asked if there was anything else that the survey respondents would like the organisers to know about their use or opinion of IIIF. In this section, the participants again highlighted both their interest and their concerns regarding IIIF implementation in smaller institutions, including those that lack IT teams, stating that they would both like to see examples of how smaller institutions could implement IIIF, but that they fear that there will likely be a clear divide between larger institutions who have resources to spend on development and smaller GLAM organisations who don’t have the institutional capability to implement IIIF. There was further call for step-by-step guides, though rather than focusing on implementation, the respondent instead was looking for a guide to implementing various features within the specification. Finally, some respondents provided advice about pitching and positioning IIIF within the sector: suggesting that IIIF highlight the open-source nature of its development and the tools that utilise it,¹⁴³ noting Islandora 8 will include improved IIIF functionality,¹⁴⁴ and pointing out the recent usability study presented at the IIIF conference in 2021 was ‘a high-point’.

¹⁴² Please note that many responses included both a positive response (e.g. ‘yes’), but also indicated that they had technical challenges. Of the 18 responses to this question, ‘Yes’ appeared 12 times, comments about technical challenges appeared 8 times (including in some of the Yes and No responses), and there were two other simple ‘No’ responses.

¹⁴³ A further comment in this section also noted that the ‘Diversity of representation in the development of IIIF and relevant tools is limited.’ (Respondent 83505416). While this critique is valid, it is perhaps more widely reflective of the IT sector as a whole. Looking at gender alone, according to the PwC UK research report, Women in Tech: Time to Close the Gender Gap, only 23% of jobs in the STEM fields are held by women, with 5% of leadership positions in the tech field are held by women. Report available: <https://www.pwc.co.uk/women-in-technology/women-in-tech-report.pdf>.

¹⁴⁴ Islandora is an open source, Digital Asset Management system which works on a Drupal website. Further information about the platform is available here: <https://islandora.github.io/documentation/>

Discussion

Nineteen years after the initial Mellon grant, and 11 years after the first grant mentioning IIF by name, the IIF has made great strides, serving billions of images daily from institutions around the globe. A decade since its beginning, this survey was both intended to reflect upon the existing implementations of IIF as well as consider the way in which IIF might develop in the future. Over the course of the 12 questions, four central themes emerged: that there is some confusion about what ‘using IIF’ actually means; the lack of IIF implementation in smaller institutions is contributing to a ‘digital divide’ in which their collections are under-represented when looking at the GLAM sector as a whole; the value of creating step-by-step implementation guidance; and the need for IIF advocacy information, designed to speak to both technologists as well as senior managers and directors.

Emerging from our first two questions, along with free text responses throughout the course of the survey, there seems, as noted, to be some confusion about what exactly ‘using IIF’ means. While only ten of our respondents noted that they ‘had never used IIF’ in the first question when asked to define their ‘relationship to IIF’, in question two 16 of the respondents stated that they ‘had never used IIF’ but would like to learn more’ when asked about their ‘current use and knowledge’ of IIF.

Of those six extra people from the second question, two defined themselves as ‘research users’ in the first question, three further respondents stated that they ‘planned adoption or implementation of IIF’, with one of these three also stating that they ‘generated content for IIF dissemination’, and the last of the six answered ‘other’ to the first question, clarifying that her institution was in the process of implementing IIF, but had yet to do so.

Furthermore, out of all 16 respondents who stated that they ‘had never used IIF’, four stated that they had also used IIF to look at images. Putting this all together suggests that respondents feel that they are not ‘using IIF’ unless they are engaging directly with the technical aspects of the specification, rather than recognising that the features that are commonly associated with IIF (smoothly-running deep-zoom, standard image viewers, etc.) are also ways of ‘using’ the framework. It is perhaps this separation in defining ‘what IIF is’ that divides the technical users from the other members of the GLAM sector. At the moment, ‘using IIF’ means different things to different communities, a dichotomy that is even reflected on the IIF website where IIF is defined as ‘an open standard for delivering high quality, attributed digital objects at scale. It is also an international community developing and implementing the IIF APIs, backed by a consortium of leading academic and cultural institutions’,¹⁴⁵ while also being defined as ‘a way to standardize the delivery of images and audio/visual files from servers to different environments on the Web where they can then be viewed and interacted with in many ways’.¹⁴⁶ While similar, this inconsistency serves to further obfuscate what exactly ‘using IIF’ entails as the former statement speaks to the technical underpinning of the framework, while the latter statement merely alludes to a standardised way of using content on the web. A simple, singular definition may help to increase recognition of IIF, moving it beyond the ‘early adopters’ – a position that is perhaps best summarised by one of our respondents, ‘I think the big challenge is to convince other libraries/archives to implement IIF. Lots

¹⁴⁵ <https://iif.io/>

¹⁴⁶ <https://iif.io/get-started/how-iif-works/>

of cold feet to fight'¹⁴⁷ – and towards an 'early majority' (Figure 34).¹⁴⁸ This lack of clarity in what exactly 'using IIF' is was also reflected in comments that we received throughout the survey in response to various questions regarding the utility and benefit of IIF that made the point that they found IIF to be a 'a really great tool, but I don't think I understand enough about how it works to really appreciate the benefits'.¹⁴⁹

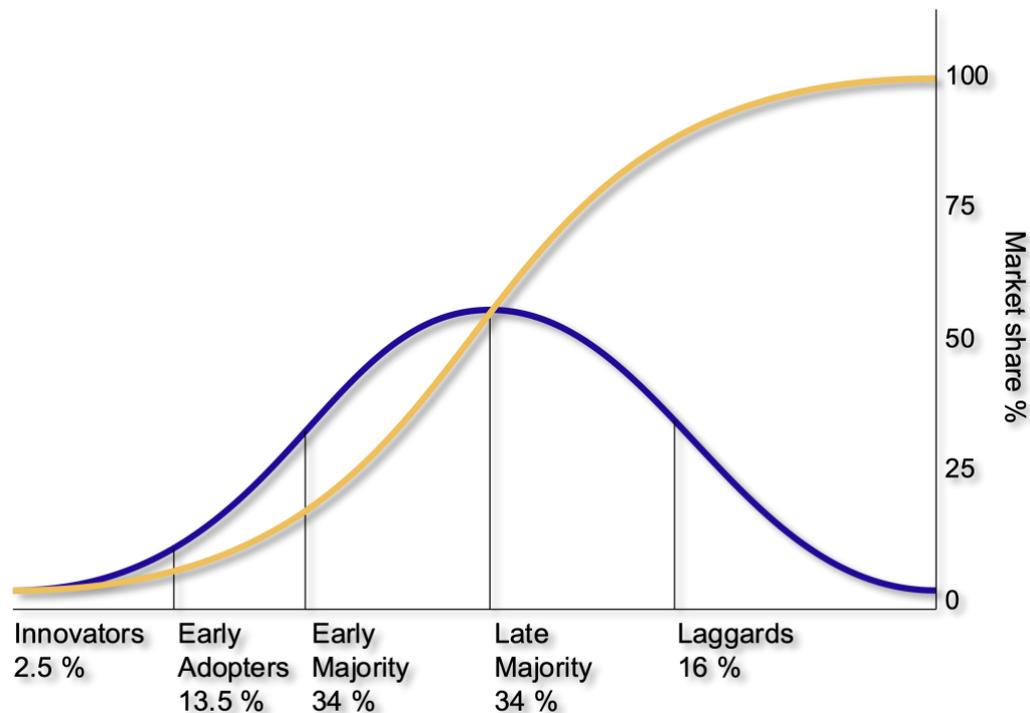


Figure 34: The diffusion of innovations according to Rogers (1962). With successive groups of consumers adopting the new technology (shown in blue), its market share (yellow) will eventually reach the saturation level, Rogers Everett, Public domain, via Wikimedia Commons (https://commons.wikimedia.org/wiki/File:Diffusion_of_ideas.svg)

The second theme that emerged in the survey was a concern about the adoption and implementation of IIF at small institutions who may not have access to the resources, both financial and technical, that larger institutions tend to possess. While this is certainly of great concern to the

¹⁴⁷ Respondent 83409189

¹⁴⁸ The terminology used in this section is drawn from E. M. Roger's *Diffusion of Innovation* (New York: The Free Press, 1983), pp. 247 – 250. Considering the population as a whole, innovators are those who will be quick to adopt to change (2.5% of the population), early adopters make up the next 13.5% and are those who 'are not too far ahead of the average individual in innovativeness [...] and is the embodiment of successful and discrete use of new ideas.' (Rogers, 249). The early majority is deliberate in their decision making, and may look to early adopters for guidance and support. The late majority tend to be sceptical about change and innovation, while the laggards respect the traditional approaches and methods. Figure 34, illustrating the diffusion of these categories within the general population is drawn from Rogers, p. 247.

¹⁴⁹ Respondent 83306572

wider IIF community, the prevalence with which it was mentioned in survey responses, as well as the repeated desire for ‘step-by-step guides to implementation’ for non-technical researchers and staff, perhaps also arises from the fact that the project which commissioned the survey is part of the ‘Towards a National Collection’ initiative. If we are to accurately represent the collections belonging to the ‘nation’, success will depend on the ability for small local museums, archives, and repositories to participate at the same level as the larger museums, libraries, archives, universities and collections. While IIF holds great promise for such a collection in that it alleviates many of the issues surrounding bringing objects from disparate collections together – after all, the roots of the framework can be traced back to ideas akin to Shailor’s desire to reassemble the scattered Ege leaves – the need for IIF compliant image and metadata servers along with an understanding of how the whole system works together is a high barrier to entry without a great deal of explanation that is readily available for consumption by a non-technical audience. While the consortium has made significant strides in recent years in the creation of IIF cookbooks for specific issues or implementations, many of these recipes assume that you have some IIF infrastructure in place, something which is not the case for many smaller institutions across the UK. The ability for an individual or small institution to set up a IIF instance which is sustainable and semi-persistent was often mentioned by our respondents who, rather than wanting to see what IIF can do, want instead to know how to start setting up their own IIF environments to take advantage of the tools and services available to IIF-compliant digital objects. Such users will be starting from scratch, and an easy, step by step guide, an ‘out-of-the-box’ solution, and a low-cost model will be essential in promoting IIF beyond large collections and repositories and facilitate its adoption by a wider audience. Beyond technical infrastructure, the capture of high-resolution digital images is a labour and time intensive process. Coming from major museums and libraries, often images are captured at very high resolutions, allowing users to see individual brushstrokes or the ductus of an individual’s handwriting, but many of the images held by smaller institutions will not be to a similar resolution prompting questions about necessary or desirable standards for capture. All of these concerns were highlighted by one respondent when asked about what they would like to see in future IIF events responded: ‘IIF across cultural heritage (GLAMs). Can you [work] with IIF with few resources and no experience? Do images have to be high resolution? (many institutions have lower resolution content)’.¹⁵⁰

In tandem with support for small institutional collections, another concern that survey participants regularly referred to was the need for information about how to advocate for IIF compliance within their institution in order to speak both to IT staff as well as to senior managers, directors, and developers. As cited earlier, given that explaining what ‘using IIF’ is poses significant challenges, it is understandable that users that are themselves just beginning to engage with the framework may need support from the wider community regarding effective ways to address the benefits and gains that are available to cultural or heritage institutions through IIF adoption. The creation of such documents, or the sharing of documents that have been written for this purpose would certainly be of benefit to the community and might be a valuable way to help colleagues work within their institutions to encourage more engagement with IIF, hopefully leading to the possibility to engage later with the ideas behind the national collection.

¹⁵⁰ Respondent 83403045

Conclusion

We have reported here on a user survey that was undertaken in Autumn 2021 as part of the ‘Practical Application of IIIF as a Building Block Towards a Digital National Collection’ Foundation Project. Through engaging with the digital cultural heritage community – and those interested in using the resources of this community – we have identified a gap between the opportunities posed by IIIF and its standards, and the institutional frameworks that would support its further uptake and use. Given the benefits that IIIF would bring to the UK National Collection, we believe that the programme should advocate for IIIF adoption with both technologists and sectoral management, create implementation guidance, explain the benefits of this approach fully and clearly, and be aware that smaller and less well-resourced institutions will need greater support to implement IIIF across their digitised collections, if they are to be integrated equally into the UK’s Digital National Collection. We thank all the users, and members of our community, who gave their time to engage with these important issues.

Appendix C - IIF implementation (S3)

Methodology

The following table represents the results of an investigation into the public presence of IIF on the websites of 44 major national collections in the UK that was carried out in the third quarter of 2021. The institutions were selected based upon Art UK's ranking system which divides the collections it represents into tiers based upon the number of works in their collections and annual net collection revenue – all of the institutions considered below represent those at the 'Gold' or 'Gold Plus' level. They represent a mixture of Art UK's 'Founder Partners' and 'Current Partners', lists of which are available on their website here: <https://artuk.org/for-collections/partner-collections>. We chose this as an initial sample to begin to understand current uptake and roll out across the UK. Future work could continue this survey across all 135 UK institutions listed at Art UK: in particular, looking at the uptake of IIF amongst smaller partners would help understand barriers in place to implementing this technology in the current financial climate.

Analysis and Findings

The resulting table shows that implementation of IIF is low across these major national collections in the UK, with some IIF enabled collections available only in part. Thirty institutions (68%) had no mention of IIF on their website, and no indication that their collections were being delivered via this mechanism when the code-source of their webpages were examined. Only three institutions (7%) had a significant and clearly marked IIF install, although not all of their collections were IIF enabled (The University of Oxford, The Fitzwilliam Museum at the University of Cambridge, and the National Library of Wales). Three further institutions (7%) had implemented some part of their collections as IIF compliant (The British Library, The National Maritime Museum, and the Science Museum Group). A further eight institutions (18%) did have some IIF functionality but had not mentioned it on their website, and so this was only known by looking at website source code and discovering use of IIF manifests and tools such as OpenSeaDragon, Mirador 2.0 and UV viewers (Aberdeen Art Gallery, Government Art Collection, National Galleries of Scotland, National Portrait Gallery, the Ashmolean Museum at the University of Oxford, the Victoria and Albert Museum, and the Wellcome Collection). This analysis suggests that major institutions with large digital teams and financial resources to support them are more likely to have the resources to update or restructure their collection presentations in order to benefit from the open IIF standards and the free tools and resources it can offer. Therefore, if there is to be an equitable roll out of the technology, then resourcing, advocacy, and support would all be needed to make the most of collections, which have already been digitised in smaller, less financially well-off institutions. However, it also demonstrates that not all major institutions are fully exploiting this technology, and those who do are concentrated in

London and the so-called “Golden Triangle” around it. It would also be useful to recommend that those institutions who have currently implemented any aspect of IIF to make this clear on public-facing websites, including documentation of and pointers to how others can utilise their IIF enabled collections, to make the most of this infrastructure, and the communities that can coalesce around it. Many of the organisations who are not yet exploiting the benefits of IIF, have indicated that they are open to people exploring and re-using their images, as indicated in the provided licensing information, so they are in a good position to explore the opportunities and efficiencies offered by IIF. However, additional help, training, guidance, or infrastructural support may be required in order for them to take full advantage of IIF.

