TOWARDS A NATIONAL COLLECTION

UKRI Arts and Humanities Research Council

INTERIM REPORT
FOUNDATION PROJECTS

PRACTICAL APPLICATIONS OF IIIF
as a building block towards a digital National Collection

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The British Library | The National Portrait Gallery |
Royal Botanic Garden Edinburgh | Stanford Univeristy Libraries |
Science Museum Group | Digirati |
Victoria and Albert Museum | IIIF Consortium

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Executive Summary

This is an interim report to AHRC for the Practical applications of IIIF as a building block towards a digital National Collection project. The project aims to highlight and demonstrate the opportunities and benefits that the International Image Interoperability Framework (IIIF) standard offers to a wide audience of heritage institutions and researchers looking to share, present and re-use high quality images and media on the web. It will explore and 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, both for research and public presentations. It will deliver up-to-date guidance on some of the opportunities and options that exist for institutions and individual researchers along with 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.

Unfortunately, even though this project is predominantly based on digital activities, the Covid-19 pandemic has had a significant effect on the initial plans for this project. The main issues have been the furloughing of one of the project's Co-Is and serious disruptions to the process of hiring the project Senior Research Fellow. In response to this, the main project activities were put on hold and a six-month extension was requested. The project Fellow position is now being re-advertised again and the work of the project as a whole is moving forward.

Although some of the main activities of the project have been on hold, work has progressed in other areas. The project has identified and developed connections and areas of overlap with other Foundation Projects and other external EU and UK based projects. The IIIF Consortium has been added as a project partner, with several of the planned project activities now being run in collaboration with existing IIIF initiatives, specifically the development of a list of IIIF guides and examples, and the examination of how users might find and engage with IIIF resources, an issue that is being explored within the new "Discovery for Humans" IIIF community group. An open platform for the project's shared technological development has been set up within GitHub and support was also provided for five of the other Foundation projects to replicate this set up.

Early work within the project has also created and presented several live IIIF demonstrators. This has concentrated on showing how individuals or even small institutions can organise and re-present existing IIIF resources using the free services provided by GitHub, making use of the Mirador V3 IIIF image viewer along with a IIIF compliant curtain viewer from the V&A. This work has been presented to external HEI researchers, NG senior management, as part of the annual Museums Computer Group (MCG) conference and to the wider IIIF community. An example has also been developed showing how, in the future, it might be possible for researchers to also have access to free IIIF hosting services, via open research repositories such as Zenodo.

There is still much work to do in the project, but it is already clear that interoperability via standards such as IIIF will need to be a key component of any future digital National Collection. A more detailed description of how IIIF can meet the needs of the wider Towards a National Collection programme (TaNC) has been included as an annex to this report.

Abstract

How can we best build a common infrastructure for sharing high quality images from heritage collections and sites?

This project will explore and demonstrate the possibilities of the International Image Interoperability Framework (IIIF) to support the dissemination of born digital and digitised heritage images for research and engagement. IIIF, along with a wide range of freely available IIIF compliant software, represents a flexible, standard approach to providing reliable access to such images[1]. However, though well described, setting up and re-using such IIIF resources can still be complex, particularly for smaller institutions or individual researchers. Also, a better understanding of how to combine IIIF resources across multiple institutions and present a National Collection to diverse audiences is needed.

This project aims to demonstrate the opportunities and benefits that IIIF offers, to a wide audience of users and help to define more robust use cases of IIIF, for institutions, but also for individual researchers who want to re-use and exploit IIIF resources to carry out new research, create new opportunities and tell alternative stories. This work will highlight existing software and resources and identify what new tools, services or training might be required to maximise the potential of IIIF within the heritage community.

This will be achieved through a series of targeted webinars/workshops and surveys, along with the creation of pilot demonstrators, to provide tangible examples of what can be achieved. This process will involve both technical and non-technical researchers in collaboratively building resources, to increase mutual understanding of the possibilities and requirements.

Aims and Objectives

Access to high quality well-documented images is key to modern research, dissemination of cultural knowledge and engagement with heritage collections and sites. The IIIF was developed as a new international collaborative approach to allow shared interoperable image resources to be created. The project aims to highlight and demonstrate opportunities and benefits this developing standard offers to a wide audience of institutions and researchers. It will explore and develop its potential to virtually connect collections at different organisations, allowing users to experience and interact with images of collections and related material, both for research and public presentations. It will explore efficient methods of using the IIIF standard as we develop more collaborative online resources involving many complex large images, and start to construct the foundations of a virtual National Collection. Images would underpin nearly all forms of engagement with and management of a 'National Collection', therefore lowering the barriers for participation in the use of IIIF would facilitate a broad spectrum of projects including collections research, conservation, collections management and audience engagement.

The project aims to bring together expertise from IROs and HEIs, currently dispersed with developments happening in silos, to collaboratively consider the research questions posed. It aims for wide consultation across these sectors through webinars and workshops, bringing in a range of disciplines, including digital humanities. This work will help to define and describe a more robust range of use cases of IIIF, for institutions able to present IIIF resources, but also for researchers and potentially members of the public who want to re-use and exploit these resources to carry out new research, create new opportunities and tell alternative stories. The project will work with existing resources and the wider IIIF community to identify existing IIIF systems and tools, and to demonstrate how a selection of them can be used. This work will also consider what additional tools,

[1] Though beyond the scope of this particular project the IIIF standard continues to be developed to cover further use cases and media types, such as A/V (https://iiif.io/community/groups/av/) and 3D (https://iiif.io/community/groups/3d/) resources.

services or training opportunities are available and explore what new ideas need to be developed to help maximise the potential of IIIF resources.

A small selection of IIIF demonstrators will provide tangible outcomes that show in a concrete way what can be achieved. An objective from their construction will be greater understanding of potential applications and any future development needs, exploring this in a deeper way than will be possible in the live webinars or workshops. This process will involve both technical and non-technical researchers in building examples collaboratively to increase mutual understanding of the possibilities and requirements.

