



NUI Galway Library, Digital Scholarship Enablement Strategy

Versions

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Introduction

This document outlines NUI Galway Library's strategy to enable digital scholarship at NUI Galway. The strategy aims to leverage infrastructure to engage with digital scholarship across three domains in particular: digital archives, research data management, and open access to materials. It envisages the consolidation of existing services and collaborations and the development of new ones to support related digital initiatives elsewhere in the University and to participate as a partner in projects locally, nationally, and internationally.

At the core of this strategy is a recognition that the Library is only one of many participants in innovative projects focused on collections of digital materials and data on the NUI Galway campus. These include, but not limited to, the Moore Institute for the Humanities and Social Studies, the Data Science Institute, the Whitaker Institute for Innovation and Societal Change, Acadamh na hOllscolaíochta Gaeilge and the Huston School of Film and Digital Media. Activities include:

- text and data analysis
- development of supporting analysis tools
- digitisation of archival and other material
- digital humanities research projects
- creation of unique digital collections across a range of media and languages, notably Irish, for use in teaching and research
- deployment of semantic web technologies and linked data to connect with and leverage other collections

Many of these initiatives involve collaboration at and beyond NUI Galway, incorporating a variety of models in terms of personnel, expertise, and funding sources. This gives the University an excellent platform for further engagement, potentially across a broader range of activities. Possible deficits locally, however, are that expertise may be unknown and/or unshared, equipment and effort duplicated, long-term sustainability uncertain, and opportunities for collaboration missed.

As a central service unit and one of the players in developing digital collections, the NUI Galway Library has developed its own technology and service infrastructure. In doing so, and cognisant of the key role that academic libraries in Europe, the United States, and internationally have played in enabling digital scholarship, we continue to consult widely regarding projects and proposals. There are great opportunities for the Library and the University through the collocation of archives and research institutes in the Hardiman Research Building, the uniqueness of our archival and special collections holdings, the quality and diversity of other players on campus and the potential for partnerships.

As regards Library **infrastructure**, the keywords throughout this document include sustainability, scalability, standardisation, compatibility (with the University's IT infrastructure), agility, and sharing. We achieve this through a robust IT environment based

on standards but with flexible use of evolving, often open-source, technologies, and a trusted digital repository at its centre. Other vital elements are systematic application of metadata, a long-term approach to digital preservation, open access where possible, and active collaboration. Opportunities for cost sharing, income generation and commercial use need to be considered to enable sustainability.

Services and collaborations include:

- hosting of digital collections
- publication and discovery
- management of research data
- subscription to identifier services, e.g. Digital Object Identifiers (DOIs), Archival Resource Keys (ARKs), ORCIDs
- digitisation
- metadata creation and enhancement for linked data use
- long-term preservation
- text and data mining of archival and other collections
- active participation in research projects
- engagement with national and international projects
- joint bids for funding and other awards
- development and promotion of the Library Maker Space
- a programme of workshops and training events to develop and share skills

The remainder of this document sets out the building blocks for the Digital Library in terms of technology, metadata, standards, discovery, preservation, rights management, funding, governance and delivery structures. Your input, perspective and advice will continue to be much valued as this journey progresses. The members of the Digital Library Strategy Group can be contacted as below:

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Goals

- Improve and secure the future of NUI Galway’s digital archival, research data, publications, and other unique content of value to NUI Galway.
- Offer services, partnerships, and supporting technologies that are sustainable, scalable, compatible with the University's technology infrastructure, and interoperable with national and international digital initiatives.
- Establish a digital environment that is agile with the ability to respond to change in wider strategies and technology trends.
- Standardise and future proof technology, standards, and related processes.
- Promote and support the scholarly use of digital content.
- Engage, outreach, innovate, and communicate locally and externally to enable collaboration, partnerships, new services, and content areas.
- Establish a national and international reputation for developing an innovative Digital Library that enables Digital and Open scholarship