Further work, in relation to institutional use of IIF, was also subsequently carried out within the wider TaNC programme as part of a commissioned Digital Audit, which was only published near the end of the ‘Practical Applications of IIF’ project.¹⁵¹ This work also identified similar levels of IIF engagement, with 30% of the institutions directly reporting current or planned usage of IIF technologies, compared to IIF technologies being identified within 32% of the institutional websites examined as part of this work.

¹⁵¹ Gosling, Kevin, McKenna, Gordon, & Cooper, Adrian. (2022). Digital Collections Audit. Zenodo. <https://doi.org/10.5281/zenodo.6379581>

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Aberdeen Art Gallery (Gold)	https://www.aberdeencity.gov.uk/AAGM	Null	Null	<p>Some of the burial registers we hold for Aberdeen City have been digitised and are available to view at Deceased Online.</p> <p>Kirk Session Records for the whole of Scotland can now be accessed in either of our search rooms. This follows a collaborative project between the Church of Scotland and the National Archives for Scotland.' -- https://www.aberdeencity.gov.uk/services/libraries-and-archives/Aberdeen-city-and-Aberdeenshire-archives/about-archives</p>	<p>The Aberdeen City and Aberdeenshire Archives (part of the larger umbrella organisation reflected in the Art UK entry) participated in the 'Charting the Nation' project (http://www.chartingthenation.lib.ed.ac.uk/). Though it is not mentioned in the technical information, nor on the homepage of the project, the images are presented in a Mirador 2.0 viewer, suggesting some engagement with the IIIF standard on behalf of the project if not the institution itself.</p>	
Arts Council Collection (Gold)	http://www.artscouncilcollection.org.uk/	Null	Null		No evidence of IIIF in use.	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Birmingham Museums Trust (Gold)	https://www.birminghammuseums.org.uk/	Null	Null	Mostly job descriptions, a news update about Birmingham on Demand -- a series of curatorial talks that one could subscribe to during the COVID pandemic. There was also a mention of a 'Digital storytelling in the museum - projection take over day' (https://www.birminghammuseums.org.uk/bmag/what-s-on/digital-storytelling-in-the-museum-projection-takeover-day) but doesn't seem to use IIIF	No evidence of IIIF, but their collection of digital images is all CC-0, can be added to a personal 'lightbox' and downloaded.	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Brighton and Hove Museums and Art Galleries (Gold)	https://brightonmuseums.org.uk/brighton/	Yes, 27 results under 'Discover': https://brightonmuseums.org.uk/discover/?s=IIIF . Not about IIIF, but the articles use IIIF'd images, use the greyscale logo under the 'share' button, and provide manifests after some creative URL manipulation.	Null		Not IIIF, but fairly extensive digital assets, CC-BY-SA. Similar to above, can be added to personal 'lightbox', downloaded, or sent as an 'e-card' -- likely inappropriate for the image of a mummified cat I'm currently looking at.	Search interface searches all associated organisations via tabs. What element is returning the 'IIIF' search? Is it the URL of the images (...'format=iiif')?
Bristol Museums, Galleries and Archives (Gold)	https://www.bristolmuseums.org.uk/	No option to search website, catalogue returned no results	No option to search website, catalogue returned no results	Catalogue search of Bristol Archives returned digital photographs. Nothing about their own digital or digitised collections	No evidence of IIIF in use.	
British Council Collection (Gold)	http://visualarts.britishcouncil.org/	Null	Null	4 results, all blog posts, none of which are relevant	No evidence of IIIF in use.	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
British Library (Gold)	https://bl.uk	10 results on website, including a new first result describing 'how to find and use the BL's IIIF images', the rest are largely press announcements about various projects (including our TaNC project) which are making use of IIIF	Eight results, some of which duplicate the first search.	Many results (746), almost none of which overlap with the results returned for IIIF. These seem to be largely links to people or projects that involve digital materials, such as presentations from the BL labs group, papers on digital preservation etc.	IIIF enabled for sections of the collection, though not everything that is digitised is available via IIIF. IIIF'd items can be found via the main catalogue search by including the string: 'blmsd OR blww1 OR blplaybill OR bldcw' or via resource specific sites (these are often tied to projects such as the Manuscripts Médiévaux portal).	This entry was updated from its original form when the BL published their announcement about 'How to Find and Use the BL's IIIF collections' page. It provides a useful introduction to IIIF as well as a list of their IIIF'd collections and is available here: https://www.bl.uk/collection-guides/iiif

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
City of London Corporation (Gold)	https://www.cityoflondon.gov.uk/	null	Null	Two results, one about eBooks from the Barbican Library, the other about a digital art installation	Searching in the London Picture Archive (https://www.londonpicturearchive.org.uk/) returned results for IIIF including William III, Richard III etc. images show no evidence of being IIIF compatible.	The Guildhall Art Gallery seems to be the repository that is represented on ArtUK, and while they don't mention anything about IIIF, they do collaborate with Watercolour World, which may be IIIF enabled (they worked with Jason Evans from National Library Wales to ingest their IIIF manifests, and the viewer may be a version of OpenSeadragon (only found when digging into their page). They also work with Klokan Technologies which runs both a IIIF hosting server and creates compliant technologies. They also work with Google Arts and Culture, so certainly digitally literate if not IIIF compatible.
Cumbrian Museum Consortium (Gold)	https://cumbriamuseums.org.uk/	Null	Null	Various exhibitions and blogs about local artists responding to the pandemic	A collection of six museums, four of which are joined together at https://lakelandarts.org.uk/ , search results returned nothing for IIIF or International Image	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
					Interoperability Framework on any of the museum's individual pages. No evidence of IIIF in use	
English Heritage (Gold)	https://www.english-heritage.org.uk/	Null	Null	blog posts, not relevant nor IIIF enabled	They offer a lot of content in the form of collection stories (https://www.english-heritage.org.uk/visit/places/Audley-end-house-and-gardens/history-and-stories/vegetable-seller/), but they don't appear to be IIIF (nor are the images they display on their website).	
Falmouth Art Gallery (Gold)	https://www.falmouthartgallery.com/Gallery/Home	Null	Null	Null	No evidence of IIIF in use.	Search was performed under the collections tab. No central search facility available.
Glasgow Museums (Gold)	https://www.glasgowmuseums.com	Null	Null	Null	No evidence of IIIF in use.	Some digital documents available via Glasgow Archives. However, they are in pdf form.

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Government Art Collection (Gold)	https://artcollection.culture.gov.uk/	Null	Null	Only results were three items that were labelled 'reproduction of image restricted by copyright'	Though they make no mention of it, some items are displayed via OpenSeadragon (e.g. https://artcollection.culture.gov.uk/artwork/12941/). Panel truck (possibly) is used to tell stories: https://artcollection.culture.gov.uk/stories/a-closer-look-charity-children-in-the-strand-on-7-july-1713/	
Hull Museums and Galleries (Gold)	http://museumcollections.hullcc.gov.uk/	Null	Null	Null	No evidence of IIIF in use.	Website seems largely non-functional.
Imperial War Museums (Gold)	https://www.iwm.org.uk/collections/	19 results, all pertaining to the 'Fairey IIIF' airplane	Null	Returned library results about digitising collections.	No evidence of IIIF, but their collection of digital images can all be embedded in a non-commercial context (embed code provided)	Huge collections of digitised photographs, some of which seem to have more 'zoomability' than others, but none seem to be IIIF enabled.
Ingram Collection of Modern and Contemporary British Art (Gold)	http://ingramcollection.com/	Null	Null	Null	No evidence of IIIF in use.	
Leeds Museums & Galleries (Gold)	https://museumsandgalleries.leeds.gov.uk/	Null	Null	24 results, all blog posts, most about	No evidence of IIIF in use.	A conglomerate of nine museums and historic sites located in Leeds

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
				contemporary digital installations		
Manchester City Galleries (Gold)	https://manchestera rtgallery.org/	Null	Null	"It's been almost one year since our collections were last available to view online. We lost access to them following the move of our website from one server to another; our website was so old that newer versions of server operating software would no longer support the technologies that helped run it and our collection search."	No evidence of IIIF in use.	The federated 'Manchester Art Galleries' no longer resolved on the Art UK page. The search here was conducted on the Manchester Art Gallery Collection and Site
Museum of London (Gold)	https://www.museumoflondon.org.uk/museum-london	Null	Null	Information about their Digital Futures Project. Not relevant	No evidence of IIIF in use.	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Museums Sheffield (Gold)	https://www.museums-sheffield.org.uk/	Null	Null	Information relating to digital content during COVID	No evidence of IIIF in use.	
National Galleries Scotland (Gold)	https://www.nationalgalleries.org/	Null	Null	Null	Deep zoom available for some images, quite smooth, but unable to inspect the page source -- perhaps an application of UV?	
National Library of Wales (Gold)	https://www.library.wales/	104 results returned, press releases about joining IIIF-C as well as its use and application in various projects	Press release about joining IIIF-C	Over 1,000 results, many of which seem to return IIIF resources	IIIF-forward for digital collections. Use of UV as a viewer for digital collections.	IIIF logo used via the embed or share option at the bottom of the viewer.

Institution	Homepage address	Search: IIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
National Maritime Museum (Gold)	https://www.rmg.co.uk/	Null	Null	A few articles about digitising their collections, nowhere does it explicitly reference IIF.	Collaborates with CUL in digitising their mss. content, making it available via CUDL: "he Board of Longitude project, a partnership between Cambridge University Library and the National Maritime Museum saw the digitisation of the complete archive of the Board of Longitude, along with complementary manuscripts from the Caird Library's archive, which included both official documentation relating to the activities of the Commissioners for the Longitude and less formal items that shed additional light on those activities."	Clearly engaged with IIF, but not actively using it on their own collection pages.
National Museum of the Royal Navy (Gold)	https://www.nmrn.org.uk/	Null	Null	Returned a surprising number of job adverts, suggesting that they	No evidence of IIF in use.	A lot of digitised content, but difficult to access easily -- even some of their highlighted collections return 'no results'.

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
				are interested in developing their digital presence in the future		
National Museum Wales (Gold)	https://museum.wales/	Returned a blog entry on "A portrait of a Welsh Squire and his children, by Johann Zoffany, distinguished painter to George III"	Returned 715 results from 'Collections Online'. Clearly something is triggering the search, but no apparent reference to IIIF or options to share the image	Returns 1,909 results from their 'Collections Online' portal	No evidence of IIIF in use with regard to presentation, but the search results perhaps suggest that there is something going on behind the scenes. Digging into the item pages code didn't prove revealing	
National Museums Liverpool (Gold)	https://www.liverpoolmuseums.org.uk/	Null	Null	Returned options related to digital services rather than digital collections	No evidence of IIIF in use.	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
National Museums Northern Ireland (Gold)	https://www.nmni.com/	Null	Null	Returns eight sub-sites that are irrelevant to the current question	No evidence of IIIF in use.	Odd emphasis on buying copies of images
National Portrait Gallery (Gold)	https://www.npg.org.uk/	Null	Null	Returns seven portraits	Digging into a random page suggests that their viewer is OpenSeadragon, which suggests a tiled image source, perhaps IIIF	Work during this IIIF TanC foundation project has highlighted that they are also using IIIF in displaying Storiies ¹⁵² and enriching their own collections.
National Trust (Gold)	https://www.nationaltrust.org.uk/	Null	Null	Returns a series of blog posts about digital initiatives	No evidence of IIIF in use.	
Norfolk Museums and Archaeology Service (Gold)	https://www.museums.norfolk.gov.uk/	Null	Null	Six results, all about education	No evidence of IIIF in use	
Nottingham City Museums and Galleries (Gold)	https://nottinghammuseums.org.uk/	Null	Null	Null	No evidence of IIIF in use	
Royal Academy of Arts (Gold)	https://www.royalacademy.org.uk/	George III featured in search results, nothing about IIIF	Null	Returns a book by the same title available in the shop	No evidence of IIIF in use.	

¹⁵² A IIIF focused digital story telling application: <https://storiies.cogapp.com/>

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Royal Botanic Gardens, Kew (Gold)	https://www.kew.org/	Null	Null	Null	No evidence of IIIF in use, both in main catalogue and herbarium specimens	Though no mention of IIIF, they do mention a 'Digital Revolution' within their collection. See https://www.kew.org/science/our-science/departments/digital-revolution
Science Museum Group (Gold)	https://www.sciencemuseumgroup.org.uk/	Null	Null	Mentioned in their Research Strategy for 2018: https://www.sciencemuseumgroup.org.uk/our-work/research-public-history/research-strategy-2018/	Though their native presentation environment is not IIIF, there is the option for the user to access the manifest, see the item in a IIIF Viewer (UV), or use IIIF to add the item to Animal Crossing. All clearly marked with the IIIF logo.	
Tate (Gold Plus)	https://www.tate.org.uk/	Null	Null	A range of posts about digitising their collections, digital artwork installations, and digital activities for children	No evidence of IIIF in use in the museum collections or in the archives	
The Ashmolean Museum (Gold)	https://www.ashmolean.org/	Null	Null	Digital Safeguarding policies, blog posts, nothing directly relevant	No evidence of IIIF, but the image viewer for their Collections online is OpenSeaDragon	

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
The Fitzwilliam Museum (Gold)	http://fitzmuseum.cam.ac.uk/	Referenced here as a potential solution: https://blogs.fitzmuseum.cam.ac.uk/conservation/2018/01/02/when-fashion-transforms-the-truth/ , but takes it no further	Same result as IIIF	Returns predominantly blog posts.	Huge IIIF presence. Option to search only for IIIF enabled objects. Objects have links to manifests and options to see the object in UV and Mirador	
The National Gallery (Gold Plus)	https://www.nationalgallery.org.uk/	Null	Null	Predominantly blog posts and policy documents	No evidence of IIIF in use, but the viewer is OpenSeaDragon which suggests tiled source	NG engages with IIIF, but you wouldn't know it from searching the website alone.
Towner (Gold)	https://townereastbourne.org.uk/	Null	Null	Null	Only way to access their artworks is through Art UK	No option to see individual works on their website
Tyne & Wear Archives & Museums (Gold)	https://www.twmuseums.org.uk/	Null	Links to every other sub-section on their site	Links to every other sub-section on their site	No evidence of IIIF in use	Odd option to 'curate your own collection', but then gives you the option to view, arrange to see them in person, or buy prints

Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
University of Oxford (Gold)	https://www.ox.ac.uk	25,900 results, most of which relate in some way to the Digital Bodleian	364 results, most of which also relate to the digital Bodleian, but some from the DH 'department' (this was a lecture given by Tom Crane, Matt McGrattan and Judith Siefring)	3,150 results, appear to be a mix of references, many from different departments, still predominantly Bodleian based.	Accessing through the 'Digital Bodleian' there's a strong IIIF presence.	This may not be representative of the University as rich collections are also held by the colleges. Search likely not comprehensive or representative
Victoria and Albert Museum (Gold)	https://www.vam.ac.uk/	121 Blog posts, features, collection highlights, past events, and policy documents	Seven results, all blog posts	533 results, from 'what's on', 'features', 'collections', 'objects', 'about us and our work' and 'blogs'.	In a general collections record, no mention of IIIF, but viewer is OpenSeadragon, suggesting a tiled image source	IIIF manifests are generally available via their API, though this did not come up in the collection records.