The project will create a landscape report to demonstrate how these digital resources can be opened up to a wider range of users and re-used to develop new areas of research. It will review the state of the art in terms of adoption of IIIF, report on the project outcomes, and reflect on the learning outcomes emerging from development of the IIIF demonstrators. The report will also provide a firm list of recommendations to the sector that can be taken up by a wider variety of institutions, including elucidating the benefits, opportunities, and barriers to adopting IIIF. The integration of users into this development will ensure that the outputs are fit for purpose, targeted towards real applications and accessible to the community.

Partnership Structure

The project consortium is now composed of representatives from ten organisations; 6 UK heritage organisations, 2 Universities (UK & USA), 1 commercial company, along with the IIIF Consortium.

The Principal Investigator (PI), representing the National Gallery, leads the project consortium and is responsible for coordinating the collaboration between the PI, Co-Investigators (Co-Is) and project partners, who are tasked with delivering the project. The work of the National Gallery, though the PI and the project Senior Research Fellow, will cover all aspects of the project including organising and facilitating webinars/workshops, running surveys and contributing to the development of the project IIIF demonstrators. Project management and finances are also managed by the National Gallery along with employing and managing the project Senior Research Fellow. The National Gallery will also lead, supported by the project Co-Is, the production of a landscape report describing the use and potential of IIIF.

Co-Investigators (Co-Is)

The Co-Is represent the University of Edinburgh, the British Library (BL) and the National Portrait Gallery (NPG). These Co-Is are responsible for directly supporting the efforts of the PI and the project Senior Research Fellow, bringing their personal and institutional expertise to the project, supporting the use and development of IIIF within the heritage community and working to highlight real life practical IIIF solutions. All three Co-Is will also support the project webinars/workshops.

The work of the University of Edinburgh will engage with end user and usability aspects, e.g. monitoring the install/hosting of IIIF resources through the design and implementation of user impact/reception study, that will contribute to the road map, ensuring that user needs from a variety of different communities are understood within the design of this infrastructure, and that ethical approaches to service design are adopted.

The BL brings experience in infrastructure, services and repositories as well as collaborations with DataCite and the Turing Institute. The BL will input especially into considerations of how to move from pure research use to greater adoption of IIIF, including for non-technical users. They will also actively undertake software development related to IIIF, with the IIIF-based Universal Viewer established as the strategic content viewer of the national library.

The NPG will coordinate the design of a IIIF Tudor/Jacobean portrait demonstrator as a user perspective case study, to address issues surfaced in relation to the 'National Collection' concept at a 2018 workshop, which raised awareness of the possibilities of IIIF with curators, conservators and collectors (e.g. consistency of metadata; image licensing issues; functionality, with a desire for tools for image-led research, such as facility to show works to scale and overlay images for comparison of different versions). This case study also presents the opportunity for collaboration with the Yale Center for British Art, a leading participant in the IIIF community. It will allow for modelling of engagement with IIIF by diverse holders of the 'National Collection', as the dataset contains works within IROS, including the NPG, the National Trust and Royal Museums Greenwich; large UK collections, including the Royal Collection; international collections, including the YCBA and the Metropolitan Museum of Art; alongside research data on works in private collections held in the National Portrait Gallery's Heinz Archive and in university conservation studios, including the Courtauld Institute of Art and the Hamilton Kerr Institute.

Project Partners

All of the collaborating partners will work directly with the project Researcher, either through onsite secondments or through virtual events/communications, participate in and where appropriate directly support the planned project webinars/workshops and assist with writing and reviewing, where appropriate, the project recommendations, guidelines and final report.

The **Royal Botanic Garden Edinburgh** (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 IIIF end point (https://iiif.rbge.org.uk/) is already live and they will work directly with the project Researcher to exploit this resource as a test case for work during the project.

Digirati staff have been involved in IIIF for many years and have developed a range of IIIF tools and services. They continue to be involved in the further development of the IIIF specifications, especially in the areas of Discovery and the sharing of references to IIIF resources (e.g., in the context of citation). Their work creating a graphic user interface for editing and generating groups of IIIF resources will be a specific focus of the development work in the project.

Stanford University Libraries were directly involved with the foundation of the IIIF and they are currently active on multiple, related fronts, particularly in relation to the development of the IIIF image viewer Mirador 3. They will support the project's work to increase awareness and implementation of IIIF tools, such as Mirador 3, among galleries, libraries, archives and museums. Stanford is also driving a IIIF community effort, "IIIF Discovery for Humans", which will reinforce and complement 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 IIIF-tooling and resourcing available nationally - and will act as a bridge between these conversations and the project.

The **Science Museum Group** (SMG) has been following the development of IIIF with interest and are already exploring the potential of IIIF within their group's collection website. They are providing access to their IIIF resources and sharing their knowledge and experience. The SMG are also very

interested in how the use of shared vocabularies and keywords, across multiple collections, will greatly enhance interoperability and the potential of cross collection searching of future IIIF resources and will provide support for project activities in these areas.

The **Victoria and Albert Museum** is actively involved in IIIF and has developed a variety of IIIF-driven website features attached to both the Museum's public programme and its research activities, aimed at both internal and external audiences. They also regularly contribute talks to IIIF events and have hosted events at the V&A to support the IIIF community and plans for future developments. They will collaborate on the development of tools to allow curatorial, conservation and research staff to make use of IIIF functionality as part of their day-to-day activities and help to expand awareness and usability of IIIF among the cultural community.

The **International Image Interoperability Framework (IIIF) Consortium** provides a direct connection to the international IIIF community connecting the project to all current IIIF related research and developments. They will enhance the dissemination potential of the project and ensure that project research work can directly contribute to the wider development of IIIF. Ongoing work and research activities within the IIIF community will also directly support several areas of work within the projects, such as providing improved documentation, opportunities for training, lists of resources and expertise to directly assist the project researcher.