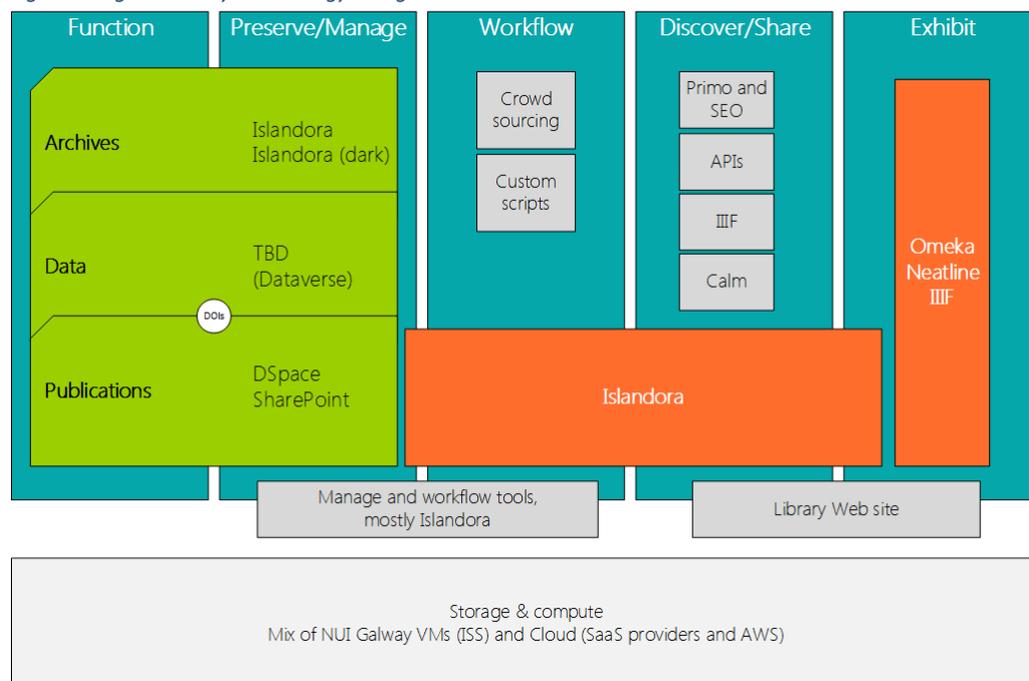
Technology

The Digital Library technology strategy employs a portfolio of open source and proprietary technologies to leverage unique content to assist research and teaching, while preserving it for long-term access.

Overview of technology design

The diagram following provides a schematic overview of the proposed design of the Digital Library from a technology perspective.

Figure 1 Digital Library Technology Design Overview



Principles

Interoperability	Our approach to interoperability is based on defined standards and utilising agreed technology. Interoperable systems provide and accept information according to these standards and technology. Accordingly, information sharing, migration and exchange is made possible between multiple, disparate systems.
Digital preservation and long-term access	To facilitate long-term preservation of and access to digital objects, a repository based on the Open Archival Information System (OAIS) reference model will be employed.
Focus on technology to support teaching and research	Supporting teaching and research requires a range of solutions which use the Digital Library for storage, management, control, preservation, and access purposes. The Library's preferred approach is to deploy proven and reusable solutions employing open source technologies applicable to a range of teaching and learning activities.
Data dissemination	Data dissemination will be conducted using non-proprietary open formats. Machine-based data dissemination will be via 'non-proprietary' open systems using internet protocols and similar standards-based Application Programming Interfaces (APIs).
Access	Will be ubiquitous from the variety of devices. Machine-to-machine and mobile access will be given specific focus.
Align with central University IT resources	The Digital Library aims to align to the maximum with existing solutions, strategies and policies at University level.
Cloud-based solutions	In general, the intention is to maximise cloud solutions to improve efficiencies, reduce cost, and stabilise Digital Library infrastructure.
Open source	Open source solutions are acknowledged as leading the digital library field. The Library embraces, accepts, and plans for the related support requirements.
New content areas	Along with services for traditional content areas such as archival material and special collections, the Digital Library will work with new types of content such as research data and geospatial data.
Open access	The Digital Library will enable open access to the fullest extent but recognising legal and other limits.

Digital Rights Management (DRM)	A variety of DRM scenarios and mechanisms will be supported, ranging from open access to on-campus-only access or other requirements.
Usability	Interfaces for the Digital Library will be user-friendly to support the requirements of end-users and administrators.

Components

Metadata	<p>Metadata are extensively used as the means to describe, share, search, manage and preserve digital resources, and thus ensure maximum potential for use and re-use. Metadata schema selection, management and administration will be tailored to meet the specific needs of the collection in hand and of its users.</p> <p>Interoperability will be achieved through the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) or by packaging one or more descriptions within a Metadata Encoding and Transmission Standard (METS) container.</p> <p>All human-created descriptive metadata will be mediated via an appropriate interface as provided by the repository.</p>
Storage	<p>Storage will be technology-agnostic and robust. Key requirements are for storage that is elastic, cost-effective, secure, and sustainable in the long term. Storage for the Digital Library may be a mix of cloud and local solutions, all meeting the same requirements.</p> <p>In the shorter term the University is currently developing a storage strategy and in the longer-term storage technology will change. The strategy of the Digital Library is to be flexible to these changing inputs.</p>
Discovery	<p>The discovery strategy covers both user- and machine-oriented discovery of resources via several interfaces.</p> <p>Central to the Digital Library repository strategy is the provision of a generic full-text retrieval facility utilising facets and modern search engine retrieval technologies as a component of the repository itself.</p> <p>For bibliographic and collection-level access records will be provided in OAI-PMH for enterprise discovery tools.</p> <p>For appropriate collections OAI-PMH records may also be provided to Google and other search engines.</p> <p>An OpenSearch API will be available.</p> <p>A SPARQL Protocol and RDF Query Language (SPARQL) endpoint will be available for semantic search and support for linked data.</p>