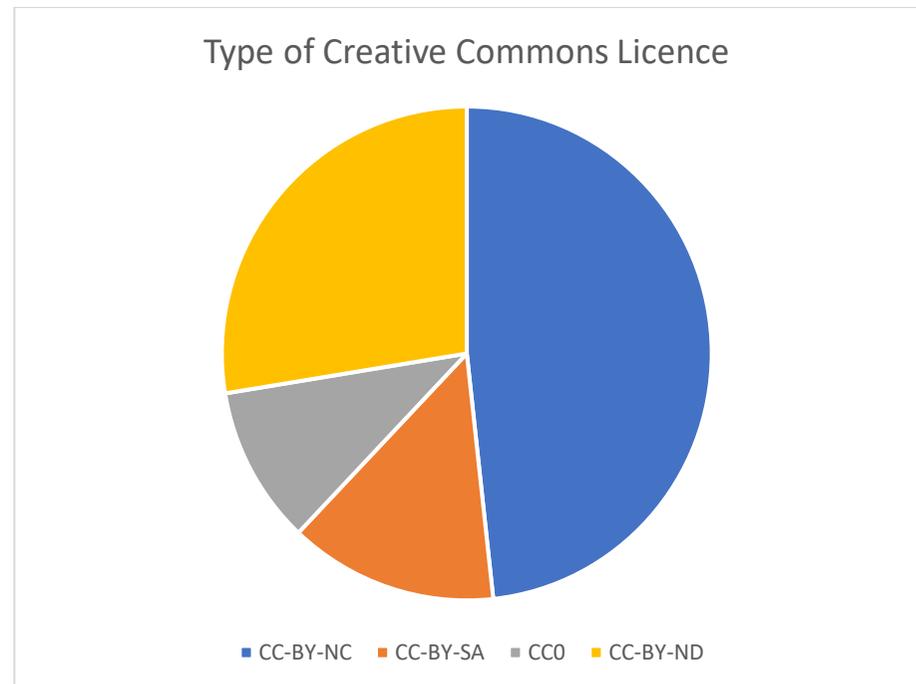
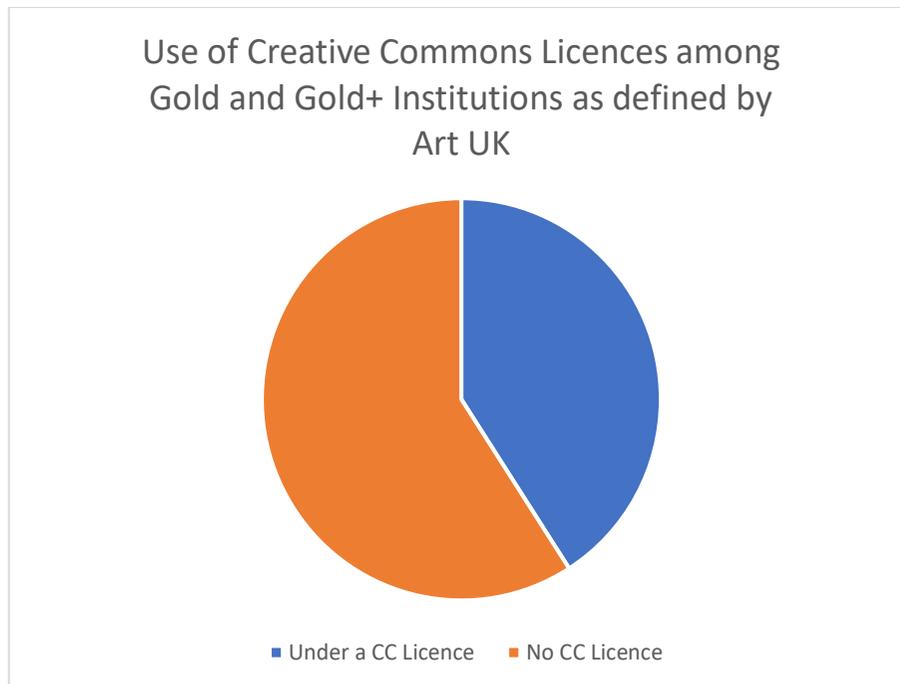
Institution	Homepage address	Search: IIIF	Search: 'International Image Interoperability Framework'	Search: 'Digital Collections'	Webpage investigation	Additional notes
Wellcome Collection (Gold)	https://wellcomecollection.org/	No general website search	No general website search	No general website search	Library and museum items have no clear IIIF link, but digging into the page it is clear that it is a IIIF viewer (Inspect page) and viewer is UV	IIIF available through their API
York Museum Trust (Gold)	https://www.yorkmuseumtrust.org.uk/	Null	Null	An event listing to 'Ask The Expert' with Martin Fell, Digital Team leader	No evidence of IIIF in use.	

Appendix D - Rights and Licencing (S3)

Methodology

Considering the same institutions as above, we also investigated their image rights and licensing statements as publicly available on their websites. We also considered whether any of their images were under a Creative Commons (CC) licences, and, if so, which type of CC licences they hold. Information about Creative Commons Licences is available here: <https://creativecommons.org/licenses/>.

Findings



Further work, in relation to use and understanding of copyright, was also subsequently carried out within the wider TaNC programme as part of a commissioned report examining open access and copyright in relation to cultural heritage collections, which was again published near the end of the 'Practical Applications of IIF' project.¹⁵³ This report highlights some of the complexities faced by institutions in relation to the understanding and application of open access and copyright licences and raises important questions in regard to the confusion as to when it is appropriate or even legal to claim copyright on some digital resources.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
Aberdeen Art Gallery (Gold)	https://www.aberdeencity.gov.uk/AAGM	Y	https://www.aberdeencity.gov.uk/AAGM/collections/image-repro	N	N	N	N	N	N	Reproductions and licences for use are both available for purchase	Images requested via forms which are then emailed to the Aberdeen Archives Galleries and Museums.

¹⁵³ Wallace, Andrea. (2022). A Culture of Copyright: A scoping study on open access to digital cultural heritage collections in the UK. Zenodo. <https://doi.org/10.5281/zenodo.6242611>

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
Arts Council Collection (Gold)	http://www.artscouncilcollection.org.uk/	Y	Information: https://artscouncilcollection.org.uk/image-hire Declaration: https://artscouncilcollection.org.uk/sites/default/files/Arts%20Council%20Collection%20Terms%20and%20Conditions%20for%20Image%20Reproduction.pdf	N	N	N	N	N	N	All images seem to need licences, fees charged based upon the use of those images	Most works still held in copyright by their creator. Arts Council will advise on who holds the copyright so that appropriate permission can be sought.
Birmingham Museums Trust (Gold)	https://www.birminghammuseums.org.uk/	Y	Digital Asset Resource: https://dams.birminghammuseums.org.uk/asset-bank/action/viewDefaultHome?browseType=folders	Y	Y	N	N	Y	Y	There may be a charge for high-resolution photographs, but perhaps not for the licences (https://www.birminghammuseums.org.uk/about/our-organisation/policies-plans-and-reports/public)	CC0 for Images in the collection, CC-BY-NC for Audio files

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										task-statement)	
Brighton and Hove Museums and Art Galleries (Gold)	https://brightonmuseums.org.uk/brighton/	Y	Digital Media Bank: https://dams-brightonmuseums.org.uk/assetbank-pavilion/action/viewHome	Y	Y	Y	N	N	N	For the images in the Digital Media Bank, there is no non-commercial stipulation on the CC licence.	No information given about the collections that fall outside of the Digital Media Bank
Bristol Museums, Galleries and Archives (Gold)	https://www.bristolmuseums.org.uk/	Y	Bristol Archives: https://archives.bristol.gov.uk/about/citation	N	N	N	N	N	N	Copies, printouts, or photographs can only be used for private study or personal research.	There is no information about the museum collections and their approach to copyright or image licencing. It is not referenced on the item pages either.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										Commercial licences are available by contacting the archives	
British Council Collection (Gold)	http://visualarts.britishcouncil.org/	Y	http://visualarts.britishcouncil.org/footer/copyright-and-permissions	N	N	N	N	N	N	The British Council doesn't hold the copyright of many of the images on the site, and states that it has tried to obtain permission to display them from the relevant bodies. Licences would need to be obtained	Their licencing policy is effectively stating that they do not need a licencing policy as they cannot licence images.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										from the copyright holders rather than the British Council	
British Library (Gold)	https://bl.uk	Y	https://imagesonline.bl.uk/permission-request/	N	N	N	N	N	N	Licence needed to reproduce images commercially, however, there seems to be some ambiguity when it comes to manuscripts which it seems to feel are in the Public	A somewhat split approach to licence some images and not others - and I wouldn't have found out about the manuscripts had I not looked at their IIF'd collections and followed the licencing link there.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										Domain(https://www.bl.uk/help/how-to-reuse-images-of-unpublished-manuscripts)	
British Library (Gold)	https://bl.uk	Y	https://imagesonline.bl.uk/permission-request/ https://www.bl.uk/help/how-can-i-use-the-images-i-order https://www.bl.uk/about-us/terms-and-conditions/content-on-flickr-and-wikimedia-commons https://www.bl.uk/help/ethical-terms-of-use	Y	Y	N	N	N	Y		Updated from above after the initial data was gathered – As the BL provides access to images, for different purposes, through multiple websites.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
City of London Corporation (Gold)	https://www.cityoflondon.gov.uk/	Y	https://www.cityoflondon.gov.uk/things-to-do/attractions-museums-entertainment/guildhall-galleries/guildhall-art-gallery/image-licensing	Y	Y	N	Y	Y	N	Copyright and licencing managed through ArtUK	While the Guildhall states that CC licences are available via ArtUK, much of their site indicates that the works are still in copyright. There seems to be a discrepancy here.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
Cumbrian Museum Consortium (Gold)	https://cumbriamuseums.org.uk/	N	N/A	N	N	N	N	N	N	N/A	A collection of six museums, none of which have an overt copyright policy, though Tullie House does state that users of the site may 'electronically copy or print portions of the website for their own personal, non-commercial use'. And Wordsworth Grasmere states 'Material on this or any other Wordsworth Trust website that is owned by the Wordsworth Trust, including but not limited to text, images, and sound, may not be printed, copied, reproduced,

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
											<p>republished, downloaded, posted, displayed, modified, reused, broadcast or transmitted in any way, except for the user's own personal non-commercial use.</p> <p>Permission for any other type of use must be obtained in advance from the Wordsworth Trust'</p>

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
English Heritage (Gold)	https://www.english-heritage.org.uk/	Y	https://www.english-heritage.org.uk/about-us/our-people/terms-and-conditions/	N	N	N	N	N	N	Content can be stored for personal use, but not shared nor published without written permission from English Heritage	
Falmouth Art Gallery (Gold)	https://www.falmouthartgallery.com/Gallery/Home	N	N/A	N	N	N	N	N	N	N/A	There is no mention of image reproduction or licencing on their content pages nor anywhere in the terms and conditions
Glasgow Museums (Gold)	https://www.glasgowlife.org.uk/museums	Y	Commercial licencing: http://www.csgimages.org.uk/indexplus/TandC.pdf CC policy: http://www.csgimages.org.uk/indexplus/page/Home.html	Y	Y	N	N	Y	N	Commercial licence available for purchase.	CC licencing information is available on collection item pages (e.g. http://collections.glasgowmuseums.com/mwebc)

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
											gi/mweb?request=record;id=15028;type=701
Government Art Collection (Gold)	https://artcollection.culture.gov.uk/	Y	https://artcollection.culture.gov.uk/licensing-images/	N	N	N	N	N	N	Licences must be obtained for any personal, commercial, or non-commercial use	Forms must be downloaded from the website, then returned to an email or postal address
Hull Museums and Galleries (Gold)	http://museumcollections.hullcc.gov.uk/	N	N/A	N	N	N	N	N	N	N/A	Website is largely non-functional
Imperial War Museums (Gold)	https://www.iwm.org.uk/collections/	Y	https://www.iwm.org.uk/commercial/collections-sales-and-licensing/ordering-and-policies	Y	Y	N	Y	Y	N	CC not explicitly referred to, but is clearly implied by the wording of the 'non-commercial	