Staffing Structure

The project Principal Investigator is Joseph Padfield (Principal Scientist at the National Gallery). At the time of writing the project Senior Research Fellow position, based at the National Gallery, has not been filled. The project Co-investigators are Torsten Reimer (Head of Research Services, British Library), 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 are represented by Lorna Mitchell (Head of Library, Archives & Publications, Royal Botanic Garden Edinburgh), Tom Crane (Technical 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, Victoria and Albert Museum) and Glen Robson (IIIF Technical Coordinator). Outreach to additional institutions and researchers is being achieved via the existing IIIF consortium communication structures.

Covid-19 Impacts

Unfortunately, even though this project is predominantly based on digital activities the Covid-19 pandemic has had a significant effect on the initial plans for this project. The main issues have been the initial furloughing of one of the project Co-Is and disruptions to the process of hiring the project Senior Research Fellow.

The Senior Research Fellow position, based at The National Gallery, has now been 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 the Covid-19 pandemic and it was not possible to re-advertise the post until August 2020. This recruitment campaign was more successful with a strong candidate being selected, with a planned start for late November; however, complications in the recruitment process, specifically related to Covid-19, meant the process was

disrupted. At this time, we are re-advertising the post for a third time, but for a shorter period, with the position supported by an additional short-term researcher or contractor.

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 activities have been delayed or put on hold. This has meant that the furloughing of one of the project Co-Is has not resulted in any additional delays.

However, even with an expected six-month extension it is no longer possible to wait for a project researcher to be recruited and various project activities, specifically the planned meetings, will need to be scheduled. Covid-19 has also meant the initial planned workshops will have to be replaced with online webinars, however given the digital nature of these discussions and the increased use of online meetings it is anticipated that the impact of these meetings may not be decreased by these changes. In fact, the potential to increase the number of participants and the ability to record the presentations for re-use may have a positive effect.

Revised overall programme

This revised programme of activities for "Practical Applications of IIIF" is adjusted to reflect the current project plan taking into account the effects of COVID-19, with adjusted dates for events and the new recruitment campaign for the Senior Research Fellow. The dates given also include the requested 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	**Feb 2021**	Dissemination	Workshop 1 - Showcase and discuss the current IIIF use and best practice - VIRTUAL
Feb 2021	**Mar 2021**	Deliverable	Workshop 2 - Discuss the potential of shared IIIF services - VIRTUAL
Dec 2021	**Jan 2022**	Deliverable	Workshop 3 - Developing practical IIIF solutions
Mar 2022	**Mar 2022**	Dissemination	Workshop 4 - The IIIF-TNC project & the future
Apr 2021	**Apr 2021**	Review	Review the plans for IIIF demonstrations and examples
Feb 2021	**Jun 2021**	Collaboration	Conduct survey and identify relevant IIIF resources - work will be linked to the IIIF consortium "IIIF Awesome" list.
Apr 2021	**Jul 2021**	Assessment	Evaluations of relevant IIIF resources and user needs.
Jun 2021	**Jan 2022**	Collaboration	Targeted project secondments - Physical and Virtual.
Nov 2021	**Dec 2021**	Review	Review the recommendations for future IIIF services and tools, along with areas of future research.
Feb 2022	**Mar 2022**	Assessment	Evaluations of project IIIF Demonstrators and Examples.
Mar 2022	**Apr 2022**	Deliverable	Presentation/Release of project IIIF Demonstrators and Examples - Digital dissemination plus targeted virtual presentations.
Apr 2022	**Apr 2022**	Deliverable	Final Report

Events and Consultations

Previous events

Event	Event date	Links	Attendees/ Responses	Note
Towards a National Collection: Opening UK Heritage to the world, Programme - Open Meeting London	2020-03-04	-	50+	Presented the IIIF project as an example TaNC Foundation project - and participated in general discussions related to the next steps for TaNC.
Towards a National Collection: Opening UK Heritage to the world, Programme - Open Meeting Edinburgh	2020-03-11	-	50+	Presented the IIIF project as an example TaNC Foundation project - and participated in general discussions related to the next steps for TaNC.
IIIF Community Call (Technical): Simple-Site – Practical applications of IIIF as a building block towards a digital National Collection	2020-06-17	-	10+	Presented the project to the IIIF community, along with the Simple-Site system as the basis of a simple platform to arrange and work with IIIF resources.
UWE CFPR Seminar: Simple-Site – Practical applications of IIIF as a building block towards a digital National Collection	2020-07-22	Link	15*	Introducing IIIF and the project to the Centre for Fine Print research group at the University of the West of England.
IIIF Community Call: Practical applications of IIIF as a building block towards a digital National Collection	2020-06-11	-	20*	Part of a joint presentation with the Programme Director, Towards a National Collection.
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 IIIF)	2020-12-10	-	15* (Live) 56 (Clones of the GitHub Code)	Brief presentation followed by a longer discussion about the project and IIIF.
Demonstration of IIIF 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.
Twitter	N/A	@practicalIIIF	90 followers	

* Figures are approximate

Future events

Event/Consultation name	Event date	Event link	Note
Project Webinar #1	TBC		Showcase and discuss current best practice
Project Webinar #2	TBC		Discuss the potential of shared IIIF services
Project Webinar/Workshop #3	TBC		Developing practical IIIF solutions
Project Webinar/Workshop #4 (Final Event)	TBC		The IIIF-TNC project & the future
Project IIIF Resource Survey	Feb 2021		Work will be linked to the IIIF consortium development of the "IIIF Awesome" list.
Project IIIF Resource User Evaluation	Jul 2021		
Project IIIF Demonstrator User Evaluations	Mar 2022		
IIIF Consortium Spring Event	Spring 2021		
IIIF Consortium Fall Event	Autumn 2021		
IIIF Consortium Spring Event	Spring 2022		

