

**HORIZON-CL2-2021
HORIZON-CL2-2021-HERITAGE-01-02****LibrarIN [101061516]: Value Co-creation and Social Innovation
for a new Generation of European Libraries****D3.3 Digital Transformation and ICT v3.0**

Project Reference No	LibrarIN -101061516
Deliverable	D3.3 Digital Transformation and ICT v3.0
Work package	WP3: Thematic and empirical work in selected co-creation areas
Type	R – Document, report
Dissemination Level	PU – Public
Date	31/10/2025
Status	Final V1.0
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Document description	This document includes version 3 of deliverable 3.3 “Digital transformation and ICT” of work package 3 which illustrate the cases selected and their relevance for the LibrarIN project.



Disclaimer

The LibrarIN project is funded by the European Union under grant agreement ID 101061516. The information and views set out in this publication are those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.



Document Revision History

Version	Date	Modifications Introduced	
		Modification Reason	Modified by
Vo.1	16/06/2025	Write up of the initial version of the report	UKON
Vo.2	06/08/2025	Final draft for reviewers	UKON
Vo.3	06/10/2025	Suggestions by reviewers	RUC
Vo.4	13/10/2025	Revised draft for submission	UKON
Vo.5	14/10/2025	Final version for submission to EC	UKON
V1.0	31/10/2025	Final review and submission	ATC

Executive Summary

This deliverable presents the outcomes of Work Package 3, Task 3.1 of the LibrarIN project, which examines the digital transformation of National Libraries in Europe and associated countries through the implementation and application of Artificial Intelligence (AI) technologies. The goal of this task has been to understand and support the transition of National Libraries into AI-enabled public institutions, capable of delivering more responsive, inclusive, and effective services. This document builds on prior work within T3.1 and provides the result of the cross-case analysis of AI projects in 12 National Libraries.

The deliverable synthesises activities undertaken throughout the project period, articulates the methodological foundations grounded in digital co-production, and reports on the findings derived from twelve case studies of AI implementation in National Libraries. Furthermore, it presents key lessons learned, identifies challenges, and puts forward targeted recommendations for library practitioners, policymakers, and technology developers.

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The methodology guiding this work is based on the co-production framework developed by Mergel et al. (2025), which divides the implementation process into four main phases: initiation, implementation, use, and outcome. These are broken down into six co-production phases: co-commissioning, co-design, co-implementation, co-delivery, co-assessment, and public value creation. This structured approach enabled a detailed analysis of stakeholder involvement, governance dynamics, and value creation mechanisms during AI implementation.

The research activities included a systematic literature review, expert interviews with executive directors of international library associations, and in-depth case studies. The case studies spanned National Libraries across eleven EU Member States as well as the UK and the United States. These libraries were selected based on their active engagement with AI projects and their representation of diverse institutional contexts, technological infrastructures, and cultural missions.

Key findings from this analysis suggest that AI implementation in National Libraries is neither linear nor uniform. Internal readiness, external funding opportunities, and the availability of technical expertise often shape the process. A notable challenge across many cases is the linguistic limitation of mainstream AI tools, which are primarily developed in English and require costly adaptation for use in

national languages. Furthermore, ethical concerns about data privacy, algorithmic transparency, and intellectual property rights remain central to the discourse on AI adoption.

Despite these challenges, libraries have demonstrated strong innovation potential. Several institutions have pioneered solutions for automated metadata generation, intelligent cataloguing, and user-driven content discovery through collaborative governance structures, cross-sector partnerships, and active user involvement. These innovations enhance operational efficiency and contribute to the broader goals of accessibility, knowledge preservation, and cultural heritage digitisation.

Stakeholder involvement has proven essential in navigating the complexities of AI implementation. Librarians, archivists, IT staff, legal advisors, and end users each play a critical role at different stages of the co-production process. Their contributions have influenced project design, technology selection, system testing, and impact evaluation. Moreover, the role of national and European policymakers has been pivotal in shaping funding frameworks and ethical guidelines that underpin AI-related activities in public institutions.

The deliverable also incorporates a comprehensive set of recommendations derived from practice-oriented insights and stakeholder consultations. These are organised across four dimensions: technical, organisational, human, and financial. Key recommendations include investing in in-house AI competencies, developing multilingual language models, promoting interdisciplinary collaboration, securing sustainable funding mechanisms, and ensuring inclusive governance practices. These recommendations are intended to serve both as strategic guidance and as operational checklists for institutions embarking on similar transformation journeys. The policy and implementation recommendations are published in detail in a Work Package 5 Policy Brief and in a book chapter of the project's book on the implementation of AI (Mergel & Schmidt, forthcoming).

In conclusion, this deliverable offers an analysis of how AI technologies are shaping the future of National Libraries. It emphasises the importance of aligning technological innovation with public value, ethical responsibility, and stakeholder engagement. By documenting diverse approaches and synthesising common lessons, the report aims to support the broader community of practice committed to the responsible and impactful use of AI in the public sector.

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List of Terms and Abbreviations

Abbreviation	Definition
AI	Artificial intelligence
ASR	Automatic Speech Recognition
BE	Belgium
BL	British Library
BNE	Biblioteca Nacional de España
BnF	Bibliothèque nationale de France
DE	Germany
DK	Denmark
DNB	Deutsche Nationalbibliothek
EE	Estonia
EMa	Erschließungsmaschine
ES	Spain
FI	Finland
FR	France
genAI	generative AI
HTR	Handwritten Text Recognition
KB	Koninklijke Bibliotheek
KBR	Royal Library of Belgium
LC	Library of Congress
LLM	Large Language Model
ML	Machine learning
NL	Netherlands
NLP	Natural Language Processing
NO	Norway
OCR	Optical Character Recognition
RDL	Det Kongelige Bibliotek
SE	Sweden
UK	United Kingdom
US	United States of America

1 Introduction

1.1 Purpose and scope

This deliverable provides the results of Work package 3, Task 3.1, especially the cross-case analysis of 12 National Libraries and their use of AI to digitally transform their processes and services to understand how AI use in National Libraries contributes to their digital transformation.

1.2 Approach for work package and relation to other work packages and deliverables

Work package 3 has three distinct tasks that focus on ways in which libraries are innovating through different means. Task 3.1 focuses on the digital transformation and the use of ICT. In an exploratory interpretative research framework, we carried out interviews with experts and conducted case studies across 12 National Libraries to examine how they digitally transform their processes and service delivery through AI.

National Libraries are regarded as crucial public sector entities that not only capture and preserve information but also disseminate it to democratise knowledge for future generations. They also support the digital literacy of both their users and their librarians and information specialists. Nevertheless, the application of AI within these libraries has not been extensively researched. Consequently, this report aims to explore how National Libraries integrate AI innovations into their services, along with the primary factors that facilitate or hinder this process.

WP3, T3.1 has been closely aligned with other work packages within the project, most notably WP2 (in-depth case analysis), and WP5 (policy recommendations and dissemination). The present document aims to synthesise the implementation trajectory, structure empirical insights, and guide future research and policy discussions.

1.3 Methodology and structure of the deliverable

National Libraries are starting to experiment with the adoption of artificial intelligence (AI) to expand their digital transformation efforts. This trend is supported by the pressure that National Libraries receive through their National AI Acts that demand the capturing and preservation of digital media content.

AI or probably better an artificial intelligence system can be defined as a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments (European Union, 2024). The National Libraries are using or developing a wide range of AI, including,

- Content and Text Recognition: Tools such as Optical Character Recognition (OCR), Handwritten Text Recognition (HTR) and Automatic Speech Recognition (ASR).