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										licence' section	
Ingram Collection of Modern and Contemporary British Art (Gold)	http://ingramcollection.com/	N	N/A	N	N	N	N	N	N	None stated	No information about copyright or licencing provided at all
Leeds Museums & Galleries (Gold)	https://museumsandgalleries.leeds.gov.uk/	Y	https://museumsandgalleries.leeds.gov.uk/terms-of-use/	N	N	N	N	N	N	Commercial licences available by contacting the museum.	You may download content from this website to file or print without our permission, provided this is not re-used or re-published in any way'
Manchester City Galleries (Gold)	https://manchesterartgallery.org/	Y	https://manchesterartgallery.org/copyright/	N	N	N	N	N	N	commercial applications can apply for a licence via an online form (https://manchesterartgallery.org/)	Images can be downloaded for personal use, but cannot be shared.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										org/copyright/).	
Museum of London (Gold)	https://www.museumoflondon.org.uk/museum-london	Y	https://www.museumoflondon.org.uk/about-us/business-services/image-licence	N	N	N	N	N	N	Commercial licence available for purchase. Images can be viewed here: http://www.museumoflondonimages.com/ , but to order you must contact the museum directly	No mention of non-commercial use of the images, though there is the option to download an image from the images site: http://www.museumoflondonimages.com/
Museums Sheffield (Gold)	https://www.museums-sheffield.org.uk/	Y	http://collections.museums-sheffield.org.uk/reproductions?state:flow=83b21f00-f279-4323-8067-2a358b35ffb3	N	N	N	N	N	N	Bridgeman Art Library holds some of the images. Commercial and	

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										educational licences are available by contacting the museum	
National Galleries Scotland (Gold)	https://www.nationalgalleries.org/	Y	https://www.nationalgalleries.org/copyright-image-licensing	Y	Y	N	N	Y	N	Commercial licence available for purchase. Academic licences are free provided certain conditions are met.	One of the clearest statements about image licencing and copyright that I've seen.
National Library of Wales (Gold)	https://www.library.wales/	Y	https://www.library.wales/about-nlw/copyright	Y	Y	Y	Y	Y	Y	Some items Public Domain, others in Copyright	Three versions of CC licence: images are CC-BY-NC-SA or CC-BY-NC-ND, metadata under CC0. Licencing given in UV for digital collections

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
National Maritime Museum (Gold)	https://www.rmg.co.uk/	Y	Policy here: https://images.rmg.co.uk/price-list/	Y	Y	N	Y	Y	N	Commercial licence available for purchase. Academic licences are free provided certain conditions are met.	Same system as the National Gallery, Ashmolean & NPG
National Museum of the Royal Navy (Gold)	https://www.nmrn.org.uk/	N	N/A	N	N	N	N	N	N		Images can be downloaded via a button, but no policy about reproduction
National Museum Wales (Gold)	https://museum.wales/	Y	https://museum.wales/picture-library/terms-and-conditions/	N	N	N	N	N	N	Images are available for purchase via their picture library (e.g. https://museum.wales/picture-library/item/2677/BRANGWYN-Sir-Frank-William-1867--	No comments about non-commercial usage of images.

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										-1956- Youthful- Ambition/	
National Museums Liverpool (Gold)	https://www.liverpoolmuseums.org.uk/	Y	https://www.liverpoolmuseums.org.uk/images-and-photography-service	N	N	N	N	N	N	Images are available for purchase via an online form	They state 'Unless they are credited to another individual or institution, all of the images on this website are wholly owned or licenced by National Museums Liverpool. You can save, copy and print our images from our website, provided that they are solely for your own personal use. Images printed from the website must not be used for reproduction or wider dissemination.' But do not explicitly state that the

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
											images are under a CC licence
National Museums Northern Ireland (Gold)	https://www.nmni.com/	Y	https://www.nmni.com/collections/licence-images.aspx Fee schedule: https://www.nmni.com/resource-library/pdf/NMNI-Picture-Library-Fees-2020.pdf	N	N	N	N	N	N	Commercial licence available for purchase.	Their image rights page states that 'Low resolution images are available on request for personal research use.' This is not reflected in their fee scale.
National Portrait Gallery (Gold)	https://www.npg.org.uk/	Y	https://www.npg.org.uk/business/images	Y	Y	N	Y	Y	N	Commercial licence available for purchase. Academic licences are free provided certain conditions are met.	commercial use can be purchased using the same platform as the National Gallery and the Ashmolean

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
National Trust (Gold)	https://www.nationaltrust.org.uk/	Y	https://www.nationaltrustimages.org.uk/pages/image-rights	N	N	N	N	N	N	Reproductions seem to be generally allowed	Image Rights section is quite convoluted and varies by object. Reproductions seem generally allowed, but high-res images must be purchased suggesting that there is some sort of commercial structure in place. An attempt to investigate this further necessitated a VAT no, so was unable to pursue this line of enquiry.
Norfolk Museums and Archaeology Service (Gold)	https://www.museums.norfolk.gov.uk/	N	https://www.museums.norfolk.gov.uk/copyright-and-reproduction-fees http://norfolkmuseumscollections.org/page/imageuse.html	Y	Y	N	N	Y	N	commercial applications need to contact the institution	CC information is not explicitly stated, but can be implied from the wording

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
Nottingham City Museums and Galleries (Gold)	https://nottinghammuseums.org.uk/	N	N/A	N	N	N	N	N	N	N/A	No information about copyright or licencing provided at all
Royal Academy of Arts (Gold)	https://www.royalacademy.org.uk/	Y	https://www.royalacademy.org.uk/copyright-policy	Y	Y	N	Y	Y	N	commercial applications need to contact the institution	"Wherever possible, images of works in the RA's Collection may be reproduced free of charge in any format or medium under the terms of a Creative Commons Attribution Non Commercial No Derivative Licence unless otherwise indicated. "
Royal Botanic Gardens, Kew (Gold)	https://www.kew.org/	Y	Various types of CC licence depending on source collection and item status.	Y	Y	N	N	N	N	Separate site for press images. Login needed	Some collections have varying licencing, however, according to their Terms and Conditions, most of their data and

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
											digital resources fall under CC-BY
Science Museum Group (Gold)	https://www.sciencemuseumgroup.org.uk/	Y	Commercial licencing: https://www.scienceandsociety.co.uk CC policy: https://www.sciencemuseumgroup.org.uk/creative-commons/	Y	Y	Y	N	Y	Y		Various types of CC licence depending on source collection and item status.
Tate (Gold Plus)	https://www.tate.org.uk/	Y	https://www.tate.org.uk/about-us/policies-and-procedures/website-terms-use	Y	Y	N	Y	Y	N	Licence available for purchase (e.g. https://www.tate-images.com/preview.asp?image=D00831)	
The Ashmolean Museum (Gold)	https://www.ashmolean.org/	Y	https://www.ashmolean.org/reproduction-rights-fees https://www.ashmolean.org/reproduction-rights-fees	N	N	N	N	N	N	Licencing available for purchase	System seems identical to that used by the National Gallery
The Fitzwilliam Museum (Gold)	http://fitzmuseum.cam.ac.uk/	N	https://fitzmuseum.cam.ac.uk/commercial-services/image-library	Y	Y	N	Y	Y	N	Licencing for publication available via	

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										form completion	
The National Gallery (Gold Plus)	https://www.nationalgallery.org.uk/	Y	https://www.nationalgalleryimages.co.uk/terms-and-conditions/	N	N	N	N	N	N	Licencing available for purchase via https://www.nationalgalleryimages.co.uk modal pop up	
Towner (Gold)	https://townereastbourne.org.uk/	N	https://townereastbourne.org.uk/about/press	N	N	N	N	N	N	Licencing and images available by contacting staff member	
Tyne & Wear Archives & Museums (Gold)	https://www.twmuseums.org.uk/	Y	https://www.twmuseums.org.uk/collections/image-licensing	N	N	N	N	N	N	Licencing available through Bridgeman Images	
University of Oxford (Gold)	https://www.ox.ac.uk	Y	https://digital.bodleian.ox.ac.uk/terms/ https://bodleianimages.co.uk/en/pages/licences.html	Y	Y	N	N	Y	N	general terms available on the two	CC information is on the item pages in the collection

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										sites listed in column D.	
Victoria and Albert Museum (Gold)	https://www.vam.ac.uk/	Y	https://www.vam.ac.uk/info/va-websites-terms-conditions	N	N	N	N	N	N	Terms vary depending on copyright holder and use of image in either a commercial or a non-commercial context. Information about 'brand licencing' is provided separately, and a pop up on collection pages gives information about	Brand licencing is here: https://www.vam.ac.uk/info/brand-licensing . Pop up on collections pages asks to contact the licencing team

Institution	Homepage address	Licence Statement Available (Y/N)	Web address for rights statement	CC (Y/N)	CC BY (Y/N)	CC SA (Y/N)	CC ND (Y/N)	CC NC (Y/N)	CC0	Non CC terms	Comments
										contacting the licencing team.	
Wellcome Collection (Gold)	https://wellcomecollection.org/	Y	https://wellcomecollection.org/works/gjue4jsb https://wellcomecollection.org/works/ker8jzms	Y	Y	N	N	N	N	Some items Public Domain	Rights information on the item pages in the collection
York Museum Trust (Gold)	https://www.yorkmuseumtrust.org.uk/	Y	https://www.yorkmuseumtrust.org.uk/collections/search/item/?id=20000013&search_query=Q0wINUlwJTVEPUZpbmUrQXJ0 https://www.yorkmuseumtrust.org.uk/collections/search/item/?id=10000003&search_query=Q0wINUlwJTVEPUNvc3R1bWUrYW5kK1RleHRpbGVz	Y	Y	Y	N	N	N	Public Domain	Licencing information on individual items in lower right corner of the image, different licences apply. Cc licences link out to CC website

Appendix E – Preliminary analysis of the results of the manifest editor survey (S4)

This survey relates to the ongoing development of the D5 - The New Digirati Manifest Editor demonstrator.

This survey was put together to help establish, with respect to a new manifest editor, ‘who are our users?’ and ‘what are they trying to do?’. It was based on internal conversations and the then current information gathered in GitHub (discussion, issues, etc).

The survey received 122 responses and unless indicated it is assumed that all questions received answers from all 122 respondents.

Survey Introduction

“IIIF (‘triple-eye-eff’) is a set of standards for working with digital content which facilitate the sharing and use on the web and is used by a growing list of GLAM organisations across the world. IIIF does this by making use of structured lists to organise the digital content and present it in compatible viewers. These lists are known as IIIF manifests.

Manifests may represent single image works, such as paintings, multi-page books or archival documents, or video and audio files. Specialised manifests can drive slideshows, curate digital exhibits, tell stories, and present bespoke educational or research collections.

However, manifests can be a little complex and difficult to create and edit manually, so we are building a new, user-friendly tool, or “Manifest Editor”, to make it easy for users with a wide range of technical skills to create their own manifests for their own purposes. For further background please see: <https://github.com/digirati-co-uk/iiif-manifest-editor/blob/main/README.md>

This survey is intended to identify people who would use this tool to ensure that we can tailor it to meet a clear set of core requirements, as well as explore what these requirements might be.

This survey should take no more than 10 minutes.

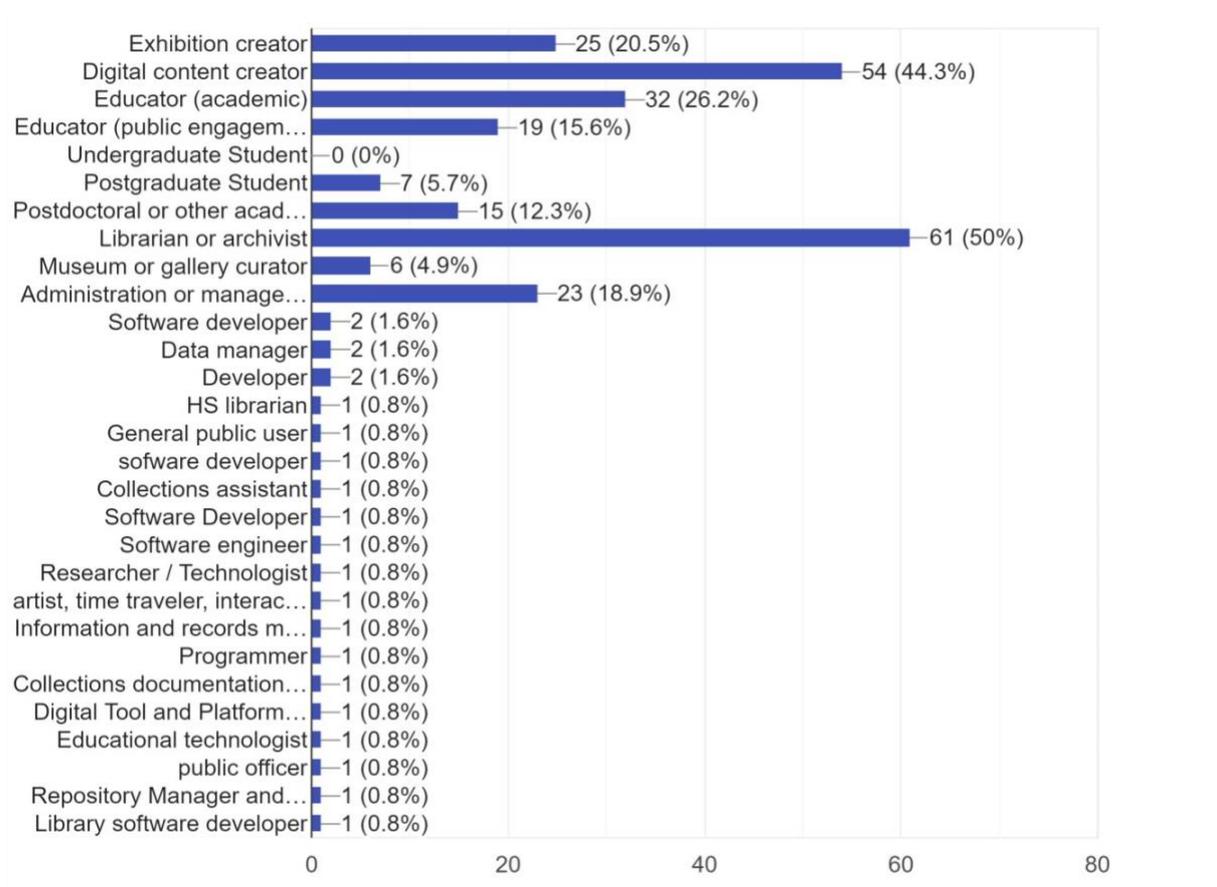
Thank you in advance for your participation. For further information about the [‘Practical Applications of IIIF’ Project](#), about this survey, and how the results will be used, please contact Dr Anne McLaughlin, Senior Research Fellow at the [National Gallery](#) ... “

Question 1: How would you define your role (Select as many as appropriate)?