Research Approach

The project will assess the current use of IIIF systems across the sector and gather the related requirements and ambitions of the project partners, documenting opportunities for and barriers to uptake, whether perceived or technical. This will be used for a landscape report and also to inform the design and development of a small selection of live, working IIIF technology demonstrations and case studies as follows:

- Working with and presenting datasets and research outputs from different institutions created as part of external research activities (e.g. exploring the IIIF resources made available through the Yale Center for British Art's 'Reformation to Restoration' project in partnership with the National Portrait Gallery as a case study[2,3]).
- Examining how IIIF resources can be used as supplementary information to support and enrich online publications or exhibitions (e.g. developing a collaborative digital research resource led by the National Gallery in conjunction with the high-profile exhibitions such as the Titian Poesie from Spring 2020).
- Developing new use cases and exploring user needs and feedback, in relation to the selected and developed tools, as the focus of a secondment for the project Researcher in Edinburgh. This would involve collaboration with the RBGE and the University of Edinburgh to explore

[2] "Yale Center for British Art's Reformation to Restoration project: Applying IIIF Mirador technology to support digital scholarly collaboration and research." MW2016: Museums and the Web 2016. Published January 30, 2016. Link Accessed 2020-12-18.

[3] Dr Edward Town 'Aims and Ambitions for collaborative IIIF-enabled research on Tudor and Jacobean paintings', at The Future of Images at Yale, 2019

prepared subsets of the RBGE digital image collection, including images of living plants, digitised herbarium specimens, historical photographs and original artworks.

- Demonstrating how individual non-technical researchers can create new aggregated IIIF presentations based on existing resources. Using a user-friendly prototype IIIF manifest aggregator, controlled via a new drag and drop based graphical user interface, which will allow non-technical users to gather images from different IIIF resources and create, describe and annotate new groups of images for their own research.

The project will also start exploring what new IIIF tools/services might be needed by the sector and how they might be created, used and maintained. It will carry 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. Building in feedback loops that integrate user studies into the development is essential to avoid wasted resources. An important premise is to involve and foster interactions between technical and non-technical people. Targeted webinars/workshops will be organised to bring together researchers in different sectors with a variety of expertise to consider the project topics outlined above.

Webinar 1: **Showcase and discuss current best practice** [tech. & non-tech]. Will explore how IIIF resources are currently being used for research and public engagement (and by whom), identifying available resources/tools, and how people would like to use these in the future, including new plugin/customisation options for existing IIIF tools e.g. that being developed for Mirador v.3, IIIF AV presentations and possible future presentation of 3D resources via IIIF. This webinar, facilitated by the National Gallery, will be broken up over a couple of days with an initial set of presentations showcasing the potential of IIIF solutions, followed by a second more workshop based webinar designed to foster discussions exploring the future potential of what has been presented and begin to develop new use cases and requirements.

Webinar 2: Discuss the potential of shared IIIF services [tech. & non-tech] Starting from the vision of seamless discovery of and access to a virtual collection, this webinar, facilitated by the British Library, will establish key requirements and assess the current IIIF capabilities to meet them. In advance of the workshop, project partners will develop a proposal for a virtual collection, brought together from materials hosted by different institutions. This will be shared with participants in advance, to allow them to critique it. During the workshop we will then assess current IIIF abilities to deliver this vision together with other existing standards, and establish requirements for further development of IIIF. These will be documented and shared with the wider IIIF community, to become part of the roadmap. The workshop will be hosted and facilitated by the British Library, inspired by strategic plans around facilitation of shared discovery and access solutions.

Webinar/Workshop 3: Developing practical IIIF solutions [tech. & non-tech] A practical workshop or hackathon designed to create working examples of aggregating, using and presenting IIIF resources as well as to help to develop use cases describing how end users can exploit these tools. The event, facilitated by the Royal Botanic Garden Edinburgh, will be a combination of technical development and practical use case discussion. Prior to the workshop specific sets of IIIF resources will be sourced along with relevant research questions, user needs and or use case scenarios. These will then be made available before the webinar/workshop, allowing technical specialists to connect with non-technical domain experts to create collaborative plans for the event. The activities will then be carried out in stages allowing the various groups to observe and benefit from each other's work.

Webinar/Workshop 4: The IIIF-TNC project & the future This will be the final project event to present and discuss the developed demonstrators and the work of the project as a whole.

In addition to these targeted workshops, project representatives will also take part in and collaborate with relevant IIIF Community events and initiatives. Additional work will also be carried out by the project Researcher to gather further information relating to user needs and assessments. A series of online surveys will be created to gather general information and then also to allow users to comment and provide feedback on their experiences of testing the technology demonstrators generated and identified within the project.

Early research outputs and results

The work has begun by establishing an open technical foundation on which to develop, present and share the activities of the project, and also to make connections with other Foundation Projects. The project has also been collaborating with the wider IIIF community, identifying related activities, working directly with the IIIF consortium, demonstrating simple examples of content and technology sharing between Heritage organisations, and beginning to explore the potential of Zenodo[4] as a free, though limited, IIIF image repository.

Sharing content via IIIF relies on the identification of relevant resources (images, collections, artists, servers, etc.) and the ability to find and organise these resources. Examining these issues in depth goes beyond the scope of this particular project, therefore one of the first steps of the project was to identify related projects, within the TaNC programme and beyond, that were already considering these areas. Connections with the TaNC *Persistent Identifiers*[5] and *Heritage Connector*[6] projects were established via shared investigators and project partners. Overlap with wider data sharing issues was achieved, via the project PI, through the H2020 EU SSHOC[7] project and connections to work examining how the relationships between IIIF resources can be standardised and described were identified via the AHRC supported Linked Art[8] and Linked Conservation Data[9] projects.