- Content and Subject Indexing: AI supports the conceptual analysis and tagging of documents (i.e.: Data Mining or Natural Language Processing (NLP)).
- Generative AI Applications (GenAI): GenAI use technologies like Large Language Models (LLMs with transformers), Generative Adversarial Networks (GAN) or Diffusion Model.

One of the initial efforts within WP3 has been the work conducted under Task 3.1. This task has systematically examined AI implementation practices in twelve National Libraries across Europe and beyond. It began with a comprehensive interpretive research design, including a systematic literature review and a Delphi study to identify gaps between theoretical approaches to digital transformation and their practical application in libraries. These initial investigations, reported in D3.1, revealed that while AI holds significant promise, its practical adoption is often constrained by structural, ethical, and technical limitations.

The research team conducted 20 expert interviews with key stakeholders, including executive directors of international library associations. These interviews highlighted National Libraries as uniquely positioned for AI experimentation and implementation due to their relatively greater resources and institutional mandates. Using snowball and intensity sampling methods, 12 National Libraries were selected as case studies. Each institution was involved in at least one AI-related project, whether in metadata enrichment, document digitisation, or service delivery.

The selected libraries included institutions such as

1. Koninklijke Bibliotheek van België, BE
2. Deutsche Nationalbibliothek, DE
3. Det Kongelige Bibliotek, DK
4. Eesti Rahvusraamatukogu, EE
5. Biblioteca Nacional de España, ES
6. Kansalliskirjasto, FI
7. Bibliothèque nationale de France, FR
8. Koninklijke Bibliotheek, NL
9. Nasjonalbiblioteket, NO
10. Kungliga biblioteket, SE
11. British Library, UK
12. Library of Congress, US

Through structured case interviews with project leads, cataloguing experts, and internal users, the team documented how AI technologies like Natural Language Processing (NLP), Optical Character Recognition (OCR), and Handwritten Text Recognition (HTR) were being utilised.

The insights gained were structured using a shared template for case illustrations, allowing for cross-case comparability and thematic coding. The findings show that AI adoption in libraries is not simply a

matter of technological readiness; rather, it depends on organisational culture, regulatory frameworks, ethical considerations, and stakeholder participation.

Several common drivers of AI adoption were identified. Libraries are using AI to improve access to information, streamline internal processes, and meet the evolving expectations of digital users. AI is also seen as a tool for enhancing sustainability and promoting inclusive digital transformation. However, challenges remain. Libraries face ongoing issues such as limited financial and human resources, concerns about data privacy, and difficulties in sourcing AI tools that are suitable for national languages and public sector values.

The study also revealed a strong value-oriented dimension: libraries are not only adopting AI but also shaping it according to their values, such as openness, transparency, and public accountability. This positions National Libraries as unique actors in the AI ecosystem, capable of promoting innovation in a responsible and sensitive way.

The introduction of this deliverable thus serves multiple purposes. It contextualises the work of T3.1 within the broader project framework of WP2, explains the rationale behind the selected methodology, and introduces the key phases and outputs of the task. It also serves as a bridge to the chapters that follow, which present the details of the activities undertaken, stakeholder involvement, empirical results, and the recommendations that emerged from the process.

Overall, WP3, T3.1 demonstrates that National Libraries are not only beneficiaries of technological change but also active contributors to the shaping of ethical, inclusive, and sustainable AI applications in the public sector.



2 Theoretical background

2.1 Digital Transformation in the Public Sector

Public sector organisations across the globe are embracing digital technologies to enhance their operational processes and improve service delivery (Meijer & Bekkers, 2015; Mergel et al., 2019). Once captured under the umbrella of 'e-government,' this evolution is now transitioning toward a more profound 'digital transformation' (Rooks et al., 2017). Unlike digitisation, which converts analogue formats into digital ones, digital transformation represents a fundamental paradigm shift. It encompasses changes in how services are designed, how institutions interact with citizens and stakeholders, and how internal processes are restructured.

Mergel et al. (2019) highlight that digital tools are not just enablers of more efficient processes, they also have the potential to reshape organisational structures, foster interoperability, and raise citizen satisfaction. Their conceptual framework outlines the drivers, methods, and outcomes of digital transformation efforts in public institutions, emphasising their iterative nature. As new technologies and changing user expectations emerge, continuous adaptation becomes essential. Consequently, digital transformation must be viewed as a long-term, fundamental and ongoing transformation, based on an evolving commitment to institutional modernisation.

2.2 AI and Public Sector Digital Transformation

Building on the notion of digital transformation as an evolving process (Mergel et al., 2019), Artificial Intelligence (AI) has emerged as a significant driver of the next phase of public sector innovation (Sun & Medaglia, 2019; Wirtz et al., 2019; Zheng et al., 2018). Governments are increasingly incorporating AI into a wide range of functions. For instance, in the United States, AI supports national defence strategies, regulatory enforcement, and fraud detection (Ahn & Chen, 2020; Chenok & Yusti, 2018). AI adoption in the public sector enables advancements in three key areas: enhancing decision-making (e.g., AI-informed policy modelling), improving service delivery (e.g., virtual assistants and chatbots), and increasing internal operational efficiency (e.g., automating routine processes). For example, the American Social Security Administration has successfully used AI to identify service patterns and streamline benefit processing (Engstrom & Ho, 2020).

Recent academic research is shedding light on AI's public value and its adoption in government. Madan and Ashok (2023) identify the technological, organisational, and environmental conditions that influence successful AI implementation. Wirtz et al. (2019) propose five key areas of AI application in government: direct public services, internal workplace transformation, legal and ethical considerations, public order, and overarching policy frameworks. In the context of library services, AI enhances user experience by improving interfaces, automating content processing, and streamlining backend workflows (Jayavadivel et al., 2024).

Despite rising academic interest, research should deepen our understanding of AI transformations in libraries. To bridge this, we propose and utilise a conceptual framework (see Figure 1) that explains the

motivations behind AI implementation, the types of AI selected, their implementation processes, and the resulting organisational and societal outcomes.

2.3 Digital Transformation of Libraries

According to the IFLA-UNESCO definition, libraries are essential for lifelong learning, personal autonomy, and cultural development (IFLA & UNESCO, 2022). Rooted in a mission to provide equitable access to knowledge, libraries are vital to the knowledge economy (Foray, 2004; Hayes, 2004) and sustainable development initiatives (United Nations, 2015). National Libraries in particular fulfil dual mandates: preserving national heritage and ensuring access to it through both conventional and digital means.

These core functions, cataloguing, managing collections, improving access, interpreting and communicating content, and supporting institutional leadership, require substantial human labour. This demand intensifies due to the exponential growth of printed and digital content, yet budgets and staffing levels often remain static or shrink. In response, libraries have long explored technological innovations, including early expert systems in the 1980s and 1990s (Anderson, 1990; Morris, 1991). These tools attempted to replicate expert reasoning for tasks like cataloguing and information retrieval, but ultimately fell short due to complexity and limited adaptability.

Modern AI technologies, as listed above, especially those based on deep learning (LeCun et al., 2015), offer promising solutions to overcome the limitations of past tools. OCR, HTR, Data and Image mining, Generative AI, and Large Language Models can facilitate full-text search, pattern recognition, and predictive maintenance. These innovations allow libraries to enhance user access and streamline internal operations while managing their core tasks more effectively.