Possible answers:

- Exhibition creator
- Digital content creator
- Educator (academic)
- Educator (public engagement)
- Undergraduate Student
- Postgraduate Student
- Postdoctoral / Academic Researcher
- Librarian or Archivist
- Museum or Gallery Curator
- Administration / management
- Other (open field)

Results: (Multiple answers possible)



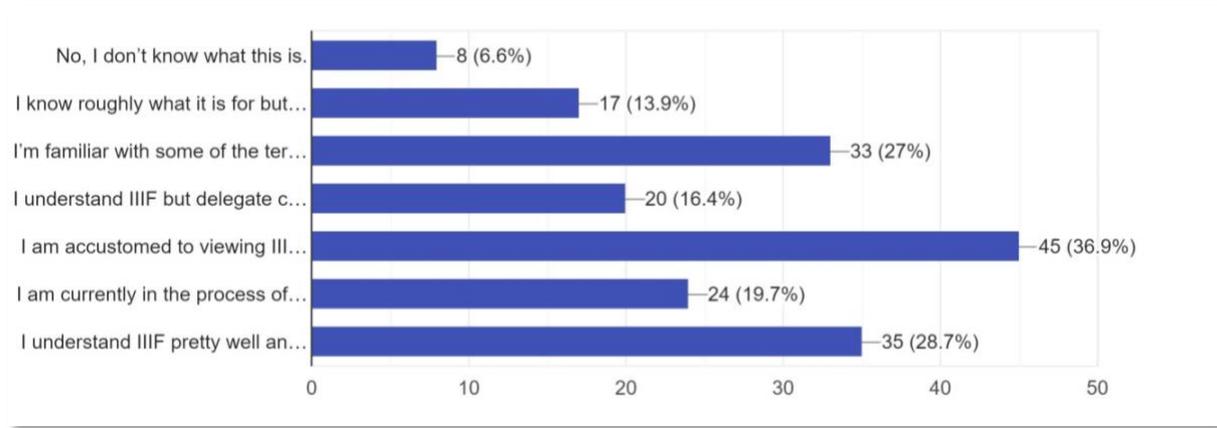
Analysis and Comments: A good range of roles representing a broad group of potential users. An additional group category for ‘developers and related engineers’ would have covered 11 of the “other” respondents. The strong interest from Librarians and Archivists was to be expected due to the historic use of the Bodleian’s Manifest Editor.

Question 2: Are you familiar with IIIF?

Possible answers:

- No, I don't know what this is
- I know roughly what it is for but am not really familiar
- I'm familiar with some of the terminology but not 'hands on'
- I understand IIIF but delegate to my team/colleagues
- I am accustomed to viewing IIIF resources in a compatible viewer
- I am currently in the process of learning about IIIF
- I understand it pretty well and could create a IIIF Manifest by hand

Results: (Multiple answers possible)



Analysis and Comments: Respondents tended to be more 'adept' users of IIIF (80/122), with 35 of this group being able to create a manifest 'by hand'. However, some of these 'adept' users also included themselves in the "process of learning about IIIF" group, indicating that there is a degree of continuing individual development in respect of IIIF. Either people expanding their use of the IIIF open standards or continuing to follow the ongoing development and broadening scope of IIIF. Some respondents checked more than one box:

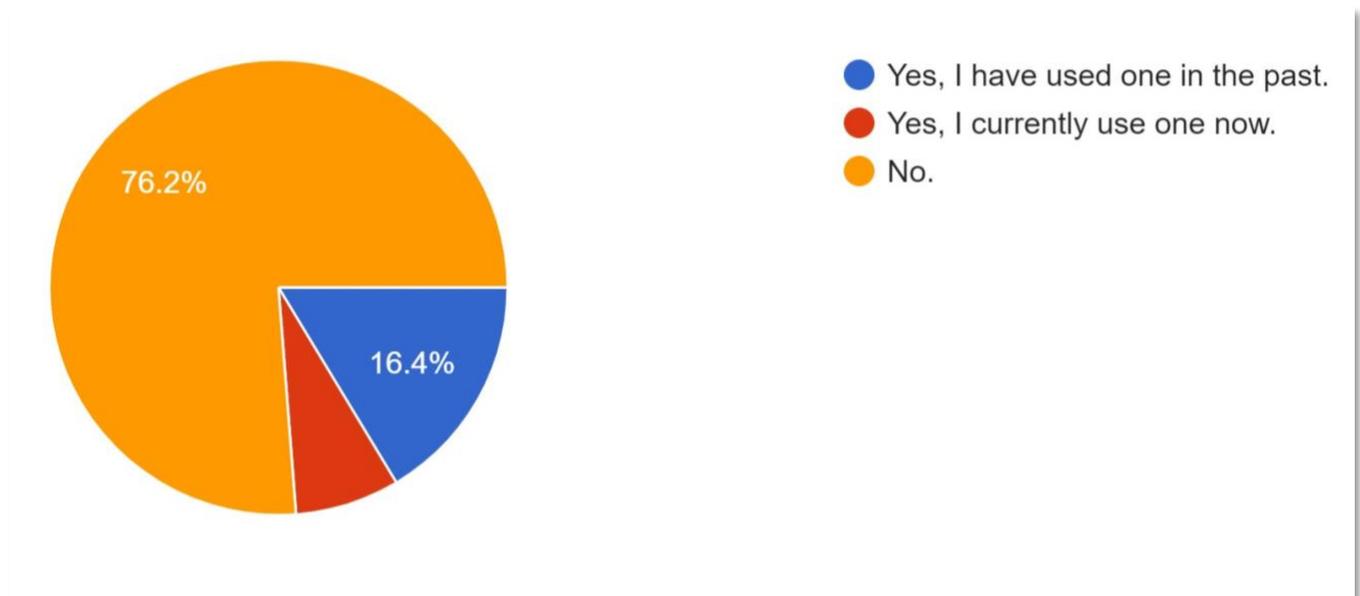
- Eight used viewers but were leaning
- Three were learning, used viewers, but could also create manifests
- Six used viewers and were creating manifests
- 12 were familiar and used viewers, but delegated day-to-day work to others.

Question 3: Have you ever used a manifest editor to create custom sets of IIF-enabled resources?

Possible answers:

- Yes, I have used one in the past.
- Yes, I currently use one now.
- No.

Results:



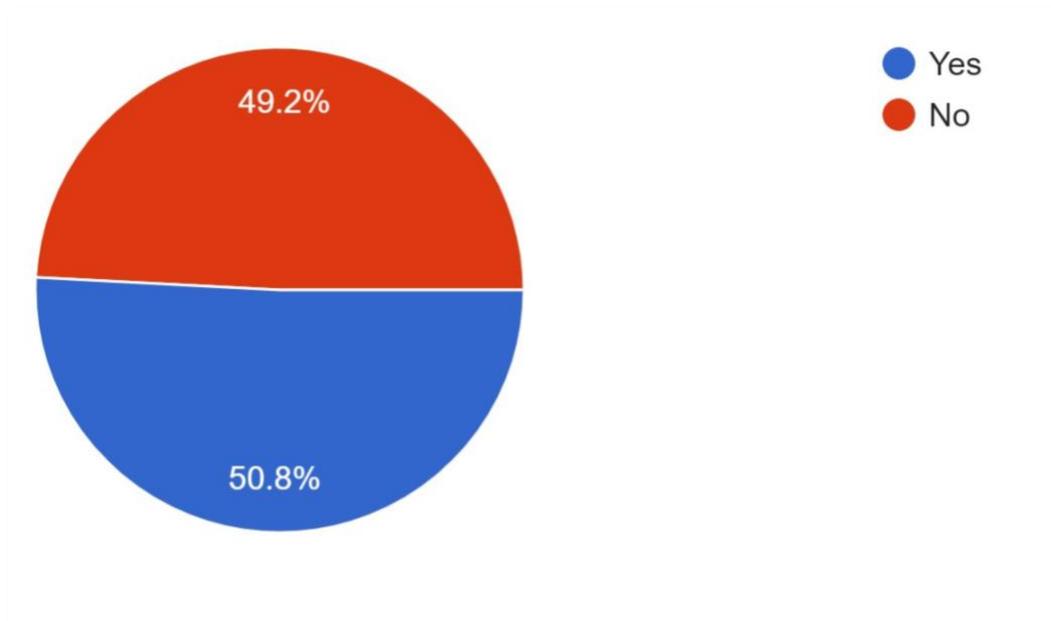
Analysis and Comments: 16 of the 29 (positive respondents) mentioned the Bodleian’s Manifest Editor, but as noted before this may relate to the higher number of “librarian” related respondents. Three mentioned script-based solutions (Python, PERL, etc) and another four mentioned the use of ‘in-house’ solutions. Other responses included a range of tools: Figgy, Goobi, Storiies (2x), exhibit.so, strollview, biff, Glen’s IIF Workbench, Rerum, and DCLS. The responses seem to indicate that there is a clear need for a user-friendly solution here, but that there could be a range of purposes for the resultant manifests. This could indicate the need for a new open solution which can be used as is or even potentially embedded into other processes.

Question 4: Do you currently create digital stories?

Possible answers:

- Yes
- No

Results:



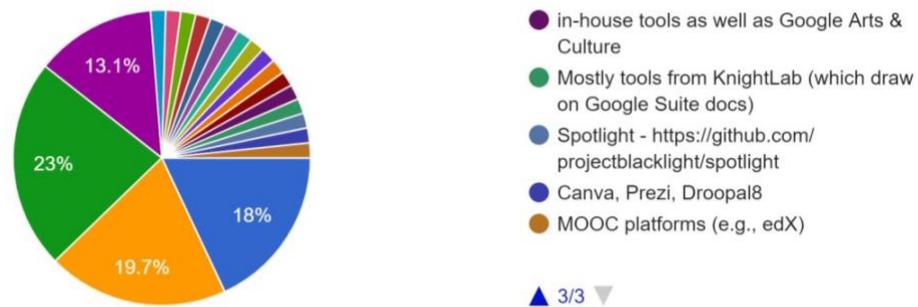
Analysis and Comments: One of the initial proposed use cases for IIF and IIF manifests was as part of the documentation and presentation of complex digital stories in relation to digital resources, such as high-resolution images. The response here confirms that this use case could be valid for a good proportion of future users.

Question 5: What do you currently use for creating digital stories using items from collections?

Possible answers:

- Office type products (Word/PowerPoint)
- Existing manifest editors
- IIF or other storytelling editors (e.g. Storiies or Exhibit.so)
- Collection/content management systems
- Bespoke design and development with internal team or agency

Results: 61 responses (Multiple answers possible)



Analysis and Comments: A wide range of responses were provided for these questions and only the most common answer groupings are specifically indicated in the graph. Although there are a few options which stand out from the others it is clear that the creation of digital stories is not a standard process with a lot of work being carried out in relation to the process of creation as well as the content of the stories themselves. A simple standardised way of organising metadata, images, and content in relation to digital stories could be very useful.

- 18% Microsoft Office, Open Office, Google Suite etc.
- 19.7% Storytelling editors (e.g. Stories or exhibit.so)
- 23% Content Management Systems (CMS)
- 13.1% Bespoke design or development with internal teams
- Most of the other responses contained a variety of solutions or a combination of the above.

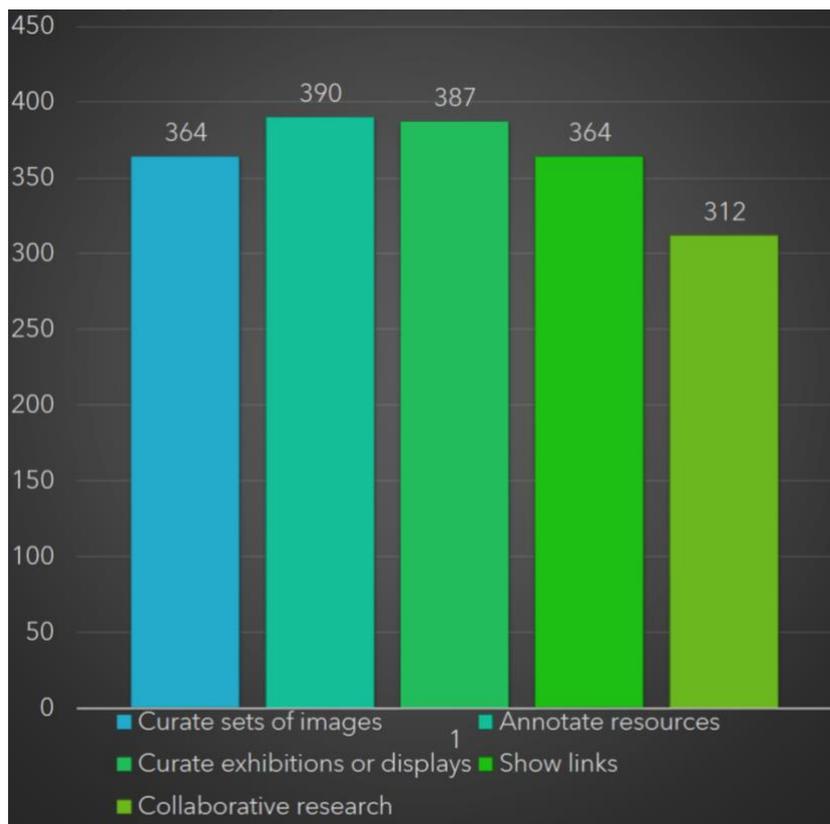
Question 6: Rank the activities for which you may use a (new) manifest editor. (1-5)

In the survey, these activities were ranked in order of frequency of use, 1 being the most important use case, 5 being the least. The rankings were used so that the most frequent use cases received the most 'points', and then these point scores were totalled. The higher the total number is then indicative of a more important use case for the Manifest Editor design process.

Possible answers:

- I'd like to be able to curate sets of images for teaching and learning purposes.
- I'd like to be able to annotate a series of resources.
- I'd like to build digital exhibitions or displays.
- I'd like to showcase links between objects in my collection, or collections held by various institutions.
- I'd like to create a shared set of resources for collaborative research.