Engaging with GitHub - Project Website & IIIF Viewers

This project involves the collaborative development of software and GitHub[10] was selected as an appropriate open repository to use for the project. A dedicated GitHub TaNC organisation[11] was set up by the PI, and along with a specific repository for the project. At this stage it was identified that in addition to hosting any developed code GitHub was also able to act as a free web server to host the project website (https://tanc-ahrc.github.io/IIIF-TNC) via a system called GitHub Pages[12]. Further

[4] https://zenodo.org/ - A general-purpose open-access repository developed under the European OpenAIRE (https://www.openaire.eu/) program and operated by CERN (https://home.cern/).
[5] https://tanc-ahrc.github.io/HeritagePIDs/
[6] https://thesciencemuseum.github.io/heritageconnector/
[7] https://sshopencloud.eu/ - as part of this wider project, examining issues of data storage and sharing, the NG is responsible for a specific task to open up, present and share heritage data including images via IIIF.
[8] https://linked.art/ - "Linked Art is a Community working together to create a shared Model based on Linked Open Data to describe Art."
[9] https://www.ligatus.org.uk/project/linked-conservation-data - "... investigate current web technologies known as Linked Data to enable accessibility to conservation records"
[10] https://github.com/ - An open, collaborative development platform, providing distributed version control and source code management.
[11] https://github.com/tanc-ahrc
[12] https://pages.github.com/

work by the PI, also identified that it was possible, using GitHub Actions[13], to create automated systems to generate formatted websites from simple text files. This work was packaged together to form the Simple Site[14] system which in turn was used to create the project websites for 6 of the 8 TaNC Foundation Project repositories[15]. The work to develop the Simple Site system was directly supported by this project along with the TaNC Persistent Identifiers, the SSHOC project and an EPSRC funded project called ARTICT[16].

In addition to providing a platform for the simple generation of project websites it soon became clear that the Simple Site system could also be used as a simple virtual research environment for researchers to organise, present and work with public IIIF resources. An extension process was developed by the PI, for the Simple Site to add in more complex data formatting and presentations, such as timelines[17] and the IIIF image viewer Mirador[18]. A copy of the Simple Site system, Simple Mirador[19], dedicated to documenting and demonstrating how it can be used to work with IIIF and Mirador was set up as this project's first demonstrator. This work has continued, upgrading the initial version 2 of Mirador to the new version 3 and collaborating with Jack Reed (Stanford University) to determine how researchers can organise complex arrangements of multiple images served from multiple institutions within a single Mirador viewer[20].

Working with the IIIF Consortium - Expanding the Project

There is a wide international community of researchers using and contributing to the development of IIIF, supported by the official IIIF Consortium. At the beginning of the project it was possible to establish an official relationship with the IIIF Consortium and welcome them as project partners. Work has continued to strengthen connections between this project and the IIIF Consortium through participation in numerous IIIF events and virtual calls along with specific project presentations given by the PI, within two IIIF events. It has also been possible to identify various resources directly aligned with planned project work and deliverables, supported by the IIIF consortium, that this project will be able to support and contribute to with future work rather than start building from scratch. Two specific examples are noted below.

Identifying Existing Resources to Build Upon

A potential solution for one of the planned project demonstrators, a tool to allow "individual non-technical researchers" to "create new aggregated IIIF presentations based on existing resources",

[13] https://docs.github.com/en/free-pro-team@latest/actions - This system allows automated processes to be set up to run and test software within a GitHub repository.
[14] https://jpadfield.github.io/simple-site/ - Initiated in Mar 2020 with development is ongoing at the time of writing.
[15] https://github.com/tanc-ahrc - Mar 2020:HeritagePIDs (https://github.com/tanc-ahrc/HeritagePIDs), Apr 2020: LocatingTANC (https://github.com/tanc-ahrc/LocatingTANC), May 2020: EngagingCrowds (https://github.com/tanc-ahrc/EngagingCrowds), May 2020: DeepDiscoveries (https://github.com/tanc-ahrc/DeepDiscoveries), Jun 2020: Provisional Semantics (https://github.com/tanc-ahrc/ProvisionalSemantics).
[16] https://art-ict.github.io/artict/ - "bringing together ICT and Heritage Science researchers to enable the cross-pollination of ideas and expertise - is to co-create new automatic signal analysis and processing tools that are able to fuse MA-XRF and HSI data to support the technical study, conservation and preservation artwork."
[17] https://jpadfield.github.io/simple-site/timeline.html - The timelines were achieved using the https://mermaid-js.github.io/mermaid Javascript diagramming tool.
[18] https://projectmirador.org/ - An open source, IIIF compliant, web based image viewer.
[19] https://jpadfield.github.io/simple-mirador/
[20] https://jpadfield.github.io/simple-mirador/Complex%20Example.html

has been identified as the Manifest Editor[21] created by one of the project partners, Digirati. All of the components used to create a working manifest editor are published on GitHub[22] and can now be used as a possible basis for this planned demonstrator.

Another planned piece of work within the project is to conduct a survey to identify relevant IIIF resources and tools. The project will now directly support the existing IIIF Awesome list[23] hosted by the IIIF consortium. This work will explore how the Awesome list could be improved, explore areas which are currently underrepresented, and potentially identify new resources to be added to the list. Examining how a complex list like this can be further managed, controlled and presented has already led to an additional extension to the Simple Site system for presenting formatted lists and galleries, demonstrated by a re-formatted version of the Awesome list[24], a formatted project team presentations[25] and simple galleries of clickable images[26].

Early Practical Collaborations

A proposal to present some of the work of the project was accepted by the MCG 2020 conference in December[27]. The conference session was based on presenting a simple collaboration between the V&A and the NG. It demonstrates how IIIF systems can be used to allow images of V&A and NG paintings to be dynamically combined to support existing web presentations.[28] Specifically in December 2020 due to developments in the NG's internal use of IIIF it became possible to combine a public IIIF manifest[29] for the "The Hay Wain" by John Constable in the NG with a public manifest[30] presenting V&A's "Full-Scale Study for The Hay Wain'' also by John Constable. A comparison of these zoomable images has also now been included as a further example within the Simple Mirador site[31].