From our literature review, we developed a conceptual model (see Figure 1) to structure our analysis. The framework outlines how motivations for AI adoption influence the selection of specific AI tools, the steps taken to implement them, and the measurable results in terms of outputs (completed tools), outcomes (effect on workflows and user experience), and impacts (long-term institutional or societal changes).

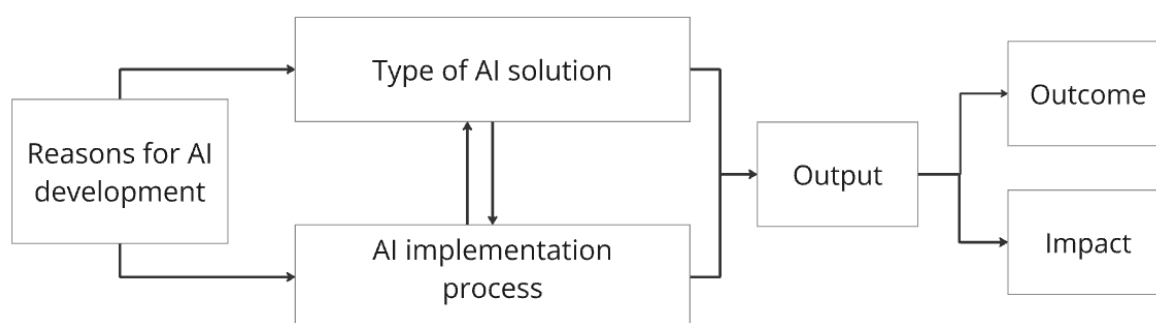


Figure 1: Conceptual Framework

Based on these considerations from the literature, we pose the general research question: *Why and how do National Libraries use AI to transform their processes and services digitally?*

3 Research Design

3.1 Research Design and Approach

To investigate how European National Libraries are engaging in the digital transformation of their services through the adoption of Artificial Intelligence (AI), this report applies an interpretative, qualitative research design. This approach is grounded in established methodologies for studying public sector transformation and co-production, allowing for in-depth exploration of complex, context-specific phenomena. As digital transformation is inherently multidimensional, spanning organisational, technical, legal, and human factors, our design is explicitly exploratory and theory-building in nature.

The methodological strategy was based on a multi-phase approach. In the initial phase, a systematic literature review was conducted (2013–2023) using the PRISMA scheme to identify key trends, gaps, and themes in empirical research on digital public library services. The results were analysed using Structural Topic Modelling (STM), which helped cluster 354 articles into 17 dominant topics such as 'Digital skill and literacy development,' 'Creating digital repositories,' and 'Libraries as social hubs.' These themes served to ground our understanding of the evolving discourse and to inform the interview guide development.

Building upon these theoretical foundations, a Delphi study with 42 international library experts was conducted to prioritise future challenges in library digitisation. Through three rounds of validation, issues such as 'The Library's role in the ecosystem' and 'Skills and mindset of staff' emerged as key future priorities. These insights shaped our case selection and guided our analytical orientation throughout the project.

3.2 Case Selection Strategy

We employed a multiple-embedded case study design, where each case represents a National Library undertaking one or more AI-driven projects. Based on both theoretical and empirical relevance, 12 National Libraries were chosen across Europe and the United States. Case selection followed a snowball and intensity sampling approach. Preliminary interviews with executive directors of library associations helped identify libraries seen as digital forerunners with the structural and financial capacity to innovate.

Each case had a minimum threshold: at least one AI-related project that had moved beyond the conceptual phase and was either implemented or in active development. This ensured analytical comparability across diverse institutional contexts.

3.3 Data Collection Procedure

The primary data source consisted of 59 semi-structured expert interviews conducted between January and September 2024 (details listed in table 1). The interviewees included project managers, directors, heads of IT or digital innovation units, curators, researchers, and cataloguing professionals. Interviews were conducted either online or on-site, recorded with participant consent, and transcribed verbatim.

Table 1: Summative Overview of Interviewees

Role of interviewee	BE	DE	DK	EE	ES	FI	FR	NL	NO	SE	UK	US	Σ
Director		2	1				1	1	1				6
Head of Unit		4	4	1	1		4	3				1	18
Project Member / Desk officer		4	1									1	6
Librarian / Historian	1	2	1										4
Curator							1				2		3
Lab member							1	1	1	1			4
Researcher			2						1	1			4
Information specialist / Data scientist				1		2				1			4
Consultant	1							1					2
Software developer				1		1							2
Information systems manager						1							1
Project director					1								1
Other			4										4
Σ	2	12	13	3	2	4	7	6	3	3	2	2	59

To ensure a consistent methodological standard, interviewers used a shared interview guide divided into six thematic blocks: (1) General overview, (2) Perception of AI's role, (3) Implementation strategies, (4) Value creation, (5) Organisational change, and (6) Long-term implications. These interviews were theory-generating and exploratory, designed to support real-time learning about emerging library strategies.

3.4 Gender Dimension

The LibrarIN project is committed to upholding the principles of gender equality and inclusivity throughout all phases of the research process. This commitment is reflected in both the design and execution of the underlying interviews and studies.

During the qualitative data collection, attention was paid to ensuring gender-balanced representation among interview participants, including directors, technical staff, and policy professionals from participating National Libraries. This approach aimed to capture diverse perspectives on the adoption and implementation of AI technologies, particularly regarding organisational change, digital skills development, and ethical considerations.

In the analysis phase, the team remained attentive to gender-sensitive implications of AI implementation. Moreover, the stakeholder engagement processes, including workshops and feedback sessions, sought to provide equitable opportunities for participation and encouraged diverse contributions, ensuring that gendered perspectives were reflected in the final recommendations.

3.5 Analytical Procedure

A hybrid analytical approach was applied, combining both deductive and inductive coding. Two researchers and two research assistants developed a codebook based on the interview guide and co-production framework. Thematic synthesis and cross-case comparison were used to identify patterns

and divergences. Special attention was paid to process coding and outcome coding to track project evolution and results.

A shared case illustration template facilitated comparability. Case write-ups documented AI integration across internal workflows, user-facing services, and GLAM-sector collaborations. These were the basis for the cross-case analysis and recommendations.

3.6 Co-Production as a Theoretical Lens

The co-production framework Mergel et al. developed informed the research design and data interpretation. This framework distinguishes phases such as co-commissioning, co-design, co-implementation, co-delivery, and co-assessment, allowing us to analyse multi-actor involvement across implementation. It highlighted how libraries serve not only as adopters of AI but as active agents shaping its development and use to reflect public sector values such as openness, transparency, and inclusion. Together, these methodological elements ensured a robust and multi-perspective examination of AI-driven transformation in National Libraries, contributing both to empirical understanding and actionable policy insights.



4 Findings

The analysis offers an overview of the drivers and challenges associated with AI adoption in the investigated National Libraries. It also identifies the types of AI technologies currently being implemented and the processes or tools they are transforming within these institutions. Furthermore, we examine the outputs, outcomes, and broader impacts of these implementations.

Interviewees highlighted that the main benefits of AI adoption lie in its role as an information equaliser, supporting the democratisation of knowledge and complementing the work of librarians. AI contributes to optimising existing workflows, enhancing accessibility, and strengthening the long-term sustainability of national libraries.

However, respondents also pointed to structural and legal constraints, including limited financial and human resources to build the necessary skills and capacities, as well as ongoing ethical challenges and dilemmas.