Results:



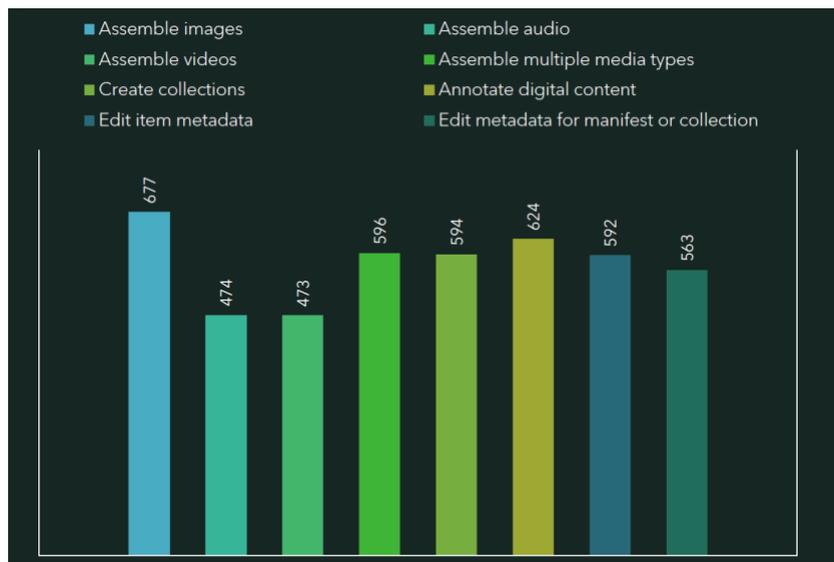
Analysis and Comments: Annotation narrowly leads the field, perhaps as this feature is not supported in the more popular Bodleian’s editor. However, the option of ‘curation of images’ and ‘curation of exhibitions or displays’ may have split respondents, suggesting that ‘curation’ may be indeed primary. Collaborative research is lowest on the poll, though doesn’t score badly. Perhaps this points to a relative unfamiliarity with IIF as a research tool or within research applications, this could be attributed to the roles of people who responded to this survey. With a maximum and minimum score here of 610 – 122, it seems that there is a general spread across the five proposed use-cases indicating that they do all represent good use-cases for the development activities to work from.

Question 7: Rank the possible features with a Manifest Editor by importance to potential users (1-6)

Possible answers:

- The ability to assemble images into a manifest
- The ability to assemble audio files into a manifest
- The ability to assemble videos into a manifest
- The ability to assemble multiple types of media (images, audio files, or videos) into a manifest
- The ability to create collections of more than one manifests
- The ability to annotate digital content
- The ability to edit an item’s individual metadata
- The ability to edit the metadata for an entire manifest or collection

Results:



Analysis and Comments: Of primary importance seems to be the ability to assemble images, followed by annotation functionality. At a general level pegging are the ability to assemble multiple media types, create collections, and edit metadata (broadly construed). The results here indicated that although important video and audio resources could be considered secondary at this early stage and the development work could begin by focussing on the organisation of images.

Question 8: Is there anything else you'd like us to know?

In addition to completing the general questions the respondents provided a number of useful comments and suggestions for this final open question. These comments have all been passed on to the developers and used to help prioritise the development work. The responses were broadly grouped into three:

Other desired features:

- 'Simple to use, browser-based viewing of digital images'
- 'I would like the editor to be linked to a database to store the Annotations being created, so I can share them by URI'
- 'IIIF Viewers should be integrated with the production of new manifests' (perhaps a request for a preview functionality)
- 'Feature request: import from table formatted metadata (csv or similar)'
- 'It could be great to be able to import (images from) manifests from IIIF-compliant collections as well as being able to import a CSV (maybe we need to establish a structure)'
- 'The ability to upload my own items that are not currently available as IIIF manifests'
- 'It would be useful to see a plugin for Visual Studio Code to help build and validate manifests'
- 'The Bodleian Manifest creator spits out non-valid code due to user error - this should never happen when validation tools exist to catch it. Also, instructions on how to setup CORS so your manifest can be used with generic viewers would be super important.'

- 'Have unique URLs to share very quickly of different zooms within the objects, allow special pans in a unique storytelling feature that can contain text overlay and audio'
- 'The editor's UI should try to not use technical IIF language and be easy to embed into other environments/tech stacks.'
- 'API to other tools like Transkribus and Goobi '
- 'That'd be great to be able to export manifests with annotations as pdf (or any other text/table formats)'

Useful concerns or criticisms:

- 'Please note that the terminology used for this survey - and in general communication to staff - is not widely understood by people outside of Digital/Scientific/Collection information teams'
- 'The notion of annotation remains unclear. I'd expect to cover this 'Transcript' and then the question follows which textual features would be supported and which not'
- 'The initial set up/import deters a lot of smaller organisations [sic]. Support integrating their existing systems would support smaller organisations'
- 'Using IIF for research/education narratives still feels a bit distant to me - it's more technical to setup than a slideshow and without any guarantee of durability, so the incentive to use it just isn't there yet for me. Any ways of addressing this might go far to engage folks like myself (should there be others).'

Comments:

- 'I use IIF in my teaching and research (mostly having to do with working with manuscript fragments) and it has transformed my work and pedagogy'
- 'A new/more featured Manifest Editor will be a real boon for the IIF community, thanks!'
- 'Thanks for all the great work you've all been doing!'

Appendix F - IIF Manifest Editor - Usability test and recommendations

A summary of the finding gathered by Digirati in April/May 2022.

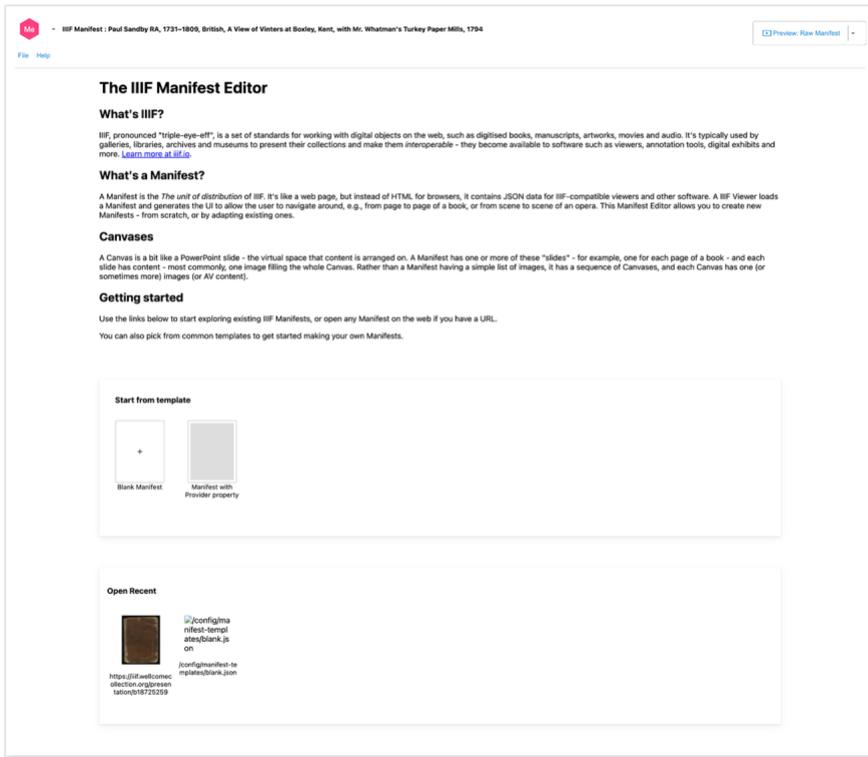
Key areas

- Loading manifests
- Editor views
- Adding canvases
- Editing metadata
- Previewing
- Saving

Loading a manifest

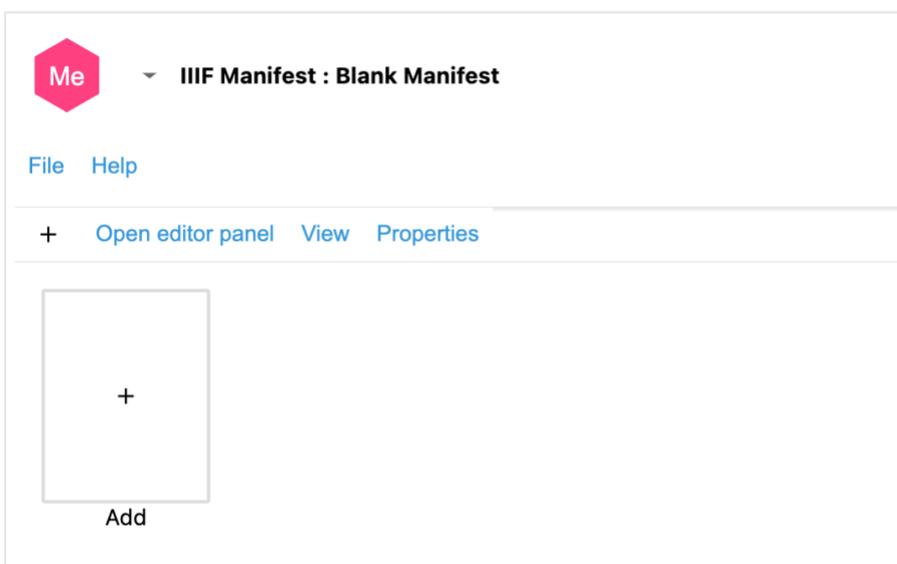
Landing page needs rethinking

- Landing page design might have contributed to people struggling to find how to load/open a manifest
- The menu (File - Help) isn't prominent enough
- Lots of instructional copy upfront
- Calls to action at the bottom don't include 'Load' – just 'Start from template' options and 'Open recent'
- 'What is Manifest with provider property?'



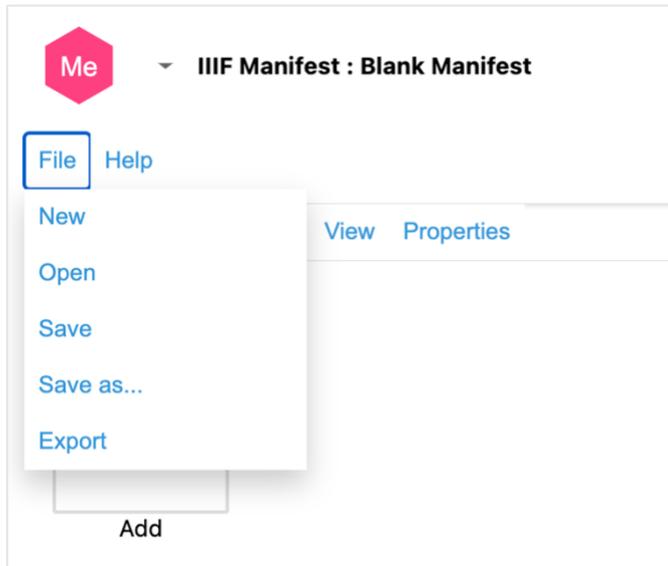
Adding a canvas saved more than one but...

- People who struggled finding File/Open ended up starting a new blank manifest from landing page
- Then, at the next page, they clicked the plus sign (for canvas) and pasted the manifest link in the dialog
- The system told them this was a manifest and gave them the choice to add it
- Though the system got people back on track, they never understood what happened there
- “Add what?” Someone asked

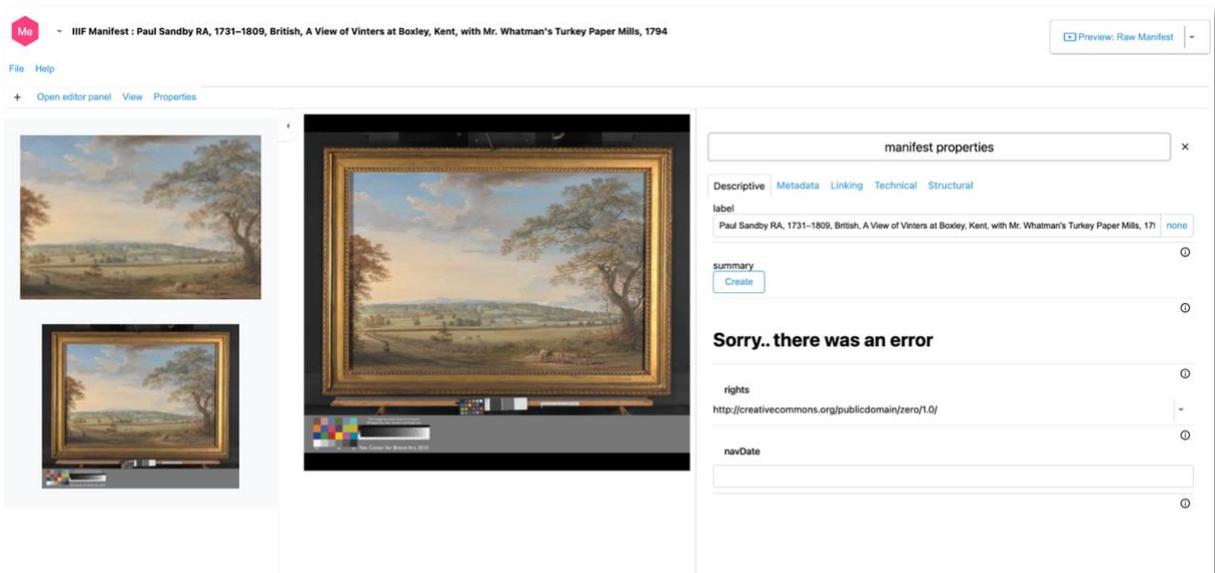


File vs Manifest: a battle of labels

- Worth investigating further but it seems that (some?) people might not associate a manifest with a file so the file menu item model wasn't obvious at first
- But for those who aren't entirely familiar with IIIF, file might be the more obvious label choice