Access management	Access management provides controlled and secure access to digital objects. Access management solutions for the Digital Library will be linked with central University IT or national level providers. In general, direct access management is provided by the repository platform. For all audiences, the Digital Library will provide both 1) user authentication (valid user) and 2) authorisation (permitted access). Supporting technology for access management is delivered by University or national level providers in the form of federated technologies which provide access to central user directories.
Security and backup	Security includes the protection of the Digital Library from unauthorised access, use, change, disclosure and destruction. Backup is an integral part of data management. Testing of restore positions is recognised as important to ensure the integrity of backups. Security and backup for the Digital Library will be informed and guided by the emerging NUI Galway IT strategy.
Capacity planning and performance management	Capacity planning seeks to ensure provision of enough data capacity, in a cost-effective manner, to meet current and future service needs. Performance management means monitoring and providing appropriate processing resources to applications in accordance with service objectives. Capacity planning and performance planning for the Digital Library will be informed and guided by the emerging NUI Galway IT strategy.

Standards

Employing standards future proofs digital resources and processes. The appropriate use of standards for digital materials enables compatibility/interoperability, compliance, consistency, efficiency, and quality. The main advantages of using standards for digital materials are to enable innovation, increased reach, lower cost and decreased time to develop. Standards are required to achieve economies of scale and ensure digital resources are preserved in the long term.

Primary standards and principles

- All Digital Library content and associated digitisation must follow a standard.
- The Digital Library complies with the OAIS (Open Archival Information System) reference model standard and other digital preservation standards and practices as they evolve.
- Digital objects are harvestable using OAI-PMH, the Open Archives Initiative Protocol for Metadata Harvesting.
- A flexible approach aims to select standards most suited to the content type.

Metadata standards

Descriptive metadata

Descriptive metadata identifies a resource and describes its content. To date, the following are used, according to need:

- General International Standard Archival Description (ISAD[G])
- Encoded Archival Description (EAD)
- Dublin Core
- VRA (Visual Resources Association) Core

Structural metadata

Structural metadata defines the structure of digital objects. It is used for complex objects with multiple relationships between its components. The Digital Library uses:

- Metadata Encoding and Transmission Standard (METS)

Preservation metadata

Preservation metadata is designed to maintain access to digital resources and preserve them for the long term

Technical metadata

Technical metadata focuses on how a digital object was created and other technical attributes, such as its format, storage, location, etc. Technical metadata can be included in preservation metadata (OAIS) or structural metadata (METS).

Ownership/rights management metadata

Ownership/rights management metadata defines usage of the digital object in terms of copyright, access, use, licensing, and reproduction. Ownership/right management metadata is often included in other metadata schemas for descriptive and structural metadata.

Discovery

Discovery means enabling easy access to content and ensuring systems work well together. Discovery is built on and enabled by [standards](#) and [metadata](#). Key elements are system interoperability and the ability to assign unique identifiers to resources.

Objectives

The main objectives for the Digital Library in terms of discovery are:

- The ability to find content quickly, precisely, accurately, and easily
- Multiple presences, same content, using a variety of channels and devices
- Open access to scholarly material to encourage sharing and citing
- Support digital scholarship for teaching and learning by facilitating searching and innovative presentation of content

- Maximise social media technology and trends to encourage “connect and share” and to aid discovery (crowd sourcing)
- Collection-specific promotion and interpretation through blogs and social media
- Link people, materials, and data using standards such as metadata and identifiers
- Third-party consumption to widen discovery

Human discovery

The discovery strategy is to provide both human discovery and machine discovery interfaces. At its centre is the provision of a unified and single search facility utilising facets and modern search engine retrieval technologies. This single search interface provides access to all Digital Library content for users from a variety of devices. While this single search interface provides the standard method for human discovery, other more bespoke discovery interfaces can be used for niche purposes and/or audiences.