As part of the preparations for this presentation it was also possible for a new IIIF curtain viewer, published by the V&A[32], which allows registered IIIF images to be directly compared one on top of another, to also be incorporated into the Simple Site system, with its own dedicated extension[33].

Beginning to Explore the use of IIIF on Zenodo

As demonstrated with the Simple Mirador example it is possible for individual researchers to organise and re-present IIIF resources published by other institutions, using free services such as GitHub. However, to present one's own images, as IIIF resources, a researcher would still need their own IIIF server set up on a public web server. The project has begun to examine what free solutions might be available to provide this type of service for researchers. Zenodo is an open research repository designed to allow researchers to publish and reference their research outputs, including

[21] https://cultural-heritage.digirati.com/building-blocks/manifest-editor
[22] https://github.com/digirati-co-uk/iiif-manifest-editor-components
[23] https://github.com/IIIF/awesome-iiif
[24] https://jpadfield.github.io/awesome-iiif/
[25] https://tanc-ahrc.github.io/IIIF-TNC/team.html
[26] https://tanc-ahrc.github.io/IIIF-TNC/about.html
[27] https://www.museumscomputergroup.org.uk/events/museumstech-2020/
[28] Such as: https://www.vam.ac.uk/articles/john-constables-sketches
[29] https://data.ng-london.org.uk/iiif/0FV6-0001-0000-0000/manifest - IIIF manifest presenting images of the "The Hay Wain" by John Constable from the National Gallery.
[30] https://research.ng-london.org.uk/iiif-exp/manifests/vanda-haywain - IIIF manifest presenting an image of the "Full-Scale Study for The Hay Wain" by John Constable from the V&A.
[31] https://jpadfield.github.io/simple-mirador/The%20Hay%20Wain.html
[32] https://github.com/vanda/curtain-viewer
[33] https://jpadfield.github.io/simple-mirador/Curtain%20Viewer%20Demo.html

images. When images are uploaded to Zenodo, as research outputs, it actually uses IIIF, internally, to present thumbnails and image previews, but it does not currently publish IIIF manifests to allow the images to be re-presented and viewed within external IIIF compliant image viewers, such as Mirador. However, they do present enough information to make it possible for others to create IIIF manifests. As an additional project demonstrator, a simple automatic IIIF manifest generator has been produced[34] by the PI, that, based on a Zenodo ID, can automatically harvest enough image information from the Zenodo website to create a working IIIF manifest. At this time the process works very well in theory, but performance is a bit limited by the current Zenodo system. Direct discussions with Zenodo have identified that they are very interested in the example Zenodo IIIF manifest generator and they have provided the project PI with the contact details for another, external, project[35] that Zenodo is currently collaborating with to explore future IIIF options. This new contact will be followed up in early 2021.

Next Steps

As indicated above, the main work of the project has been on hold, awaiting the employment of the project Senior Research Fellow. However, at this stage, even with the proposed six month extension, it is no longer possible to wait and preparations for the rest of the planned project activities are moving forward. The first step will be to re-advertise the Senior Research Fellow position and organise the first two project webinars/workshops.

The new advert for Senior Research Fellow position will be open during January 2021, allowing a researcher to be in position from early March, which will allow the post to run for up to 13 months. This will need to be further supported by a second shorter term researcher/contractor and or additional investigator time.

The first project webinar, described above, is now planned for late January - February 2021, it will be a virtual event spread over two days. This event is planned to further raise awareness of IIIF within the cultural sector, providing an opportunity to showcase and discuss current best practice. The event will be organised in two sections, the first made up of more formal presentations and the second providing space for short presentations and break-out sessions for discussion. The second project webinar, also described above, is now planned for late March 2021 and will concentrate more on the tools and service needed by the field. Assessment of these two webinars along with the organisation and assessment of the final two events will then progress as outlined in the revised project timeline[36].

The next step for the project will be to begin discussing, between the project investigators and project partners, the details of the remaining project IIIF demonstrators. This includes organising the resources required and the timing for the work.

Once the project researcher is in post the project will progress with the remaining planned activities as outlined in the “Research approach” section above.

[34] https://github.com/jpadfield/iiif-zenodo

[35] Zenodo have identified that the Data Futures project (https://www.data-futures.org/) have been working on developing the use of IIIF within the Zenodo platform.