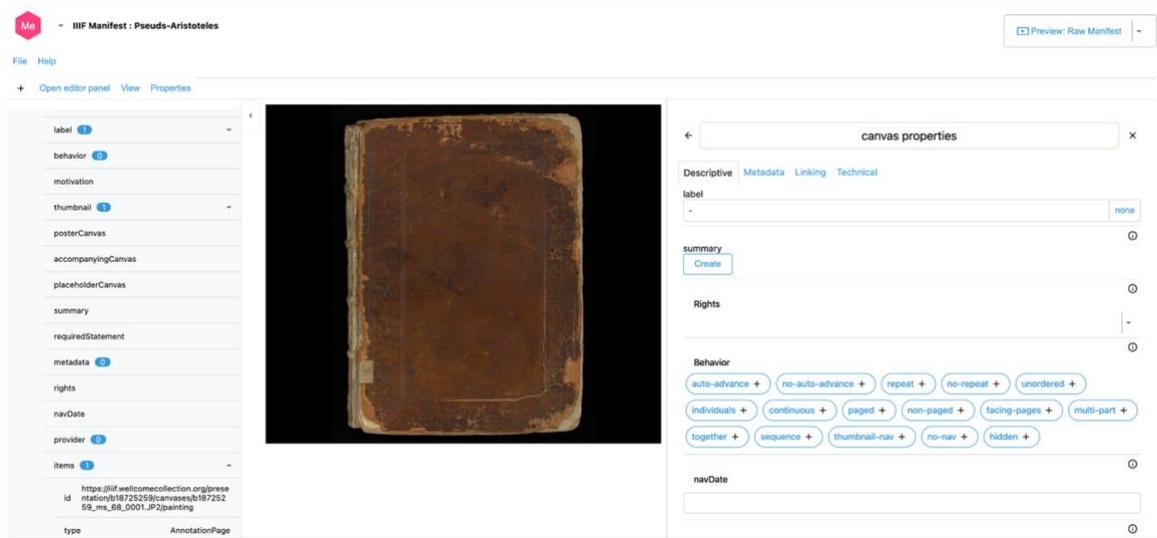
Error when loading own resources



Manifest views

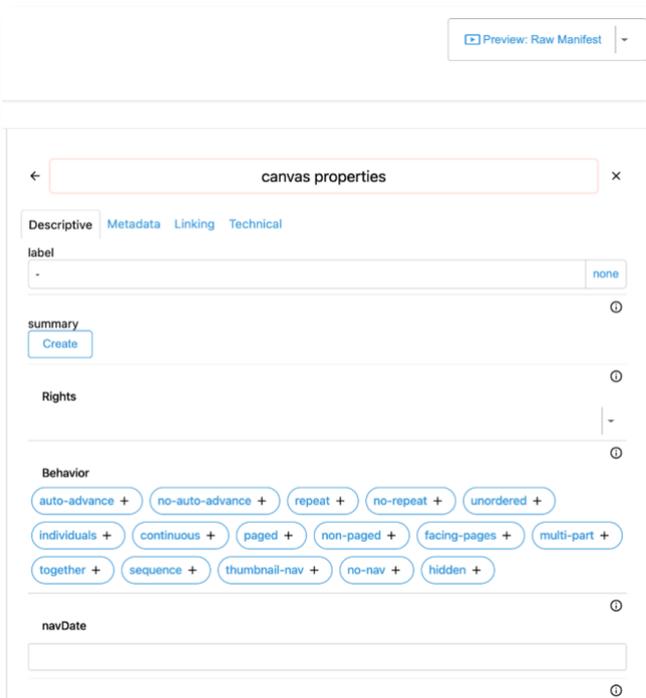
Outline view

- Not immediately obvious what it is for some
- Slightly disconnected conceptually from RHS editing view: we might need to explore a different way to relate the two columns as there is repetition between the two but different groupings



Small screens

- Some users have small (laptop) screens, the Lookback script took even more real estate
- Grid and strip views ended up looking similar
- The width of the editing metadata section (right) would need to be fluid rather than fixed



Add canvases

A few notes

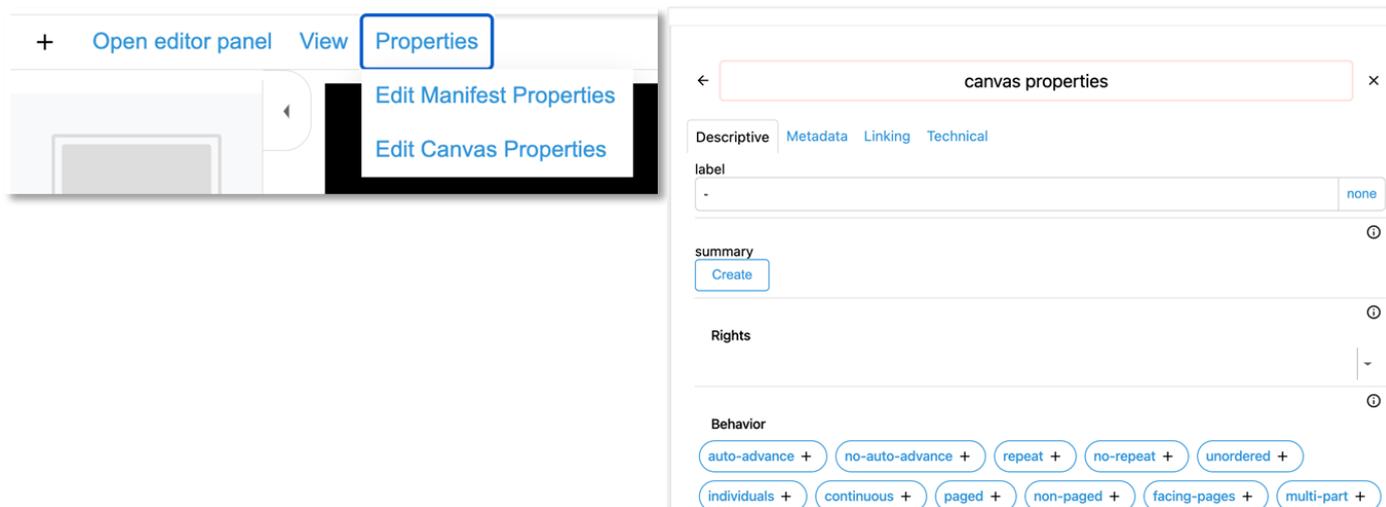
- 'How do I remove a canvas?'

- Thumbnail didn't load sometimes - users thought they need to set that themselves somewhere
- Add canvas button isn't clear enough - we need a label there
- 'What is an empty canvas?' - need help there
- New canvas is added to the bottom so in some views it can't be seen unless users scroll down. Can we re- focus the canvas area in the centre screen to display the new addition?

Editing metadata

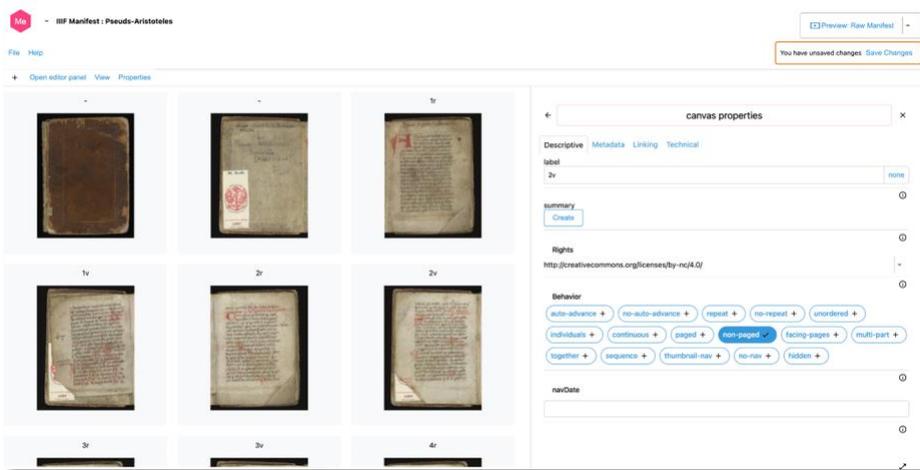
Manifest editing vs Canvas editing

- Some users didn't notice that by interacting with the thumbnails they were switching between manifest and canvas properties
- The current visual style is not emphasising the relationship between the two strongly enough
- 'Open editor panel' menu option feels often redundant:
- Panel is opened by default
- Can be reopened and switched from Properties



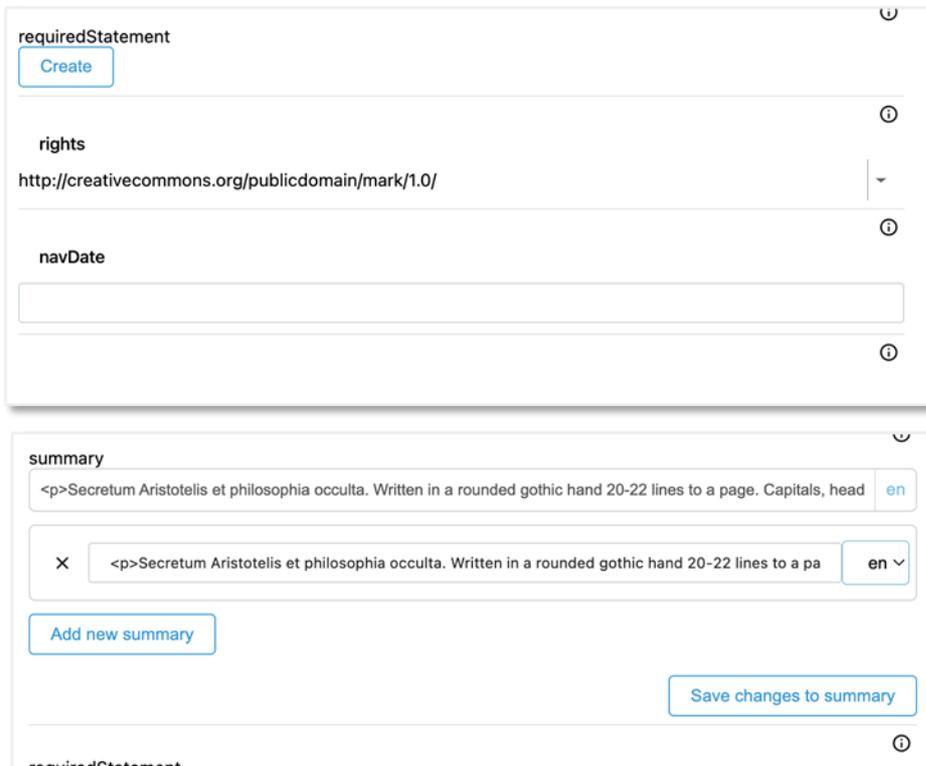
Which canvas is on?

- Not obvious which canvas is selected in UI grid
- A simple highlighting should do here

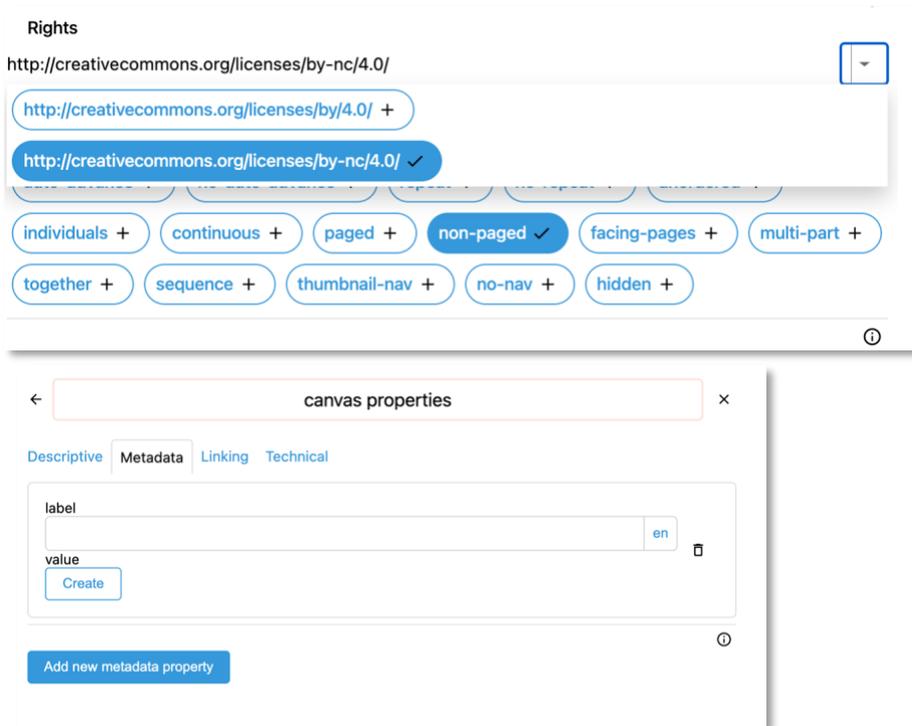


UI improvements and questions

- Why do some fields have a create button while others show the empty input field directly? Can we normalise this?
- We should look at the possibility of reducing the number of buttons here
- Smaller add new
- Remove save changes?



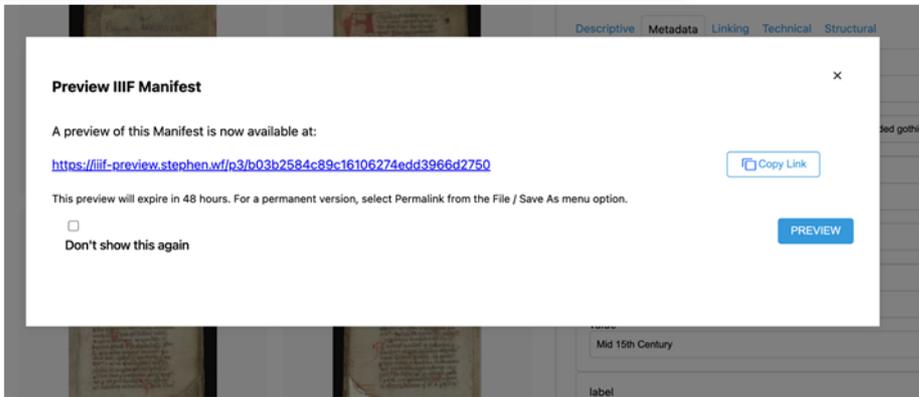
- Similar but different components? Can we normalise, reduce these?
- Why "add new metadata pair" requires extra clicks - one for each field? Can we just add the two fields straight away by default at first? Then people can add more values later if needed.



Previewing

We need to make this more seamless

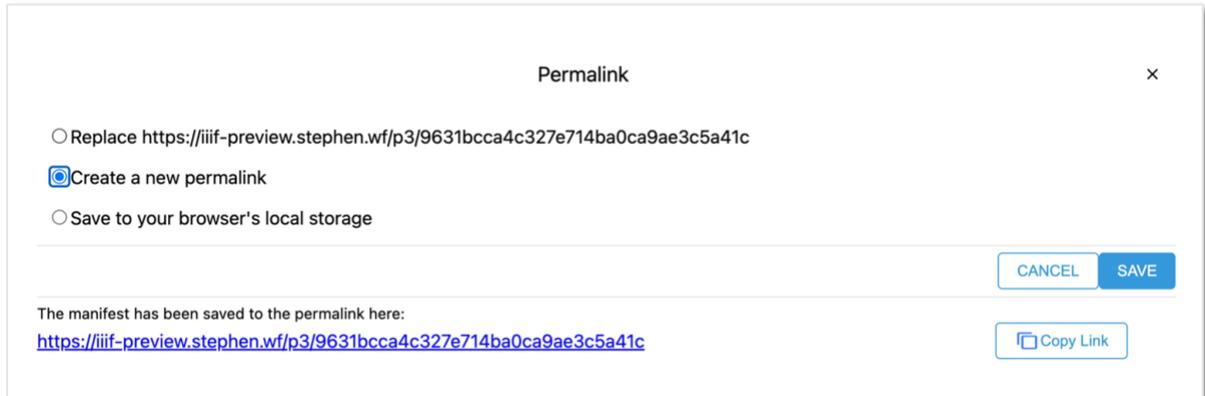
- Preview dialogue seems overly laborious
- Preview - raw link vs an actual preview. A fight for attention
- JSON file more prominent than preview option - people going for that
- Users seemed to expect some kind of special send functionality, but they just copied the url in browser address bar
- Misaligned checkbox
- Preview fails for UV
- Some users missed the preview dropdown and ends up looking at raw file (default) only



Saving

"Did I save it?"