Our research shows that National Libraries employ various AI technologies, such as Automated Subject Indexing (Golub, 2021; Mai, 2005), Optical Character Recognition (OCR) (Memon et al., 2020), Handwritten Text Recognition (HTR) (Memon et al., 2020), and Generative AI (GenAI) (Mariani & Dwivedi, 2024), which includes applications like Automatic Speech Recognition (ASR) (Alharbi et al., 2021) and Large Language Models (LLMs) (Blank, 2023; Mariani & Dwivedi, 2024). These technologies are deployed to enhance library functions, internal processes, and service delivery, while libraries, in turn, influence the design and application of these tools. Definitions and distinctions between these AI types are provided in the appendix.

Beyond operational changes, a value dimension has been discovered. This dimension reflects the unique data assets libraries hold and their trusted role as advocates for openness, innovation, and equitable access to knowledge. National libraries also contribute to the ethical and responsible development of AI technologies. Additionally, AI projects in these institutions foster AI literacy among both staff and patrons, thereby serving an important societal role.

4.1 Finding 1: Drivers for Digital Transformation with AI

The adoption of AI in National Libraries is motivated by a combination of strategic, operational, and policy-driven factors. These drivers reflect the broader transformation of libraries into digitally enabled knowledge institutions capable of meeting contemporary societal and technological demands.

4.1.1 Enhancing Access and Discoverability

One of the primary goals of digital transformation is to improve access to collections and make them more discoverable. Libraries are digitising legacy materials and enriching metadata to facilitate advanced search capabilities. AI technologies are instrumental in this process, enabling automated cataloguing and classification, enhancing user navigation and information retrieval across vast and diverse collections.

4.1.2 Increasing Efficiency in Managing Large Data Volumes

The exponential digital and print content growth has made traditional cataloguing approaches unsustainable. AI offers scalable solutions for automating repetitive and time-intensive tasks such as indexing, tagging, and classification. This significantly accelerates processing times, reduces backlogs, and allows institutions to allocate human resources to higher-value activities.

4.1.3 Supporting Research and Innovation

AI technologies contribute to advancing research through sophisticated analytical tools. Features such as semantic search, text mining, and data visualisation enable new forms of knowledge discovery that were not feasible in conventional digital library systems. These capabilities support scholars, educators, and the general public by providing innovative ways to engage with large and complex datasets.

4.1.4 Legal and Policy Requirements

National and European regulatory frameworks play a critical role in driving AI adoption. Laws mandating comprehensive collection and organisation of published materials, along with EU directives on text and data mining, create both obligations and opportunities for libraries to invest in AI. These policies establish a strong institutional mandate for digitisation and ensure compliance with emerging standards for data accessibility and interoperability.

4.1.5 Addressing Limitations of Existing Systems

Current commercial AI solutions are often optimised for English, creating challenges for libraries operating in smaller linguistic markets. European libraries are increasingly developing localised AI systems to preserve linguistic diversity and cultural heritage. These initiatives aim to maintain autonomy from dominant technology providers and ensure that national languages remain integral to the digital knowledge ecosystem.

4.1.6 Responding to Changing User Expectations

Users now expect seamless access to content, personalised services, and multilingual functionality. AI enables libraries to offer enhanced services such as automated summarisation, adaptive search, and user-specific recommendations. These innovations not only improve user experience but also position libraries as competitive and relevant in the evolving digital landscape.

4.1.7 Building Institutional and Societal Competence

Finally, AI adoption is viewed as a strategic investment in institutional learning and digital literacy. Experimentation with emerging technologies allows libraries to develop technical expertise, foster innovation, and strengthen their role in educating the public about responsible AI use. This dual focus on

institutional capacity and societal benefit underscores the broader mission of libraries as enablers of democratic access to information.

4.2 Finding 2: Types of AI Technologies in Digital Transformation Processes

The findings indicate that National Libraries implement AI technologies across three primary domains: (1) internal library processes, (2) user-facing services for private individuals such as citizens and researchers, and (3) services designed for external stakeholders in the GLAM sector (Galleries, Libraries, Archives, and Museums).

4.2.1 Digitally Transforming Internal Library Processes

AI technologies are extensively applied to automate and enhance core internal operations. A key area of focus is content indexing across different media formats, including text, images, and video. Libraries adopt a range of approaches, from semi-automated processes that require human oversight, predictive maintenance, and optimisation of book storage, to fully automated indexing systems. Subject indexing and metadata generation constitute the primary use cases, improving cataloguing speed and consistency while reducing manual workload.

Additionally, libraries use AI-driven tools to extract structured data from unstructured sources. For example, methods for recognising and classifying bibliographic elements, such as titles, authors, and publishers, support the creation of formal metadata in cases where such data are unavailable from publishers or associations. These systems combine structural recognition with semantic analysis to improve classification accuracy.

Optical Character Recognition (OCR) and related technologies are also widely used to convert printed and handwritten content into machine-readable formats. This functionality enables full-text searchability and integration within centralised digital library systems. Many libraries employ OCR-based solutions as part of large-scale digitisation projects, ensuring that historical materials and newspapers can be accessed through unified indexing platforms.

Specialised tools such as Transkribus, which applies AI-based handwriting recognition, allow libraries to decode and digitise historical manuscripts. Over time, these systems improve their accuracy through iterative model training. Such technologies are instrumental in unlocking access to cultural heritage materials that would otherwise remain difficult to interpret, particularly those featuring historical calligraphy or degraded physical formats.

Beyond OCR and handwriting recognition, libraries are experimenting with Generative AI (GenAI) technologies, including large language models (LLMs) and Automatic Speech Recognition (ASR). Single- and multi-modal LLMs are being developed or adapted to support text generation, translation, and content analysis tasks, often in national languages to reduce dependence on commercial providers. ASR systems are applied to transcribe audio-visual content, enhancing accessibility and compliance with European regulations mandating subtitles for public materials. These technologies further enable advanced content discovery by transforming audio archives into searchable datasets.

4.2.2 Transforming Library Services for Private Users

AI-driven tools also enhance the services provided directly to individual users, including citizens and researchers. National libraries deploy conversational interfaces, intelligent search portals, and personalised recommendation systems to improve information retrieval and user engagement. These applications leverage language models and semantic indexing to deliver relevant results, summarise content, and adapt responses to different user needs.

Some libraries also integrate AI-assisted tools into submission workflows for digital repositories. For instance, when students deposit theses, AI-based subject indexing suggestions reduce manual intervention and improve metadata quality. These features optimise resource allocation and enhance the overall user experience by enabling quicker and more accurate search functionalities (e.g. for researchers using AI tools or by providing easier access to collections).

4.2.3 Extending Services to the GLAM Sector

Several National Libraries have adopted a collaborative approach by providing AI solutions as shared services for other cultural institutions. These include speech recognition models, centralised search platforms, and generative AI tools designed to improve metadata generation and accessibility across the GLAM (**G**alleries, **L**ibraries, **A**rchives, **M**useums) sector. Such services promote interoperability, reduce duplication of effort, and strengthen the digital infrastructure for cultural heritage management.

In addition to improving discoverability, these tools enable researchers and creative professionals to analyse large-scale digital collections as datasets. Furthermore, for example, they are publishing code and tools that could be used by other institutions. This expands the potential for scholarly inquiry, creative reuse, and innovation while reinforcing the role of National Libraries as central nodes in the cultural and research ecosystem.

4.3 Finding 3: Digital Transformation Outputs, Outcomes, and Impacts of AI

Implementing AI within National Libraries has generated significant outputs, outcomes, and long-term impacts extending beyond operational improvements. By applying established definitions, these results can be categorised into outputs (immediate, measurable deliverables), outcomes (medium-term changes in processes and behaviours), and impacts (long-term effects on institutional strategies and societal value).