[36] https://tanc-ahrc.github.io/IIIF-TNC/timeline.html

Contacts

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Annexes and Links

Annex 1: Screenshots and Links to Early Demonstrators

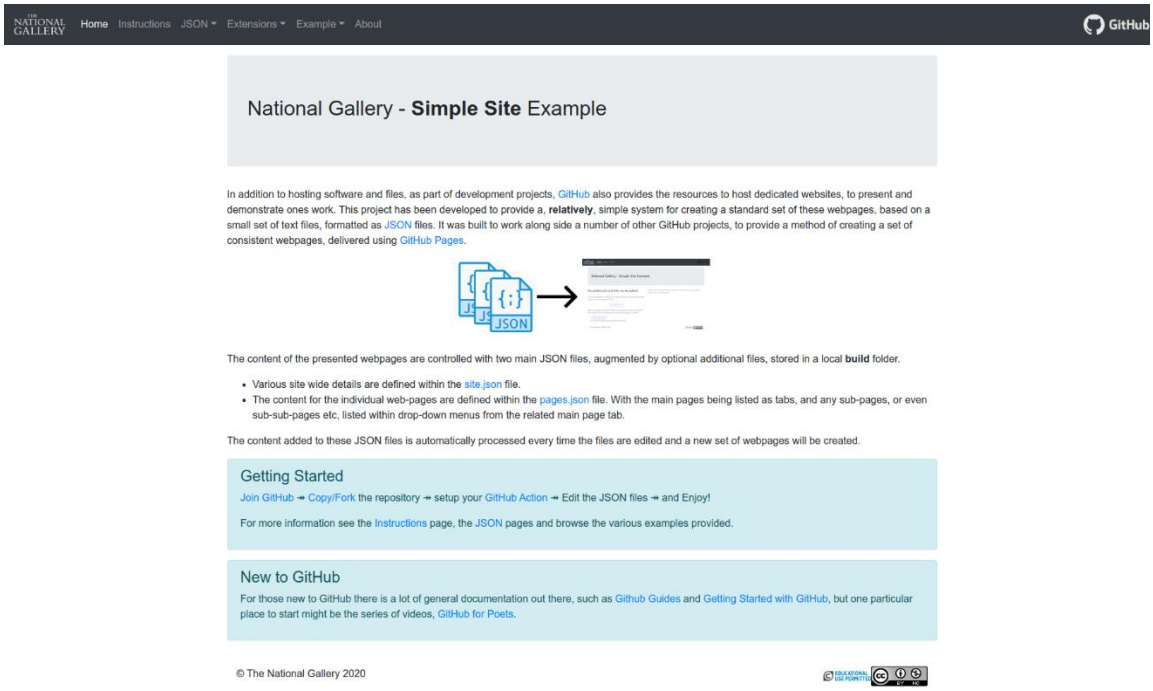

Figure 1: A screenshot of the landing webpage for Simple Site system used to publish the project website on GitHub - https://jpadfield.github.io/simple-site/

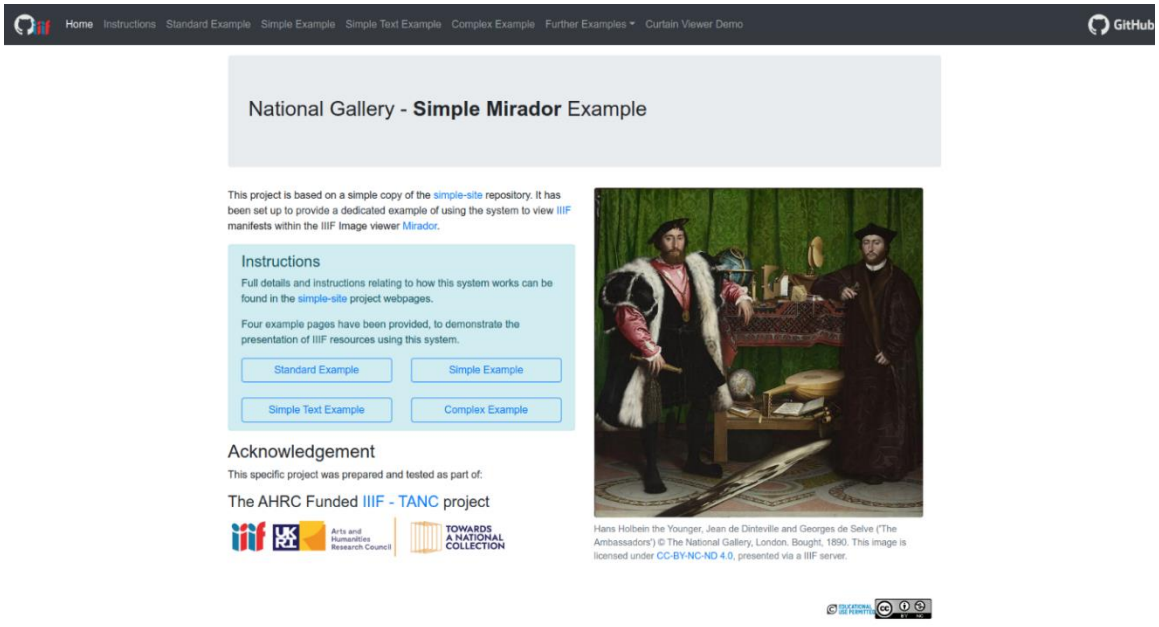

Figure 2: A screenshot of the landing webpage for Simple Mirador example publish on GitHub as the first IIIF project demonstrator - https://jpadfield.github.io/simple-mirador