Machine discovery

In addition to human discovery, machine-friendly interfaces are used to enable interoperability, wider reach, and to support digital scholarship. For machine discovery, the following objectives apply:

- Provide records in OAI-PMH format for enterprise discovery tools
- Facilitate wide discovery by enabling access to digital material using Application Program Interfaces (APIs). This focus on third-party consumption allows others to discover Digital Library content. Included are APIs for selected collections and content types as well as the provision of an OpenSearch API
- Digital Library records can also be provided to Google and other search engines, thereby increasing reach
- Linked data is supported using identifiers, while a SPARQL endpoint is employed for semantic search and enabling linked data queries.

Identifiers

Identifiers facilitate increased discovery of digital resources by supporting both human and machine discovery. Digital Object Identifiers (DOIs) provide identification, attribution, and discovery for digital *resources*. DOIs also provide a mechanism to link data. ORCID identifiers provide identification, attribution, and discovery for *researchers*.

The Digital Library supports both DOIs and ORCIDs.

Digital Preservation

Long-term preservation of digital collections is demanding. The British Library’s [Digital Preservation Strategy](#) notes that preserving and providing long-term access to digital

content “requires action and intervention throughout the lifecycle, far earlier and more frequently than does our physical collection.”

The National Digital Stewardship Alliance (NDSA) publication [Levels of Digital Preservation](#) identifies the following functional areas of preservation:

1. Storage & geographic location
2. File fixity & data integrity
3. Information security
4. Metadata
5. File formats

The Library will pursue Trusted Digital Repository status and will continue to align its workflows for acquiring and curating digital archival material to the best practice standards accepted under its awarding criteria. Staff skills development will also be planned accordingly.

[Read more about the NUI Galway Digital Preservation Policy](#)

Digital Rights Management (DRM)

There are two primary facets of DRM: 1) describing the rights and permissions for access to and usage of digital objects; and 2) enforcing these rights and permissions.

Description

Digital Library staff will determine and implement the rights and permissions that are associated with our existing digitised materials. A combination of features of the Digital Library repository, a rights expression language (e.g., ODRL, XrML, etc.), and other appropriate tools will be used to adequately describe these rights and permissions on ingest, and to maintain them over time.

For newly acquired materials issues such as transfer of copyright, ownership of intellectual property, restrictions on use/copying, licensing and charging, attribution, embargo periods and redaction will be discussed and agreed with their providers. Born-digital donations may present issues concerning privacy, intellectual property, and ownership.

Enforcement

Restricting access to digital materials will continue to occur using current and best practices, including hardware and software capabilities. Clearly stated terms and conditions of use are published on our public facing Digital Repository, and our Library website, to which end users must sign up. These outline the terms under which digital objects can be used, state a requirement for attribution wherever material or metadata from the repository is used, and outlines the Library’s responsibilities and legal obligations.

Monitoring and controlling the use and re-use of digital materials present complex technical and legal challenges. These include discovery of user violations and taking appropriate follow-up actions; ensuring clarity of permissions; and licensing of software required to manipulate data sets etc. Furthermore, the legal framework may change, requiring re-assessment of practices.

Governance and Delivery Structures

Two groupings will guide, manage, and realise Digital Scholarship activity: governance and operational. The governance layer, the **Digital Library Group**, will be primarily composed of Library management and operational team representatives and will focus on:

- Strategy
- Budget
- Policy
- Prioritisation
- Risk management
- Monitoring of progress
- Communication
- Advocacy

Its priority will be to ensure that those projects with highest impact in terms of scholarship, learning and profile are selected and supported following rigorous assessment. The **Digital Publishing and Innovation Team** will develop and deliver the Digital Library, Digital Scholarship activity, and its associated projects, drawing on skills in:

- Repository management
- Workflow design
- Administration of content
- Assignment of metadata
- Interface design
- API development
- Digitisation
- Data manipulation and curation
- Digital preservation
- Rights and access management
- Project management

Acquiring and developing these skills informs staff recruitment, deployment and development. A focused approach to skills development includes systematic identification and resourcing of opportunities, attendance in person or virtually at relevant training events and conferences, and sharing of learning, contacts, readings and experiments.

Finance

Financial support for the Digital Library encompasses many elements, including:

- Staffing
- Hardware
- Software
- Maintenance
- Storage
- Cloud computing
- Hosting
- Subscriptions (e.g. Identifiers)
- Membership of relevant organisations
- Service procurement

- Staff development
- Marketing
- Larger digitisation projects

Some recurrent funding is assigned within the Library's operations budget, but supplementary sources of funding are essential. There is a focus on opportunities to bid, often collaboratively, for funding awards. The approach is to seek out funding awards proactively and to partner where possible with other NUI Galway research institutes or external organisations in project bids. The development of service level agreements is anticipated, including schedules of charges where required, e.g. to cover shared costs.