4.3.1 Outputs (Direct Results of AI Projects)

AI integration has produced a range of direct outputs, including open-source solutions, automation processes, experimental AI units, and practical tools tested and deployed in real-world contexts. Many libraries have adopted open-source technologies to maintain autonomy, enhance transparency, and facilitate collaboration across institutions. These initiatives have enabled the development of shared repositories, modular AI tools for subject indexing, and cataloguing systems accessible to broader research and cultural communities.



Additional outputs include AI-driven prototypes for automated cataloguing, metadata generation, and digital content indexing. OCR-based systems and handwriting recognition technologies have significantly accelerated the digitisation of historical materials, converting print and handwritten artefacts into searchable digital formats. Generative AI models and Automatic Speech Recognition (ASR) technologies are also being integrated to transcribe audiovisual content, enabling compliance with accessibility standards and enhancing the usability of extensive audio-visual archives.

Experimental AI units or labs established within some libraries serve as structured environments for innovation. These units allow testing of emerging technologies, development of prototypes, and evaluation of AI performance before large-scale deployment. While some institutions prefer centralised innovation hubs, others integrate AI development across departments to ensure distributed expertise and flexibility.

Automation represents another primary output. AI has streamlined repetitive and resource-intensive workflows, such as cataloguing, metadata enrichment, and document splitting during digitisation. These efficiencies have reduced backlogs and allowed human resources to focus on higher-value activities.

Finally, AI-enabled search mechanisms have transformed information retrieval. New models provide advanced semantic capabilities, image-based searches, and transcription-driven search functionalities, facilitating access to vast and diverse digital collections.

4.3.2 Outcomes (Institutional and User-Level Changes)

AI adoption has triggered structural and behavioural changes within libraries. Internally, traditional cataloguing systems have evolved to accommodate dynamic digital research needs, requiring staff to adapt to continuous learning and embrace interdisciplinary collaboration. These shifts reflect a broader cultural change within institutions, emphasising agility, experimentation, and innovation.

Enhanced efficiency and effectiveness are evident across multiple domains. Automating routine tasks has freed staff for intellectually demanding and creative responsibilities, while new digital tools have improved the accuracy and comprehensiveness of metadata. As a result, collections are more accessible, and user experiences are enriched through features such as personalised recommendations and advanced discovery tools.

The outcomes also include creating specialised roles (e.g., machine learning engineers, research scientists) and reallocating human resources toward AI governance, data stewardship, and technology integration. This transformation underscores the importance of capacity building and professional development to sustain innovation.

AI has also facilitated interdisciplinary collaboration, both internally, across library departments, and externally, through partnerships with universities, research institutions, and technology providers.

These collaborations strengthen knowledge exchange and accelerate the deployment of AI-driven services.

4.3.3 Impacts (Strategic and Societal Effects)

The long-term impact of AI adoption extends to strategic positioning, ethical governance, and cultural preservation. While libraries maintain their core mission of safeguarding heritage and providing public access to knowledge, AI enhances their ability to fulfil these objectives more effectively. Notably, AI supports the preservation of minority and indigenous languages, mitigating the risk of linguistic marginalisation in the digital era. This aligns with broader cultural policies promoting diversity and inclusion.

AI applications also play a critical role in predictive maintenance, as well as in restoring and protecting historical artefacts. Machine learning algorithms facilitate the restoration of degraded manuscripts and enable scalable digitisation projects, ensuring that cultural assets remain accessible to future generations.

At a societal level, libraries contribute to AI literacy and public engagement by providing platforms for education and debate on emerging technologies. These initiatives reinforce trust in public institutions as ethical stewards of technology, promoting transparency and accountability.

However, these advances raise concerns about bias, data provenance, and privacy. Ethical governance frameworks are essential to prevent the perpetuation of historical inequalities through biased algorithms and to maintain public trust in AI-driven services. Libraries are responding by improving documentation practices and developing methodologies to ensure responsible use of cultural datasets.

Finally, the integration of AI drives a democratisation of access to information. Enhanced searchability, personalisation, and multimodal discovery capabilities expand the reach of library services, fostering inclusive access for diverse user groups.

4.4 Finding 4: Challenges to the Adoption of AI in Libraries

National libraries are among the frontrunners in introducing AI technologies in the public sector, yet this transition presents various challenges alongside significant opportunities. While AI adoption enhances efficiency and opens new possibilities for user engagement, it also introduces structural, technical, and ethical complexities that must be addressed for sustainable implementation. Key challenges identified include ethical considerations, legal constraints, workforce concerns, quality assurance, organisational culture, and dependence on external vendors. Additional obstacles relate to linguistic diversity, data availability, and financial limitations.

4.4.1 Ethical Aspects

AI integration raises numerous ethical issues, particularly regarding transparency, accountability, and fairness. A central concern is the quality of training data, as biased or harmful content can perpetuate

inaccuracies and discriminatory practices in AI-generated outputs. The principle of “garbage in, garbage out” underscores the importance of curating and documenting datasets rigorously to prevent harmful predictions. Additionally, protecting user privacy and ensuring compliance with data protection laws is essential. Libraries must implement explainability mechanisms to clarify AI processes and provide transparency in decision-making. Failure to address these issues risks eroding public trust in libraries as authoritative and neutral institutions.

4.4.2 Copyright and Legal Constraints

Copyright law poses a significant barrier to developing AI solutions. Libraries often cannot share copyrighted material beyond institutional boundaries, limiting the datasets available for training AI models. Some jurisdictions mitigate this through agreements with rights holders, allowing restricted access for research while preventing redistribution of full datasets. However, such arrangements require negotiation, compensation, and monitoring to ensure compliance. Moreover, using high-quality copyrighted content is essential for producing accurate and reliable AI tools, creating a tension between legal obligations and technological requirements.

4.4.3 Job Security Concerns Among Librarians

AI-driven cataloguing and metadata-generating automation raises fears among librarians about job displacement. While AI primarily supports repetitive, low-value tasks, there is apprehension that management might leverage automation to justify reducing staff. This perception is compounded by the potential risk of errors in AI-generated data, which could compromise the quality of bibliographic records and increase user frustration. Addressing these concerns requires clear communication strategies emphasising AI as an assistive tool rather than replacing human expertise.

4.4.4 Quality Control

Ensuring the accuracy of AI-generated outputs is a critical challenge. Although AI systems perform well in structured tasks such as predicting titles or authors, they perform less well in complex areas like subject classification. Consequently, human oversight remains indispensable. Manual verification and correction of AI outputs often increase workloads rather than reduce them, particularly when errors are subtle or context-dependent. This underscores the need for robust quality control frameworks and systematic feedback loops to refine AI models continuously.

4.4.5 Cultural and Organisational Mindset Shifts

Adopting AI requires a fundamental shift in organisational culture, which is often slow and difficult to achieve. Resistance arises from uncertainty about the role of AI and its alignment with professional values. The complexity of AI technologies, including the opaque nature of specific machine-learning models, compounds this challenge. Effective change management strategies, continuous communication, and leadership engagement are necessary to overcome scepticism and facilitate acceptance across different organisational levels.



4.4.6 Dependence on External Technology Providers

Libraries increasingly rely on commercial vendors for AI solutions, creating risks related to autonomy, transparency, and sustainability. External dependence may limit institutional control over system functionality and raise concerns about data privacy and ethical compliance. Additionally, proprietary systems can introduce vendor lock-in, reducing flexibility and long-term cost efficiency. Building in-house expertise and prioritising open-source or interoperable solutions are critical steps toward mitigating these risks.