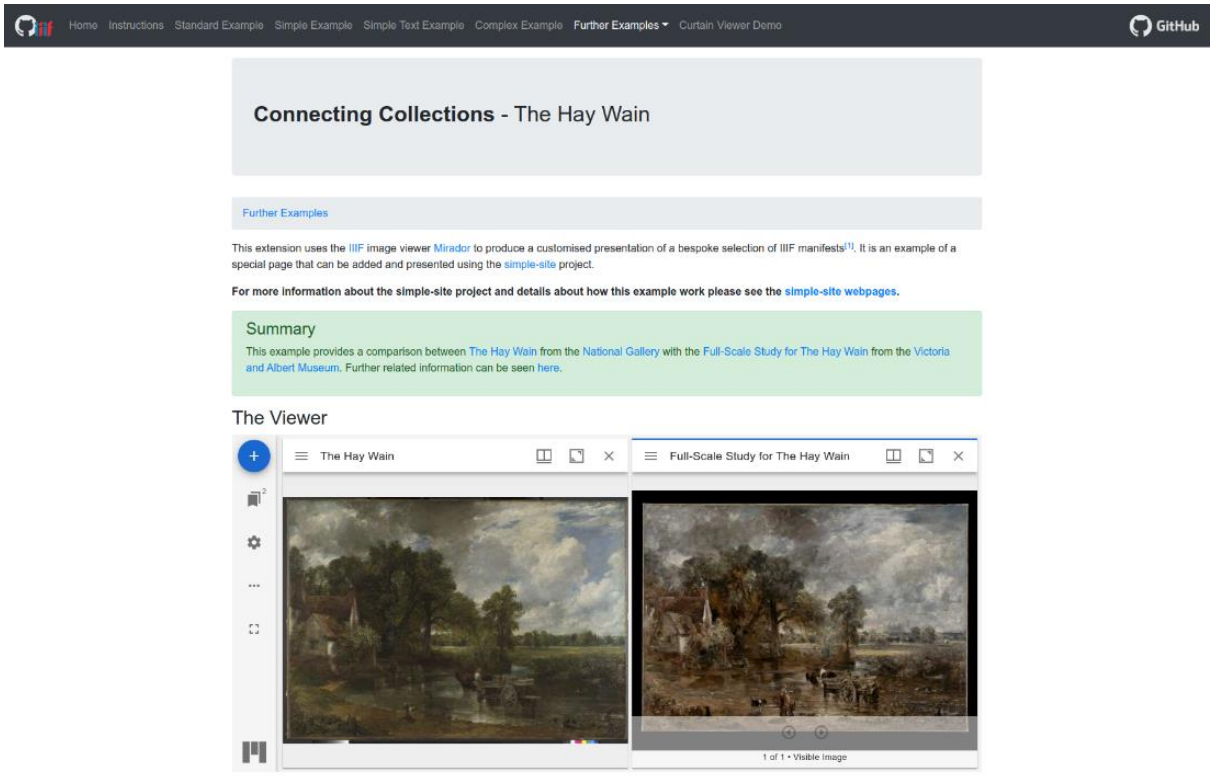

Figure 3: A screenshot of the Simple Mirador example simultaneously presenting images from The National Gallery and the V&A - https://jpadfield.github.io/simple-mirador/The%20Hay%20Wain.html

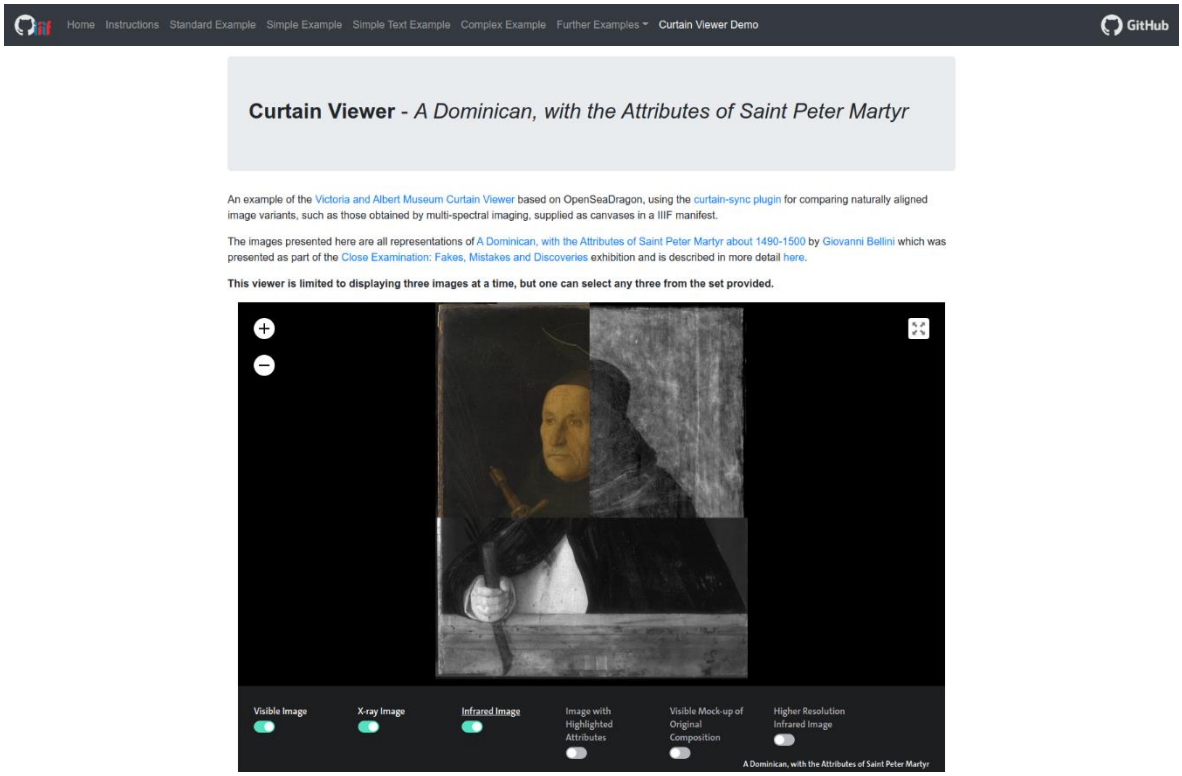

Figure 4: A screenshot of the IIIF Curtain Viewer integrated into the Simple Site system on GitHub - https://jpadfield.github.io/simple-mirador/Curtain%20Viewer%20Demo.html

Annex 2: How IIIF can support a National Collection

- Glen Robson (IIIF Technical Coordinator)

Introduction

The IIIF 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 IIIF provides and also inform its future directions.

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

1. *to begin to dissolve barriers between different collections*

This is one of the key use cases for IIIF and has informed its development from the beginning. Among many examples there is a blog from Ben Albritton discussing how IIIF 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.

2. *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 IIIF 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.

3. *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 IIIF 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. IIIF 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.

4. *to benefit a diverse range of audiences*

IIIF 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.

5. *to be active and of benefit across the UK*

The UK has had a strong impact on the development of the IIIF standards with the University of Oxford and the British Library being two of the core founding members of the IIIF 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 IIIF community. One of the largest benefits of adopting IIIF 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 IIIF could be made available for others in the UK to benefit from.

6. *to provide clear evidence and exemplars that support enhanced funding going forward.*

Finally, IIIF 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 IIIF enabled 'aggregators' who harvest IIIF assets from institutions to create a collection of IIIF resources. The advantage of IIIF 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 IIIF manifest which details how the interaction can work. For institutions like Europeana, the benefit in adopting IIIF 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 IIIF 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 program 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 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 IIIF 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 IIIF 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 IIIF website.