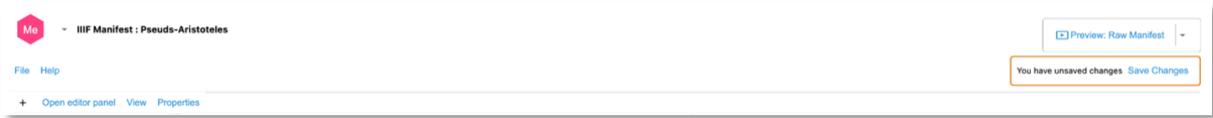
- User wasn't sure whether he should save the manifest every time he adds a canvas
- "Did I just lose my manifest?" (refreshed page)
- Some options not clear enough e.g. "Replace..."



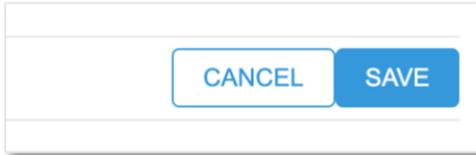
Bonus track

We need to tighten the header section

- Two menus with just a few items doesn't look good
- As seen before, we need to ensure the preview button and its options are clear enough
- The save message might need to be placed in the centre
- We can potentially reduce vertical space here



We need to do a final check with spacing in general



Appendix G – How IIF can support a National Collection

Introduction

The IIF standards came from the need to share collections between institutions and provide a framework to build shared services and software. Since its early releases implementation has grown across the world and the UK has always been an important pillar in its development. The National Collection initiative comes at an opportune time to both take advantage of the facilities IIF provides and also inform its future directions.

The 'Towards a National Collection' (TaNC) initiative has [six objectives](#) and IIF can be an important enabler to assist in their achievement. There are already a number of examples from the IIF community which provide evidence of its suitability. The six National Collection aims are enumerated below with illustrative examples from the IIF community.

to begin to dissolve barriers between different collections

This is one of the key use cases for IIF and has informed its development from the beginning. Among many examples there is a [blog](#) from Ben Albritton discussing how IIF dissolves the barriers for manuscript scholars working with items from different collections. As well as use by individual researchers there have also been projects whose core purpose is to gather items from different collections, this could be gathering works from a particular poet, working with distributed and [fragmented manuscripts](#) or finding different [witnesses to events](#).

to open up collections to new cross-disciplinary and cross-collection lines of research

Building on the previous examples once you have collections which can be gathered together by end users it is possible to support cross-disciplinary and cross-collection research by exposing the items of interest which normally would be buried in amongst a larger digital haystack. An example of this approach is the Digital Music lab based at McGill University. They have a search tool called [MusicLibs](#) which contains IIF musical scores from numerous institutions around the world and they are able to build experimental search tools on the material like pitch searching. Many scores exist in distributed collections but allowing the aggregating into a subject specific aggregator means they receive greater attention than from an institution's own catalogue.

to extend researcher and public access beyond the physical boundaries of their location

As well as the previous examples of remote access to digital resources there are also numerous examples of IIF used with annotation and crowdsourcing which is one method to enable public access and engagement with collections. There are many benefits in allowing the public to interact with collections through these projects and they go further than just simply providing access. A few examples include one from the British Library with their [Playbills project](#), a crowdsourcing platform

to support the transcription of manuscripts [FromThePage](#) and an Omeka-s based [crowdsourcing platform](#) from the National Library of Wales. IIF provides both an infrastructure to build a crowdsourcing solution on top of and also a method for displaying the results using search and export with W3C annotations.

To benefit a diverse range of audiences

IIF allows the re-use and repurposing of collections and a good example of this is the [Indigenous Digital Archive](#) project. This is an initiative to take the records on indigenous communities from the US National Archives and re-contextualise them with involvement with the communities the records represent. These types of decolonisation and contextualising collections projects will become more and more important.

To be active and of benefit across the UK

The UK has had a strong impact on the development of the IIF standards with the University of Oxford and the British Library being two of the core founding members of the IIF consortium. They have now been joined by the University of Cambridge and the National Libraries of Scotland and Wales. As well as consortium members there are a growing number of institutions in the UK who have implemented and take an active part in the IIF community. One of the largest benefits of adopting IIF is the wealth of open source and free software that is available to work with their collections. It would also be true that any future software produced by the TaNC projects that are compatible with IIF could be made available for others in the UK to benefit from.

To provide clear evidence and exemplars that support enhanced funding going forward.

Finally, IIF provides the infrastructure which can support the investigation into research questions. It provides the technical solutions to working with images and AV and means any tools developed can be reused on collections outside of the project. With its design on interoperability it is particularly suited to support research connecting institutions and research groups.

Existing examples of discovery

When considering how to build a National Collection for the UK it is useful to see how other countries and regions have tried to achieve this and if lessons can be learned. There are a number of IIF enabled 'aggregators' who harvest IIF assets from institutions to create a collection of IIF resources. The advantage of IIF for this use case is in its ability to support distributed viewing of an item. It is no longer necessary to transfer large image or video files between institutions but instead only to transfer a IIF manifest which details how the interaction can work. For institutions like Europeana, the benefit in adopting IIF has allowed them to embed a large zoomable image into their website whereas previously they were limited to a thumbnail and a link back to an institution's website. Along with not having to transfer large files, institutions also benefit as any usage of their content on places like Europeana will register with their own logs rather than having to go to third party websites to see the impact and use of their material. Two examples have been chosen below to show some of the features of using IIF to create a National Collection.

Cultural Japan and Japan Search

<https://cultural.jp/en>

Cultural Japan provides a one stop service for over one million Japanese related images from all over the world. It collects information from 38 databases including Japan Search, Europeana, DPLA, Trove, DigitalNZ, and many important sources such as British Museum, V&A, Tate, MET Museum, Harvard University, Library of Congress and MoMA. As well as aggregating local and international collections it also provides features like a way to build your own [virtual museum](#) with its artwork.

Europeana

https://www.europeana.eu/en/search?query=provider_aggregation_edm_isShownBy%3A%2aiiif%2a&view=grid

Europeana is a showcase for the collections in Archives, Galleries and Museums in Europe. In the last few years it has started to harvest IIIF resources from its partners and the link above will retrieve this subset. Europeana take an active role in the IIIF Discovery groups and are evaluating some of the new specifications to see if they can improve their current approaches.

Upcoming developments

As mentioned in the introduction the TaNC programme comes at an opportune time for the IIIF community as it is just embarking on a community effort to look into the issues around discovery. This takes two forms; one a technical group looking into the new standards that are required to support aggregation and a second community group, called Discovery for Humans or D4H that focuses on the wider non technical issues which hamper finding IIIF resources.

The [D4H group](#) are currently working on an evaluation of discovery solutions and extracting key features from the many examples in the IIIF community. This will lead to a list of recommendations both on features like user collection creation but also guidance on how to make IIIF assets discoverable possibly through specific IIIF facets. The group is also looking into the user experience of working with IIIF material and seeing how this can be improved. Finally, the group is working on a website to describe how to access IIIF Manifests on the community websites. This is accessible at guides.iiif.io and came out of work done by the University of St Andrews to list locations of IIIF content for remote teaching during the COVID pandemic. It currently lists 45 institutions from around the globe and this number is increasing quickly.

The other group is the Discovery Technical Specification Group (TSG) and this has been running for a number of years looking at the standards required to share and collect IIIF resources. They recently released a BETA version of the [Change Discovery API](#) which is intended to allow aggregators to harvest IIIF resources from an institution and be notified when an object is updated. The specification also details methods for retrieving metadata about IIIF assets to allow an aggregator to create a rich faceted searching experience across multiple collections. There are a number of implementations of the Change Discovery API including one from the University of Oxford. The group is currently working on a new standard called [Content State API](#) which is intended to allow

users to take their current view of an object and transfer it to a different viewer. This would support the following use cases:

Creation of a IIF bookmarking service to allow users to create a collection of resources they are interested in.

- To share a discovery in a manuscript or other resource with another person.
- To open up a list of search results in a viewer outside of the originating organisation.
This could be useful in moving search results to a viewer which supports annotation.

The final part of the Discovery TSG is to look into notifications so that when a user annotates a IIF resource or adds a table of contents then there is a method for this to be submitted back to the institution that owns the manifest. This could mean a research project can submit their work back to a cultural heritage institution to improve discovery of the material on the institution's website.

Both the D4H group and the Discovery TSG are open for anyone to join and both meet regularly on Zoom. To take part in these discussions please see the [groups page](#) on the IIF website.

Appendix H – Additional links and related documents

On being the right size, Tom Crane, May 2021

<https://canvas-panel.digirati.com/developer-stories/rightsize.html>

“Digitisation doesn't make everything equal, it just makes everything the same size” - A short description of how IIIF can be used to present digitised works of art at the correct relative scale, rather than as a gallery of images at the same number of pixels.

IIIF Manifest Editor —commentary on first round of user group feedback, Tom Crane, Feb 2022

<https://medium.com/digirati-ch/iiif-manifest-editor-commentary-on-first-round-of-user-group-feedback-eb30cd252157>

A discussion relating to the development of the D5 - The New Digirati Manifest Editor.

Connected Collections

In celebration of reaching 500 followers on Twitter, as well as marking the halfway point of the project, a series of blogs were produced to showcase highlights of the project partners' collections and their work and engagement with IIIF. The main landing page for these can be found at:

<https://tanc-ahrc.github.io/IIIF-TNC/connected-collections.html>

- [The National Gallery: The Virgin and Child Enthroned, with Narrative Scenes](#)
- [The Royal Botanic Garden Edinburgh: Rhododendron augustinii](#)
- [The National Portrait Gallery: King Edward VI and the Pope](#)
- [The British Library: The Sherborne Missal](#)
- [The V&A: The Tomb of Cecilia Metella](#)
- [The University of Edinburgh: The Mahābhārata Scroll](#)
- [Stanford University: An Antiphonal from the parish at Santa Maria sopra Porta](#)
- [Digirati: The Royal Academy Summer Exhibition: A Chronicle, 1769–2018](#)
- [The Science Museum Group: Sokol Space Suit](#)
- [IIIF: The IIIF Community](#)

Appendix I – Summary of accessibility of resources

Name	Format	Licence ¹⁵⁴	Link
Webinar 1: The Practical Applications of IIF	Presentation	CC BY-NC 4.0	https://tanc-ahrc.github.io/IIF-TNC/webinar01.html
	Dataset	CC BY-4.0	https://doi.org/10.5281/zenodo.4633183
Webinar 2: IIF Services and Tools	Presentation	CC BY-NC 4.0	https://tanc-ahrc.github.io/IIF-TNC/webinar02.html
	Dataset	CC BY-4.0	https://doi.org/10.5281/zenodo.5137298
Webinar 3: Project Outcomes and Future Directions	Presentation	CC BY-NC 4.0	https://tanc-ahrc.github.io/IIF-TNC/webinar03.html
	Dataset	CC BY-4.0	https://doi.org/10.5281/zenodo.6587143
Seminar 1: Image Registration and IIF	Presentation	CC BY-NC 4.0	https://tanc-ahrc.github.io/IIF-TNC/seminar01.html
	Dataset	CC BY-4.0	https://doi.org/10.5281/zenodo.5215677
Seminar 2: PIDs and IIF (Collaborative)	Presentation	CC BY-NC 4.0	https://tanc-ahrc.github.io/IIF-TNC/seminar02.html
	Dataset	CC BY-4.0	https://doi.org/10.5281/zenodo.5780055
D1 - Simple Site	Doc/Presentation	CC BY-NC 4.0	https://jpadfield.github.io/simple-site/
	Code	GPL-3.0	https://github.com/jpadfield/simple-site
	Dataset	GPL-3.0	https://doi.org/10.5281/zenodo.4504844
D2 - Simple IIF Discovery	Doc/Presentation	CC BY-NC 4.0	https://research.ng-london.org.uk/ss-iiif/
	Code	GPL-3.0	https://github.com/jpadfield/iiif-discovery
	Dataset	GPL-3.0	https://doi.org/10.5281/zenodo.5512980
D3 - IIF Collections Explorer	Doc/Presentation	CC BY-NC 4.0	https://research.ng-london.org.uk/iiif-projects/
	Code	GPL-3.0	https://github.com/jpadfield/iiif-collection-explorer
	Dataset	GPL-3.0	https://doi.org/10.5281/zenodo.6577232
D3.1 – IIF Collection Preview	Presentation	CC BY-NC 4.0	https://research.ng-london.org.uk/cv/?uri=https://research.ng-london.org.uk/iiif-projects/json/ng-projects.json&limit=250
	Code	GPL-3.0	https://github.com/jpadfield/iiif-collecton-preview
	Dataset	GPL-3.0	https://doi.org/10.5281/zenodo.6577533
	Doc/Presentation	CC BY-NC 4.0	https://tudor-portraits.npg.hasdai.org

¹⁵⁴ All images and metadata sourced from external APIs/Sources are subject to the IPR set by the content owners.

D4 - Tudor Portrait Resource	Software Webpage	Custom	https://invenio-software.org/products/rdm/
	Code	Custom	https://github.com/inveniosoftware/docs-invenio-rdm/
D4.1 – IIIF Zenodo	Example	CC-BY-4.0	https://cima.ng-london.org.uk/zenodo/3758523
	Code	GPL-3.0	https://github.com/jpadfield/iiif-zenodo
	Dataset	GPL-3.0	https://doi.org/10.5281/zenodo.4584109
D5 - The New Digirati Manifest Editor	Test Version	MIT	https://manifest-editor-testing.netlify.app/
	Code	MIT	https://github.com/digirati-co-uk/iiif-manifest-editor
	Discussion	MIT	https://github.com/digirati-co-uk/iiif-manifest-editor/wiki/Product-Vision