4.4.7 Skills Alignment and Workforce Competence

Effective AI adoption depends on aligning staff competencies with technological requirements. Cataloguers and metadata specialists need foundational knowledge of AI functionalities, limitations, and biases to make informed judgments about machine-generated outputs. Training programs must address these gaps by equipping staff with practical skills for evaluating and correcting AI outputs. Developing a shared understanding of AI across all roles is vital to ensure consistent quality standards and adequate user support.

4.4.8 Limited AI Literacy Among Librarians

Low levels of AI literacy remain a significant barrier. While some institutions have introduced AI labs to promote internal learning, many librarians lack the technical expertise to manage AI projects effectively. Upskilling initiatives are therefore essential, particularly as technical roles such as machine learning engineers and data scientists become integral to AI implementation. Given the global shortage of AI specialists, libraries must prioritise internal capacity building to remain competitive, legitimate, relevant and independent.

4.4.9 Lack of AI Tools for Smaller Languages

Language diversity presents another challenge, as many commercial AI tools are optimised for English and other dominant languages. Ensuring linguistic inclusivity requires targeted efforts to develop and train models in minority and regional languages. Failure to address this gap risks marginalising smaller languages in the digital domain, undermining cultural preservation efforts.

4.4.10 Extensive Data Requirements

Training effective AI systems demands large, high-quality datasets. However, access to such data remains limited due to legal, technical, and logistical constraints. Insufficient data availability hampers the development of generative AI tools and compromises model accuracy. Libraries must explore innovative strategies for data aggregation and collaborative frameworks to overcome these limitations.

4.4.11 Financial Constraints

Finally, financial barriers hinder especially the scaling and extension of AI initiatives. Implementing advanced technologies requires significant investments in infrastructure, specialised personnel, and ongoing maintenance. Budget limitations restrict the ability of libraries to recruit developers, establish training programs, and secure necessary computing resources. Without sustained funding, many institutions risk falling behind in digital innovation.

4.5 Summary of Findings

The table (Table 2) below provides a simplified overview of key findings related to the adoption of AI technologies in National Libraries, including the focus areas and selected examples.

Table 2: Summary of Findings

Finding	Focus Areas	Selected Examples
1. Drivers for Digital Transformation	Access, Efficiency, Innovation, Policy, User Needs	AI improves search, automates indexing, supports research, addresses language barriers
2. Types of AI Technologies	Internal processes, User services, GLAM tools	OCR, HTR, ASR, LLMs, chatbots, shared AI platforms for cultural institutions
3. Outputs, Outcomes, Impacts	Tools, Organisational Change, Public Trust	Open-source AI tools, experimental labs, improved discoverability and metadata
4. Challenges to AI Adoption	Ethics, Legal Barriers, Skills Gaps, Funding	Bias, copyright, job fears, error-prone results, resistance to change, lack of local language support

5 Lessons Learned

The cross-case analysis of AI implementation in National Libraries has generated a set of key findings and transferable lessons. These findings reflect shared challenges and opportunities encountered by the participating institutions and offer a blueprint for other public-sector organisations considering similar digital transformation efforts.

First and foremost, the analysis confirms that AI implementation is not a purely technological endeavour. While algorithms and models are central to AI systems, their successful adoption depends equally on organisational culture, governance models, and capacity-building. Libraries that fostered interdisciplinary collaboration and created agile internal structures were more likely to advance their AI agendas.

Second, successful AI initiatives were grounded in a clear articulation of public value. Institutions that framed their AI use cases in terms of improving access, preserving cultural heritage, or increasing operational efficiency tended to secure stronger internal support and external legitimacy. AI was viewed not as an end, but as a tool to advance the mission of democratising knowledge.

A third key finding is the importance of co-production and stakeholder engagement throughout the AI implementation lifecycle. From ideation to evaluation, inclusive practices led to solutions that were better aligned with user needs, more robust against bias, and more sustainable over time. This iterative engagement has built trust among staff and external partners and created a sense of shared ownership.

Fourth, digital maturity plays a critical role in determining the success of AI projects. National Libraries with existing digital infrastructures, experienced IT teams, and digital literacy programs were more prepared to integrate AI tools into their workflows. Conversely, institutions that lacked foundational digital systems or faced resource constraints struggled to move beyond pilot stages.

Fifth, the human-AI relationship remains central. Libraries that adopted a “human-in-the-loop” approach, where AI tools are used to augment and automate, not replace, human expertise, reported higher acceptance rates among staff and users. These systems allowed for quality control, ethical oversight, and contextual interpretation that pure automation could not provide.

Sixth, several barriers continue to hinder AI implementation. These include a lack of sustainable funding, fragmented data governance, limited access to training data in local languages, and regulatory uncertainty around copyright and data protection. These structural issues require not only institutional effort but also policy-level interventions.

In terms of lessons learned, one major insight is the need to invest early in capacity-building. Skills development for both technical and non-technical staff should begin before the launch of any AI initiative. It is important to involve all relevant staff members from the outset and to clearly communicate the overarching ideas, goals, and potential implications of the planned AI

implementation. Their early involvement fosters a sense of ownership, increases transparency, and helps mitigate resistance. Equally important is the creation of internal feedback loops to continuously learn from implementation and adjust strategies accordingly. This iterative engagement not only strengthens institutional learning but also ensures that the AI tools are adapted to real user needs and evolving operational contexts.

Another lesson is the importance of transparency and explainability. Communicating how AI systems function and why they make certain decisions increases institutional accountability and user trust. Several case studies demonstrated that simple steps, such as flagging AI-generated metadata or publishing model training sources, can make a significant difference.

Finally, sustainability and success require long-term thinking. Institutions that designed their AI initiatives with maintenance, scalability, and future adaptability in mind were more likely to sustain momentum. Embedding AI into broader digital strategies, rather than treating it as an isolated experiment, emerged as a critical success factor.

In sum, the key findings of this report emphasise that the future of AI in National Libraries lies in thoughtful integration, collaborative governance, and mission-driven innovation. National Libraries using AI in a way that reinforces their role as guardians of cultural memory and enablers of democratic access to information, they are acting not just as adopters of the latest digital trends. The lessons learned highlight the value of incremental experimentation, stakeholder inclusion, and ethical awareness as guiding principles for digital transformation in public knowledge institutions.

6 Recommendations for Practitioners and Policymakers

This chapter offers comprehensive recommendations derived from the findings of the LibrarIN project and its cross-case analysis of Artificial Intelligence (AI) implementation in National Libraries. These recommendations are directed toward both library practitioners and public policymakers at national and European levels. They cover institutional, technical, ethical, and financial aspects that are essential for sustainable and inclusive AI-driven digital transformation in the public sector. The recommendations are based on the empirical findings gathered throughout the project and were presented to project members and stakeholders for validation. They are directly informed by the feedback from these diverse groups and closely aligned with the key findings identified across the different national case studies.

6.1 Strategic Vision and Institutional Leadership

To drive sustainable AI integration, National Libraries need to formulate a long-term digital transformation strategy that includes a clear roadmap for AI use. This should align with the institution's public mission and be grounded in values such as transparency, inclusion, and accessibility.

Library leadership must take an active role in communicating the potential and limitations of AI, establishing strategic priorities, and setting internal expectations. Executive buy-in is critical for securing resources, enabling cross-departmental collaboration, and maintaining project momentum.

6.2 Ethical and Legal Frameworks

AI deployment in public institutions must adhere to ethical standards and legal obligations. Libraries should proactively develop internal ethical guidelines for AI use, building on frameworks such as the European Commission's Ethics Guidelines for Trustworthy AI.

These guidelines should address transparency, explainability, fairness, non-discrimination, and accountability. Libraries should also establish internal review processes to assess the ethical implications of AI tools and develop safeguards for high-risk use cases (e.g., user data processing, automated decision-making).

On the legal side, libraries must ensure compliance with relevant legislation, including the General Data Protection Regulation (GDPR), copyright law, and public procurement rules. Where legal ambiguity exists (e.g., regarding AI-generated metadata), libraries should advocate for clearer policy guidance.

6.3 Human-Centric Design and Capacity Building

AI systems must be designed and implemented with human users in mind. Libraries should adopt a human-in-the-loop model that integrates human expertise into algorithmic workflows. This approach enhances quality assurance and mitigates risks associated with bias, opacity, or technical failure.

Investing in digital literacy and staff training is essential. Librarians, IT staff, and decision-makers alike should be equipped with the knowledge and skills to evaluate, monitor, and co-design AI solutions. Training programs should include technical basics, ethical awareness, and governance principles.

6.4 Technical Infrastructure and Vendor Independence

Robust and scalable infrastructure is a prerequisite for effective AI deployment. National Libraries should invest in open-source solutions, interoperable platforms, and modular architectures to reduce vendor lock-in. Where feasible, libraries should develop or co-develop AI models tailored to their domain-specific needs and linguistic contexts.

Public funding bodies should support infrastructure development through targeted grants, while also encouraging shared services and joint procurement models. This will foster economies of scale and facilitate knowledge sharing across institutions.

6.5 Stakeholder Engagement and Co-Production

AI implementation should follow co-productive principles that include stakeholders throughout the technology lifecycle, from problem definition and design to testing and evaluation. Libraries should use participatory workshops, surveys, and feedback loops to incorporate diverse perspectives, including those of underrepresented user groups.

At the governance level, co-creation models must include legal experts, ethical advisors, librarians, data scientists, and end users. National Libraries can serve as testbeds for inclusive public-sector innovation, helping to establish best practices for participatory technology governance.

6.6 Evaluation, Feedback, and Continuous Learning

Libraries must develop robust mechanisms for evaluating AI performance. These should include both quantitative indicators (e.g., accuracy, efficiency gains) and qualitative assessments (e.g., user satisfaction, fairness). Evaluation results should be shared transparently and used to inform future developments.

Continuous learning should be embedded into project cycles. Libraries should treat AI deployment as an iterative process and document lessons learned to feed into institutional memory and broader policy debates.

6.7 Data Governance and Openness

Data is the foundation of AI. Libraries should adopt data governance policies that ensure data quality, provenance, and accessibility. Where possible, libraries should make training data, annotations, and outputs available to the public in machine-readable formats, while respecting privacy and copyright laws.

Open datasets not only improve transparency and reproducibility but also enable collaboration across the public sector, academia, and civil society. National Libraries can lead by example in promoting data commons and open metadata standards.

6.8 Multilingual and Cultural Adaptation

AI tools often reflect the biases of their training data, which are frequently English-centric. National Libraries must invest in the development and deployment of models adapted to local languages and cultural contexts. This includes partnering with academic institutions and consortia to build open, linguistically diverse models and corpora.



The European Union should support these efforts through funding instruments such as Horizon Europe and the Digital Europe Programme, ensuring that AI adoption does not exacerbate digital inequalities between larger and smaller language communities.

6.9 Policy Recommendations for National and European Policymakers

Policymakers play a critical role in shaping the AI ecosystem for public services. Based on the findings from the LibrarIN project, we recommend that national and EU institutions:

- Develop sector-specific AI strategies for libraries, archives, and cultural institutions, aligned with public values.
- Fund AI experimentation through dedicated calls that support co-creation, evaluation, and reuse.
- Establish interdisciplinary task forces to support ethical, legal, and technical guidance in AI implementation.
- Create regulatory sandboxes to explore legal uncertainties (e.g., copyright, model explainability) in real-world settings.
- Support cross-border collaboration and multilingual AI resource development, especially for underrepresented languages.

6.10 Sustainability and Long-Term Impact

AI projects should be planned with sustainability in mind. Libraries must budget for long-term maintenance, retraining of models, software updates, and personnel development. Funders should move away from short-term pilots and toward supporting the full AI lifecycle, including procurement, deployment, scaling, and decommissioning.

Environmental sustainability must also be considered. Libraries should evaluate the energy footprint of AI applications and prioritise lightweight, energy-efficient models. EU green computing principles can serve as a reference.

In summary, the recommendations outlined in this chapter reflect a holistic approach to AI implementation in National Libraries. They emphasise the need for alignment with public-sector values, robust institutional frameworks, ethical integrity, and cross-sector collaboration. AI can support libraries in fulfilling their democratic mandate, preserving cultural heritage, promoting open access to information, and equipping citizens for the digital age, but only if its adoption is guided by principles of public good, inclusivity, and long-term stewardship.

7 Summary overview of cross-case findings

This concluding chapter outlines areas for future research and reflects on the long-term outlook for Artificial Intelligence (AI) in National Libraries and the broader public knowledge sector. The LibrarIN project has revealed significant potential for AI to enhance the mission, operations, and societal value of libraries. However, it has also underscored that AI implementation is a complex, evolving process requiring interdisciplinary collaboration, public sector stewardship, and continuous adaptation.

7.1 Longitudinal Impact Studies

Future research should investigate the long-term impacts of AI systems in libraries. Key areas include how AI affects service accessibility, user satisfaction, staff roles, and institutional trust. Longitudinal studies can capture changes in user behaviour, institutional performance, and perceptions of AI legitimacy over time. Such insights are essential to inform evidence-based digital transformation strategies.

7.2 AI Literacy and Digital Skills Evolution

Research is needed to understand the evolving AI literacy needs of library staff and users. What kinds of training are most effective? How do AI tools reshape professional competencies in cataloguing, preservation, and outreach? Comparative studies across countries and library types can help identify best practices for fostering inclusive, future-ready digital skills ecosystems.

7.3 Co-Creation Processes and Organisational Change

Further empirical work should explore how co-creation and stakeholder engagement processes influence AI adoption success. Case studies could investigate the conditions under which participatory design methods lead to sustainable outcomes, staff buy-in, and ethical compliance. Research can also examine the interplay between digital innovation and organisational culture, hierarchy, and governance.

7.4 Comparative Policy and Legal Studies

AI regulation is evolving rapidly. Comparative legal research can help clarify how national and EU policies support or constrain AI use in libraries. Key questions include how different copyright regimes, data protection frameworks, and procurement rules influence technology adoption. Research should aim to support harmonisation and provide policy guidance that balances innovation with public interest.

7.5 Measuring Public Value and Social Return

More sophisticated frameworks are needed to assess the public value generated by AI in libraries. Beyond efficiency metrics, libraries need ways to evaluate their contribution to digital equity, cultural preservation, democratic participation, and civic education. Research should develop methodologies and indicators to quantify and qualify these societal outcomes.

7.6 Environmental Impacts and Sustainable AI

Future work should explore the environmental footprint of AI applications in the cultural heritage sector. How can libraries ensure that their AI systems are energy-efficient and aligned with climate

goals? This includes studying the lifecycle costs of different AI models, from training to deployment, and identifying opportunities for greener digital infrastructure.

7.7 Innovation Ecosystems and Cross-Sector Collaboration

Further research should examine how National Libraries can contribute to and benefit from wider AI innovation ecosystems. This includes understanding the role of libraries as data providers, ethical watchdogs, training hubs, and co-creation spaces within national and European AI strategies. Studies could map successful collaboration models between libraries, academia, industry, and civil society.

7.8 AI Governance and Institutional Ethics

Finally, research is needed on the governance models that best support ethical and accountable AI in public institutions. What organisational structures, roles, and decision-making processes promote responsible innovation? How can libraries build internal capacities for algorithmic auditing, ethical review, and user advocacy? Insights from public administration and technology governance studies can inform library-specific models.

7.9 Feedback

The findings and recommendations of the LibrarIN project were presented to stakeholders during a dedicated meeting held on 30.09.2025. The session aimed to foster dialogue around the practical relevance and anticipated impact of the project results. Stakeholders were asked to respond to the guiding question:

"How do you foresee your work being impacted by the LibrarIN results?"

(For example, you can think about impact on policy, on research and knowledge production, and on your practice.)

The feedback received and displayed in the picture below reflects a broad and detailed engagement with the cross-case analysis and recommendations for AI implementation in National Libraries.

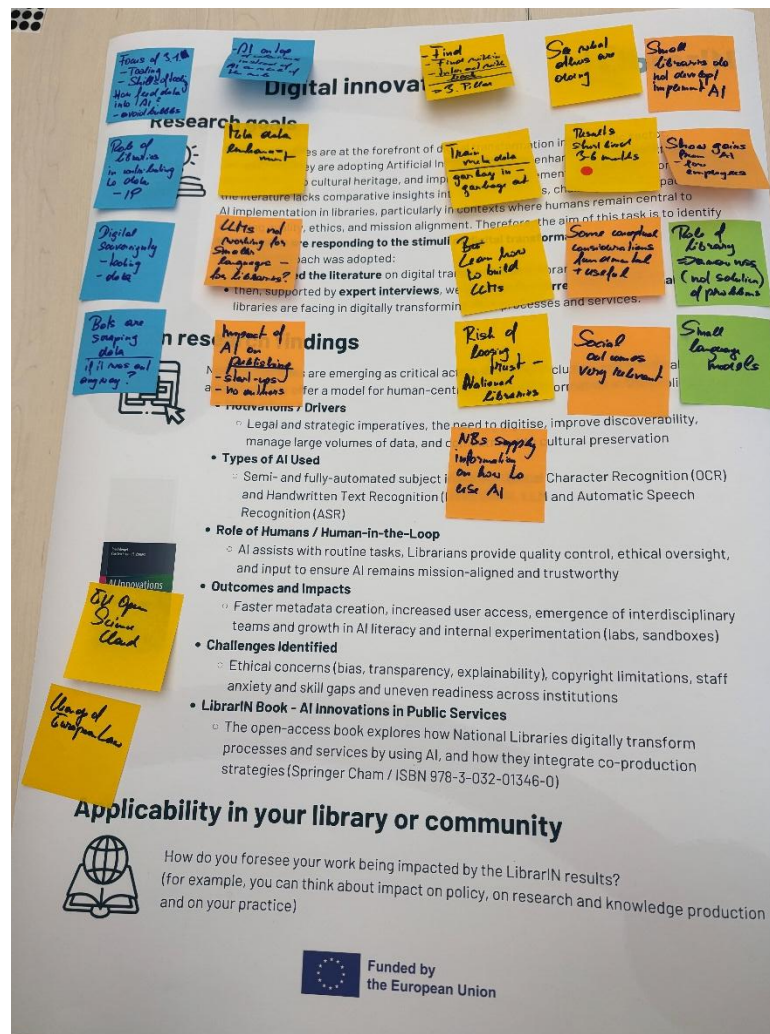


Figure 2: Feedback Poster Stakeholder Meeting 30.09.2025

The following insights summarise the key reflections expressed during the session:

- **Institutional Role and Responsibility:** Several participants highlighted that libraries should not be seen as solution providers, but rather as institutions that raise awareness around key challenges, such as ethical use of data, misinformation, and the societal implications of AI. This positions libraries as trusted facilitators in the public debate surrounding responsible AI adoption.
- **Digital Sovereignty and Intellectual Property (IP):** Stakeholders stressed the importance of maintaining control over data assets, particularly in the face of automated scraping and ambiguous IP boundaries. The notion of digital sovereignty, ensuring that public knowledge institutions can manage their own data flows and AI development trajectories, emerged as a central concern.



- **Skills and Tooling:** The recommendations on workforce development resonated strongly. It was emphasised that both technical and non-technical skills must be addressed early, especially in understanding how data is prepared and fed into AI systems. The challenge is not just to implement tools, but to build institutional competence in shaping them.
- **Metadata and the Quality of Input Data:** Stakeholders reinforced the insight that “garbage in, garbage out” remains a foundational principle. Libraries, especially National Libraries, have a key role in enhancing metadata quality and potentially training AI systems to better recognise structured cultural data, especially in the context of underrepresented languages.
- **Language and Inclusivity:** The limitations of large language models (LLMs) for smaller languages were raised as a critical gap. Some participants saw a strategic opportunity for National Libraries to take the lead in developing small language models, thus contributing to linguistic diversity in the digital space.
- **Changing Nature of Library Work:** The evolution of the librarian’s role was another theme. Stakeholders noted a shift from “finding a book” to “finding within a book”, and now towards “interacting with the book” through AI-driven interfaces. This transformation implies the emergence of a third pillar in library services, centred on user interaction with AI-augmented content.
- **Impact on Publishing and Content Creation:** Several stakeholders predicted a radical transformation of the publishing landscape, including the emergence of AI-generated books and the rise of start-ups leveraging LLMs. This will inevitably impact library acquisition practices, content curation, and the verification of authorial provenance.
- **Short- vs. Long-Term Relevance of AI Insights:** While acknowledging the rapid pace of AI innovation, where some findings may become outdated within 3–6 months, stakeholders agreed that many of the conceptual and strategic considerations identified in the project remain fundamentally valuable over the long term.
- **Usefulness for Peer Learning:** The cross-case insights were considered helpful for benchmarking and mutual learning, particularly for institutions that have not yet embarked on AI implementation. Seeing what others are doing, both the gains and the challenges, was described as a motivating and guiding resource.
- **Policy and Research Impact:** The potential influence of the LibrarIN findings on European policy and the EU Open Science Cloud was also noted. Changes in European law, especially around data access and AI governance, were seen as areas where the project could contribute meaningfully to policy debates.

In summary, the stakeholder feedback validated the LibrarIN recommendations while offering additional reflections on the future role of libraries in shaping ethical, inclusive, and technically sound AI ecosystems. The session underscored the relevance of combining short-term agility with long-term institutional positioning, especially as public knowledge organisations navigate the fast-evolving AI landscape.



7.10 Outlook

Looking ahead, the role of National Libraries in the digital society is likely to become even more important. As trusted public institutions, libraries have the opportunity to shape the development and use of AI in a way that is inclusive, ethical, and democratic. By embracing a forward-looking, reflective, and collaborative approach, they can ensure that AI strengthens, rather than compromises, their foundational mission of preserving knowledge and ensuring universal access to information.

The insights generated through the LibrarIN project provide a foundation for ongoing experimentation, learning, and transformation. As AI technologies evolve, so too must the frameworks, competencies, and values that guide their use in public knowledge institutions. The future of libraries and the future of public sector AI are intertwined, and both depend on the collective capacity to innovate responsibly.



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